GOVERNMENT OF PUERTO RICO
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY
SAN JUAN, PUERTO RICO

Autoridad de Acueductos
y Alcantarillados

VOLUME A

PROJECT DOCUMENTS

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)

YAUCO, PR
CIP: 4-79-7005
BID NUMBER: 27-SP-021

ENG. LUIS R. GONZÁLEZ DELGADO
PRASA EXECUTIVE PRESIDENT

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
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GOVERNMENT OF PUERTO RICO
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY
SAN JUAN, PUERTO RICO

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR
CIP: 4-79-7005
BID NUMBER: 27-SP-021

A.1 ADVERTISEMENT

Sealed bids for the above-mentioned project will be received by the Puerto Rico Aqueduct and Sewer Authority (PRASA) until **2:30 P.M**. of **April 6, 2027,** at the Board of Awards of the PRASA, eight floor of PRASA Main Building, located at 604 Barbosa Avenue, Hato Rey, Puerto Rico. The bid proposals shall be in accordance with the specifications and other Bidding Documents prepared by PRASA. Just after the deadline mentioned above, all received bids will be publicly opened and read aloud on the eight floor of PRASA's Board of Awards.

All bidders must include with their proposals a certification from the Bidder Registration Office of the General Service Administration (Registro Único de Licitadores de la Administración de Servicios Generales) indicating they are eligible to participate in bids from Agencies of the Executive Branch of the Government of Puerto Rico.

Prospective bidders can attend a non-compulsory pre-bid meeting to be held at the Rio Prieto Raw Water Intake (RWI) located at State Road PR-374 Km. 12 Interior (Coordinates: 18.143892°, -66.825239°) in Yauco, Puerto Rico on **January 11, 2027,** at **10:00** a.m. For additional information regarding the meeting place, please contact Eng. Rosangela Santiago at telephone (787) 383-2242, or at rosantiago@csagroup.com. All questions arising concerning this project shall be submitted ten (10) calendar days before the bid opening date.

The project consists of the improvements and repairs to the Rio Prieto Raw Water Intake. All in accordance with the construction drawings, and specifications prepared by PRASA.

Bidding Documents will be available from November 18, 2026, using Portal AAA at https://www.acueductos.pr.gov/infraestructura/aaa-subastas. Bidders shall gain access to download the digital documents on the above specified date through the Portal AAA website https://www.acueductos.pr.gov/infraestructura/aaa-subastas. Hard copies or CDs shall not be provided by PRASA.

The PRASA's Cost Estimate for this project is $10,411,694.10

Bidders shall submit proposals on or before the time and date previously mentioned at the Documents Administration Section. All bids received will be publicly opened and read aloud on the Board of Awards.

Each proposal must be accompanied by a Proposal Guarantee, a certified check or a bid bond from a reliable surety company authorized to do business in Puerto Rico and satisfactory to the PRASA, in an amount equal to five (5%) percent of the proposal.

The Proposal Guarantee will be accrued in favor of PRASA to pay for any damage or loss to PRASA in case the successful Bidder shall neglect or refuse to enter into a contract in accordance with the proposal. The successful Bidder will be required to obtain and pay for performance, payment, and all other bonds, as specified in the Contract Documents.

PRASA has issued this bid in compliance with the public policy of the Government of Puerto Rico as established in Art. 3 of Law No. 42 of January 21st, 2018, "Ley de Preferencia para Contratistas y Proveedores Locales de Construcción".

Law No. 42-2018 states that all governmental entities are required to reserve at least twenty percent (20%) of procurement and construction contracts to services rendered by Local Business or Providers of Construction Services, as defined in Art. 2 (B) and (C) of said law. PRASA affirms and recognizes this preference policy, therefore Law 42-2018 applies to all bidding processes conducted at PRASA. Bidders that comply with all the requirements and parameters established in Law 42-2018 will have the right to claim PRASA to apply the percentage of preference at the adjudication of bid.

The Puerto Rico Aqueduct and Sewer Authority reserves the right to consider bids for ninety (90) calendar days after bid opening date before awarding any contract and the right is reserved to waive any informalities, to accept any or all bids, and to reject any or all bids in the benefit of the best interest of PRASA. The award will be made to the lowest, responsive, responsible Bidder. The responsiveness and responsibility of the Bidders will be determined by the PRASA.

Bidders must certify that they do not, and will not, maintain or provide for their employees any facilities that are segregated on a basis of race, color, creed, or national origin. The requirements for bidders and contractors under these orders are explained in the specifications.

This project will be financed with funds from the Puerto Rico Aqueduct and Sewer Authority (PRASA), the Federal Management Emergency Agency (FEMA) under the FEMA’s Accelerated Obligation Strategy (known as FAAST), and the Community Development Block Grant Disaster Recovery (CDBG-DR) Program. This project will be in compliance with all applicable state and federal environmental laws and regulations.

Eng. Luis R. González Delgado
PRASA Executive President
November 18, 2026

GOVERNMENT OF PUERTO RICO
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY
SAN JUAN, PUERTO RICO

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

A.2 DESCRIPTIVE MEMOIR

The Puerto Rico Aqueduct and Sewer Authority (PRASA) propose the rehabilitation of the raw water intake (RWI) of the Rio Prieto Water Filtration Plant (WFP), located in the Municipality of Yauco. The intake was constructed in 1988, near State Road PR-374, in La Montaña Sector of the Río Prieto Ward, in Yauco, PR. The raw water intake (RWI) consists of a concrete river weir with a steel grating on top and a lateral intake structure located in the Río Prieto. Water from the river enters the intake and flows via two (2) 8-inch diameter gravity pipelines to the raw water pump station (PS), located about 400 meters downstream of the intake. The existing pump station pumps the raw water to the Río Prieto Water Filtration Plant (WFP), where it gets treated for distribution to an estimated population of 2,651 habitants within the Municipalities of Yauco and Maricao.

The work required by this Project includes all labor, material, equipment, and supervision, to perform all necessary work to remove, dispose, inspect, repair, install, build, and replace the designated components of the water Filtration Plant. All these, in accordance with the Scope of Work (SOW), PRASA Supplementary Technical Specifications, PRASA Standard Technical Specifications and Construction Drawings.

The proposed Project includes the following tasks herein specified:

a. Rehabilitate the existing Río Prieto raw water intake structure.
b. Improve and modify the existing river weir.
c. Install Coanda screens and a bypass intake entrance.
d. Provide temporary raw water intake during construction.
e. Construct a new raw water pump station near the intake.
f. Install new pumps, valves, controls, and instrumentation.
g. Construct a new electrical and control room.
h. Install a new electrical substation and utility connection.
i. Provide a standby emergency generator and diesel fuel system.
j. Implement telemetry and SCADA integration for remote monitoring.
k. Construct a new raw water pipeline connecting to the existing system.
l. Rehabilitate and improve the site access road.

Project will benefit approximately 894 families in the Municipality of Yauco, Puerto Rico.

This project will be financed with funds from the Puerto Rico Aqueduct and Sewer Authority (PRASA), the Federal Management Emergency Agency (FEMA) under the FEMA's Accelerated Obligation Strategy (known as FAAST), and the Community Development Block Grant Disaster Recovery (CDBG-DR) Program.

GOVERNMENT OF PUERTO RICO
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY
SAN JUAN, PUERTO RICO

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

A.3 SUPPLEMENTARY INSTRUCTION TO BIDDERS

ARTICLE 1. - GENERAL

Section 1.01 Definition of Terms

Unless otherwise specified or required the definition of terms used in the Documents and Contract Documents are found in Article 1 of the General Conditions titled Definitions.

Section 1.02 Organization of Documents

The documents are organized into three main parts. Specific information on the content of these volumes is found in their index.

Volume A contain some or all the following project documents: Advertisement, Descriptive Memoir, Supplementary Instructions to Bidders including forms that must be submitted in the Proposal, Conceptual Documents, Alternatives Form, Allowances Form, Proposal Form, Supplementary Conditions, Supplementary Technical Specifications, Form of Agreement, Endorsements, Reports and other documents included for the specific project.

Volume B dated **January 2020** contains the following standard documents: Standard Instructions to Bidders, General Conditions, Standard Technical Specifications, and General Information for Contractors, OCIP, etc.

Volume C consists of the Construction Drawings, which are part of the Bidding and Contract Documents.

Section 1.03 Proposals

1. Proposal shall be submitted in sealed envelopes, plainly addressed, ink or typed, as follows:
   Board of Awards
   Infrastructure Offices
   Puerto Rico Aqueduct and Sewer Authority
   604 Barbosa Avenue (8th Floor)
   Hato Rey, Puerto Rico 00917-4310.

2. The following note shall be written, ink or typed, at the lower left corner of the envelope: Proposal for the **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST) YAUCO, PR, CIP: 4-79-7005, BID NUMBER: 27-SP-021.**

3. The above-mentioned envelope shall be enclosed in another sealed envelope addressed and mailed or delivered to:

   Board of Awards
   Infrastructure Offices
   Puerto Rico Aqueduct and Sewer Authority
   604 Barbosa Avenue (8thFloor)
   Hato Rey, Puerto Rico 00917-4310

4. The bid number, date and time of bid opening, and the name, address and telephone number of the Bidder shall be clearly written on the envelope.

Section 1.04 Selection Period

1. The selection of the contract, if it were selected, will be made within **ninety (90)** calendar days after the opening of proposals. This period of time is the Selection Period. The successful Bidder will be mailed a Notice of Selection to the address shown on his proposal, indicating that his proposal has been accepted and that he has been awarded the contract. No proposal shall be withdrawn within the selection period.

2. In the event that the selection is not made within the Selection Period, any Bidder whose Proposal Guaranty has been retained shall have the right to withdraw his proposal without penalty unless the Selection Period is extended by mutual written consent.

Section 1.05 Construction Drawings

1. The Construction Drawings for the entire project are **102** sheets. Numerical dimensions will prevail over scaled dimensions and where dimensions are omitted and the Bidders are in doubt they shall request information from PRASA.

2. Unless the Construction Drawings or specifications indicate otherwise, the datum to which elevations are referred to, shown on the Construction Drawings and in the specifications, is the mean sea level.

3. The proposed project is located at the site shown on the location plan.

Section 1.06 Completion Date

1. Contractor agrees to proceed at once with the preparation of materials and to begin the construction of all work which is possible for him to begin prior to the receipt of materials and to reach Substantial Completion on or before the expiration of **seven hundred twenty (720)** consecutive calendar days from the Date of Commencement of Work indicated in the Notice to Proceed from Contracting Officer.

2. Contractor agrees that the Work shall reach Final Acceptance and be ready for final payment within sixty (60) Days from the termination of the period specified in paragraph 1, of this section for achievement of Substantial Completion of Work, in accordance with the provisions of Section titled "Contract Time" of the General Conditions. Contracting Officer may specify at the pre-construction conference, a period for achieving Final Acceptance after the achievement of Substantial Completion that is longer than the 30 consecutive calendar days specified herein, but never more than 60 consecutive calendar days. The final payment shall be made on the period specified in the Contract Documents after the date of Final Acceptance.

Section 1.07 Changes in Law

Any change in law during the bidding process, including, without limitation, any changes in applicable tax law, that causes an increase in the Contractor's cost in supplying any products or services to PRASA shall be the Contractor's responsibility.

PRASA advises prospective Bidders to consult their CPA and/or the Treasury Department in order to get informed of the required taxes for acquisition of products, equipment and services for any particular project.

Section 1.08 Location of Work

The proposed work is located at Rio Prieto Raw Water Intake in Yauco, Puerto Rico.

Section 1.09 Obtaining Information

During the request for proposals period only administrative, and technical information concerning the proposals can be obtained from:

Written inquires: Board of Awards
Infrastructure Offices
Puerto Rico Aqueduct and Sewer Authority
604 Barbosa Avenue (8th Floor)
Hato Rey, Puerto Rico 00917-4310

E-mail inquires: addendumspmc@acueductospr.com

Fax Inquires: (787) 993-9027

Telephone: (787) 620-2277, Extensions 1108, 1109 & 1139

Section 1.10 Project Sign

1. This project is financed with funds from the Federal Emergency Management Agency (FEMA); therefore, the guidelines established for the signage of such projects must be followed. Please refer to the COR3 Memo entitled "Rótulos en Proyectos de Construcción" of October 21, 2025, and the enclosed template.

ARTICLE 2. – LIST OF DOCUMENTS TO BE SUBMITTED WITH THE PROPOSAL

PRASA reserves the right to reject any or all Proposals, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Proposals. PRASA further reserves the right to reject the Proposal of any Bidders whom it finds, after reasonable inquiry and evaluation, to be non-responsible. PRASA also reserves the right to waive all informalities not involving price, time, quantity, quality, delivery, changes in the Work, compliance with laws and regulations of federal funding agency requirements, as applicable.

Prospective Bidders will submit in their proposals, duly completed, and signed, one (1) valid original and two (2) true and exact copies of the following documents using the forms provided below in Article 3. The original will be submitted in a separate envelope. Both envelopes will be submitted following the instructions provided in the proposal's documents. The Proposal will include the following information:

1. The proposal form found below in Article 3.
2. Proposal Guarantee: The proposal Bond Form is found in Article 3 of this Volume and must be submitted following the provisions of the Proposal Form, in its section titled Additional Request Information and Notes, subsection 4, and the instructions provided in the Bid Bond Form.
3. Firm Information, Experience and Equipment Statement. This form is found below in Article 3.
4. Site Visit Affidavit. This form is found below in Article 3.
5. Non-Collusive Affidavit. This form is found below in Article 3.
6. An eligibility certificate from the Bidder Registration Office of the General Service Administration **(*Registro Único de Licitadores de la Administración de Servicios Generales)*** indicating Bidder is eligible to participate in proposals from Agencies of the Government of Puerto Rico.
7. Prospective bidders shall provide with Proposal their own **Cost Breakdown** format including the indicated unit price and allowance, if any.
8. Declaration under oath before a notary public, as required by Law 2 of January 4, 2018. This form is found below in Article 3.
9. Declaration under oath before a notary public, regarding the bidder's compliance with the Law 42 of January 21, 2018. The affidavit shall be accompanied by the certificate of incorporation from the Puerto Rico Department of State. This form is found below in Article 3. (If applicable)
10. Certification of use cement made in Puerto Rico (OE-2018-033).
11. FEMA Declaration Clauses (Lobbying). See Article 3.
12. FEMA Conflict of Interest and Unfair Competitive Advantage Certification. See Article 3.
13. Evidence of the System for Award Management (SAM) Registration.

ARTICLE 3. – FORMS

This Article contains the available forms of documents to be submitted in the Proposal.

Note: Space below in this page intentionally left blank.

1. PROPOSAL FORM

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

To: PRASA Executive President
Puerto Rico Aqueduct and Sewer Authority
San Juan, Puerto Rico

I (We) hereby certify that I (we) have examined the site of the Work and read the Agreement, together with all Documents, including the Standard and Supplementary Instructions to Bidders, Supplementary Content, all Addenda, Construction Drawings, Bonds, and Contract Documents; and fully understand the meaning of all of them; and if awarded the contract hereby agree that I (we) will comply with all the terms, covenants and agreements set forth therein.

I (We) certify that the prices in this proposal have been arrived at independently without collusion, consultation, communication, or agreement with any other Proponent or with any competitor for the purpose of restricting competition. No attempt has been made or will be made by myself or any member of my organization to induce any other person or organization to submit or not to submit a proposal on this project, or otherwise take any action in restraint of free competitive process on this project. This proposal is made in pursuance of and subject to all terms and conditions of the Standard and Supplementary Technical Specifications, the Agreement, Supplementary Content, Construction Drawings (if applicable) and all other Contract Documents pertaining to the work to be done, all of which have been examined by the undersigned.

I (We) submit this proposal with an entire knowledge of the kind, quality and quantity of the materials and workmanship required, and should it be accepted will execute the Agreement within ten (10) calendar days from the date when the written Notice of Selection of the contract is delivered at the address given on this proposal. The name and address of the corporate surety with which the Bidder proposes to furnish the required insurance and bonds for the true execution of the Work is as follows:

_____

_____

_____.

I (We) certify that this proposal is submitted with an entire knowledge of the kind, quality and quantity of the material and workmanship required, and should it be accepted will execute the Agreement within ten (10) calendar days after the date of Notice of Award furnishing the required insurance and bonds for the true execution of the Work; agreeing to achieve Substantial Completion within **seven hundred twenty (720)** consecutives calendar days from the Date of Commencement of Work indicated in the Notice to Proceed. The Work must achieve Final Acceptance and be ready for final payment within 60 consecutive calendar days from termination of the period specified for achieving Substantial Completion. PRASA may specify at the initial construction conference a period for achieving Final Acceptance after the achievement of Substantial Completion that is longer than the 30 consecutive calendar days specified herein, but never

more than 60 consecutive calendar days. The final payment shall be made on the period specified in the Contract Documents after the date of Final Acceptance.

I (we) agree to receive as full compensation for completing the Work including furnishing all materials, labor, tools, plant, equipment, and others called for under these specifications and necessary for the **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST) YAUCO, PR, CIP NUMBER: 4-79-7005, BID NUMBER: 27-SP-021**, as specified, complete and finished in every detail, and in full accordance with the Contract Documents which are hereby made part and parcel of this proposal as follows:

1. Work to be paid on a lump sum basis:

   a. For the **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST) YAUCO, PR, CIP NUMBER: 4-79-7005, BID NUMBER: 27-SP-021** as specified for all Administrative and General Conditions related to the Scope of Work described in this Volume, including **Allowances**, bonds and insurances, patent, taxes, fees and permits, mobilization and demobilization, pipes, excavations, and protection (including installation and leaving in place at his own criteria of all necessary measures and/or structures for protection of excavation), backfill, demolition and replacement of asphalt and/or concrete pavements (including furnishing and placing black base material along trench excavation up to existing grade if necessary), curbs, sidewalks, and any other miscellaneous items or resources needed to complete the project for the lump sum price of:

   _____

   _____

   _____**DOLLARS ($_____).**

2. Work to be paid on a unit cost basis:

   a. For rock excavation, as defined in Section 02A015 of the Standard Technical Specifications, in the approximate amount of **one hundred (100)** cubic meters at the unit price of: _____ (**$**_____), for the contract price of _____ _____ **DOLLARS ($**_____).

   b. For 2-inch thick cold milling in existing asphalt pavement in the approximate amount of **one thousand three hundred eighty seven (1,387)** square meters at the unit price of: _____ (**$**_____), for the contract price of _____ _____ **DOLLARS ($**_____).

   c. For furnishing and placing of 2-inch thick wearing course asphalt pavement for repavement of two lanes on streets, municipal and state roads, in the approximate amount of **one hundred ninety two (192)** tons at the unit price of_____ _____ (**$**_____), for the contract price of _____ **DOLLARS ($**_____).

d. For asphalt thermoplastic pavement marking stripes, white & yellow in the approximate amount of **seven hundred sixty-two (762)** linear meters at the unit price of _____ (**$**_____), for the contract price of_____ _____ **DOLLARS** (**$**_____).

e. For Portland cement concrete pavement of 4,000 PSI of one lane on streets, municipal and state roads in the approximate amount of **four hundred twenty-three (423)** cubic yards at the unit price of_____ (**$**_____), for the contract price of_____ _____ **DOLLARS** (**$**_____).

The total amount for items 1.a and 2.a 2.b, 2.c, 2.d, and 2.e is the Contract Price of _____

_____

_____

DOLLARS (**$** _____).

Allowances:

Document A.4 – Allowances Form, is an integral part of this proposal. All the Allowances included in A.4 Allowances Form are part of the Work and are included as part of the Work to be paid on a lump sum basis stated above.

Payment to the Contractor for this Work will be subject to the terms, condition and schedule indicated in the Contract Documents (refer to Article titled "INVOICES AND PAYMENT" of the General Conditions).

I (we) hereby acknowledge receipt of the following Addenda. All modifications indicated therein are included in this proposal:

Addendum Number	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

CONTRACTOR

Seal	**Firm Name:** _____ _____ **By:** _____ **Typed Name:** _____ **Title:** _____
Signature: _____ **Typed Name:** _____ **Tittle:** _____ (Authorized Representative (s))	**Signature:** _____ **Typed Name:** _____ **Tittle:** _____ **Date:** _____

Note: Signature of each principal is required if Contractor is a Partnership or a Consortium.

Bidder's Street Address: No: _____ Street: _____

City: _____ Telephone: _____ Fax: _____

Bidder Mailing Address: _____

City: _____ Zip Code: _____

e-mail (if available) _____

Additional Request of Information and Notes:

1. For PRASA's statistic purpose we are requiring the following information:

   The approximate number of new employees to be hired in this project (not including the permanent employees of the Contractor will be _____.

2. This Proposal must be fully completed. The prices must be written in ink and also stated in figures. In case of variation, the written prices shall govern. All correction of errors, erasures, blots, etc., must be initialed.

3. The list of documents that must be submitted with the proposal is found in Article 2. - "List of documents to be submitted with the Proposal" of the Standard Instructions to Bidders.

4. The insurance policies and bonds must be submitted to PRASA in ten (10) calendar days from the selection date indicated in the Notice of Selection.

2. BID BOND

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

_____

as Principal, and _____ as Surety, are hereby held and firmly bound unto Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico, as owner in the penal sum of _____

_____($_____)

for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed, this _____ day of _____ 20 _____.

The condition of the above obligation is such that whereas the principal has submitted to Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico, a certain Proposal, attached hereto and hereby made a part hereof to enter into a contract in writing, for the: **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST), YAUCO, PR, CIP NUMBER: 4-79-7005, BID NUMBER: 27-SP-021.**

NOW, THEREFORE

1. If said Proposal shall be rejected, or in the alternate,

2. If said Proposal shall be accepted and the Principal shall execute and deliver a contract with owner for the purpose stated above and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Proposal, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

   The Surety, for value received, hereby stipulates, and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may have accepted such Proposal; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, The Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

PRINCIPAL:	**SURETY:**
Firm Name: _____	Firm Name: _____
By: _____ (Typed Name)	By: _____ (Typed Name)
Authorized Representative	Authorized Representative
Address: _____	Address: _____
_____	_____
Signature: _____	Signature:
Date: _____	Date: _____
Seal:	Seal:

Notes:

1. If Contractor is partnership, all partners should execute BOND.
2. This Bid Bond will be valid for ninety (90) days after Proposal opening.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current List (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

3. FIRM INFORMATION, EXPERIENCE AND EQUIPMENT STATEMENT FORM

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

I. FIRM INFORMATION

Submitted by _____

with principal office at _____

To: PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

II. EXPERIENCE

1. How many years has your organization been in business as a general Contractor under your present business name? _____

2. What projects similar to this one has your organization completed?

Class of Work (1)	Contract Amount (2)	When Complete (3)	Name and Address of Engineer or Owner (4)

3. Have you ever failed to complete any work awarded to you?
If so, state where and why _____

4. What is the construction experience of the principal individuals of your organization:

Name	Title	Years of Experience	Magnitude and Type of Work	Capacity

5. All Bidders shall submit verifiable evidence of their construction experience in projects of similar type and magnitude as **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST) YAUCO, PR** shall clearly state if the work was completed as a main or as a sub-contractor. All other previous experience submitted by bidders shall not be considered by PRASA as experience resulting in non-responsiveness with the Article 2, List of Documents to be Submitted in the Proposal.

III. Contractor's Distribution of Project Resources

Instructions: Fill out one or more pages (as needed) for each project underway and for each future project including the project on this proposal.

Project Name_____

Project Owner _____

Project Start Date _____ Actual Estimated Project Completion Date _____

Total Contract Amount in $ (including Change Orders) $_____

% Complete [(total pay request certified / total project cost) x 100%] _____%

Equipment used in this project		**Principal Personnel Engineers and Foremen**	
Equipment	**Owner of this equipment**	**Name**	**Title**

Page 1 of ___

Continuation: Project Resource Distribution for: (Name or Project) _____			
Equipment		**Principal Personnel Engineers and Foremen**	
Equipment used in this project	**Owner of this equipment**	**Name**	**Title**

Page ___ of ___

IV. EQUIPMENT

3. What equipment do you own that is available for the proposed Work?

Item	Description, Size, Capacity, etc.	Condition	Years of Service

V. AFFIDAVIT

I _____, of legal age, _____
(civil status)
a resident of _____ being duly sworn say:

1. That the personal circumstances above stated are correct.
2. That have been authorized to furnish information to the Puerto Rico Aqueduct and Sewer Authority to support the foregoing Proposal.
3. That the information supplied on the foregoing Financial, Experience and Equipment Statement is true, correct, and complete to the best of my knowledge and belief.

_____
Signature if Affiant

Affidavit No. _____

Sworn and subscribed to before me, the undersigned Notary Public, by _____
_____ to me personally known and personally known to me to be of legal age, _____
_____

IN WITNESS WHEREOF, I set my hand and seal at _____
_____
this _____ days of _____, _____.

_____
Notary Public

Seal

4. SITE VISIT AFFIDAVIT

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

I (we) hereby certify that I (we) have visited, examined, and evaluated the site of Work of the above-mentioned project.

Seal

CONTRACTOR

Firm Name _____

By _____

Tittle _____

Signature _____

AFFIDAVIT NO._____

Sworn and subscribed to before me, the undersigned Notary Public, by (Name) _____ _____ who is of legal age, with marital status (Single, married, etc.) _____and a resident of _____, Puerto Rico, personally known to me and of the personal circumstances herein stated.

IN WITNESS WHEREOF, I set my hand and seal this_____ day of _____, _____, at (City) _____, Puerto Rico.

_____

NOTARY PUBLIC

5. NON-COLLUSIVE AFFIDAVIT

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

I, _____, of legal age and resident of _____, Puerto Rico, being duly sworn depose as follows:

1. That I am a bidder for a contract offered in public competitive proposal by Puerto Rico Aqueduct and Sewer Authority for the execution of Project **REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST), CIP NUMBER: 4-79-7005, BID NUMBER: 27-SP-021.**

2. That I have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive participation in connections with the here-in-before-mentioned contract.

CONTRACTOR

Firm Name _____

By _____

Tittle _____

Signature _____

AFFIDAVIT _____

Sworn to and subscribed before me by _____ of legal age, Contractor and resident of _____, Puerto Rico, personally known to me, in _____ Puerto Rico, on the _____day of _____ of 20_____.

_____

NOTARY PUBLIC

6. COST BREAKDOWN

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

Prospective Bidders shall provide with the proposal their own Cost Breakdown Format including the indicated unit prices item and allowances, if any.

In accordance with Law 14 of 2004, "Ley para la Inversión en la Industria Puertorriqueña", bidders shall submit with their Cost Breakdown, when applicable, and in compliance with the Law:

1. Resolution from the "Junta para la Inversión en la Industria Puertorriqueña" indicating the investment parameter approved (percentage) and the product to which it applies.

2. Quotation from supplier who the Resolution in Item 1 is awarded to.

PRASA shall adjust the cost breakdown accordingly for bid evaluation purposes. Bidders shall not include the percent discount in their proposals. Bidders shall honor the quotation presented with this bid during construction

7. DECLARACIÓN JURADA LEY 2 - 2018

Yo _____, mayor de edad,_____, vecino__ de _____,
(Nombre completo) (Estado Civil) (Donde vive)
_____ de_____, bajo el más solemne Juramento
(Posición que Ocupa) (Nombre de la Sociedad o Corporación)

DECLARO:

I _____, of legal age, _____and resident of _____,
(Full name) (Civil Status) (Where you live)
as _____ of _____, under the most solemn Oath
(Position) (Name of the Company or Corporation)

DECLARE:

1. Que mi nombre y demás circunstancias personales son las anteriormente expresadas.

That my name and other personal circumstances are those previously expressed.

2. Que la compañía que represento interesa formalizar un Contrato con la Autoridad de Acueductos y Alcantarillados de Puerto Rico.

That the company that I represent is interested in formalizing a Contract with the Puerto Rico Aqueduct and Sewer Authority.

3. Que presto esta declaración jurada con el propósito de cumplir con las disposiciones de la Ley Núm. 2-2018, que le impone la obligación a toda persona natural o jurídica que desee participar de la adjudicación de una subasta o del otorgamiento de un contrato con cualquier agencia o instrumentalidad, corporación pública o municipio, de someter una declaración jurada donde informe si he sido convicto o declarado culpable o la persona jurídica que represento ha sido convicta o se ha declarado culpable de los delitos contenidos en el Artículo 6.8 de la Ley 8-2017, según enmendada.

That I am executing this sworn statement with the purpose of complying with the provisions of Act No. 2-2018, which imposes the obligation on any natural or legal entity wishing to participate in the award of a bid or the granting of a contract. with any agency or instrumentality, public corporation or municipality, to submit a sworn statement stating whether I have been convicted or pled guilty, or the legal entity that I represent has been convicted or has pled guilty of the crimes contained in Article 6.8 of Act 8-2017, as amended.

4. Por tal razón, certifico que de conformidad con lo dispuesto en la Ley Núm. 2-2018, ni el suscribiente, ni la persona jurídica que represento o cualquier presidente, vicepresidente, director, director ejecutivo, socio o miembro de una junta de oficiales o junta de directores, o personas que desempeñen funciones equivalentes para la persona jurídica no ha sido convicto o declarado culpable de ninguno de los delitos enumerados en la Sección 6.8 de la Ley 8-2017, según enmendada, conocida como "Ley para la Administración y Transformación de los Recursos Humanos en el Gobierno de Puerto Rico."

For this reason, I certify that pursuant to the provisions of Act No. 2-2018, neither the undersigned, nor the legal entity that I represent or any president, vice president, director, executive director, member or member of a board of officers or board of directors, or persons performing equivalent functions for the legal entity, have not been convicted or pled guilty of any of the crimes enumerated in Section 6.8 of Act 8-2017, as amended, known as the "Law for the Administration and Transformation of Human Resources in the Government of Puerto Rico."

5. Certifico además que ni el suscribiente, ni la persona jurídica que represento o cualquier presidente, vicepresidente, director, director ejecutivo, socio o miembro de una junta de oficiales o junta de directores, o personas que desempeñen funciones equivalentes para la persona jurídica que represento ha sido convicto o declarado culpable de ninguno de los delitos a los que se refiere en la Ley 2-2018, según enmendada, conocida como el "Código Anticorrupción para el Nuevo Puerto Rico".

I further certify that neither the undersigned, nor the legal entity that I represent or any president, vice president, director, executive director, partner or member of a board of officers or board of directors, or persons who perform equivalent functions for the legal entity has been convicted or convicted of any of the crimes referred to in Act 2-2018, as amended, known as the "Anti-Corruption Code for the New Puerto Rico."

6. Para fines de la jurisdicción federal, de los estados o territorios de los Estados Unidos de América aplicará la prohibición contenida en la presente declaración jurada en casos de convicción por delitos cuyos elementos sean equivalentes a los referidos en los incisos 4 y 5 anteriores.

For purposes of federal jurisdiction, of the states or territories of the United States of America, the prohibition contained in this affidavit will apply in cases of conviction for crimes whose elements are equivalent to those referred to in the paragraphs 4 and 5 above.

7. Además, hago constar que en este momento no tengo conocimiento informado de que el suscribiente, la persona jurídica que represento o cualquier presidente, vicepresidente, director, director ejecutivo, socio o miembro de una junta de oficiales o junta de directores, o personas que desempeñen funciones equivalentes para la persona jurídica que represento, sea objeto de investigación, o procedimiento criminal alguno por hechos relacionados con los delitos referidos anteriormente. Me comprometo y obligo a informar de inmediato si alguna vez conociéramos que somos objeto de investigación o procedimiento criminal por hechos relacionados con dichos delitos.

In addition, it is noted that at this time I have no informed knowledge that the undersigned, the legal person or any president, vice president, director, executive director, partner, or member of a board of officers or board of directors, or persons who perform equivalent functions for the legal entity, are subject of any investigation, or criminal procedure in connection with the crimes referred to above. I agree to inform immediately if we become aware that we are objects of any investigation or criminal procedure in connection with such crimes.

8. Todo lo declarado es la verdad y nada más que la verdad.

Everything stated is the truth and nothing but the truth.

EN TESTIMONIO DE LO CUAL, otorgo esta declaración jurada para cumplir con las disposiciones de la legislación vigente y específicamente aquellas establecidas en virtud de la Ley Núm. Ley Núm. 2-2018, y para que en su consecuencia se cumplimente mi expediente para la contratación con la Autoridad de Acueductos y Alcantarillados Puerto Rico.

IN WITNESS WHEREOF*, I hereby execute this sworn statement to comply with the provisions of current legislation and specifically those established by virtue of Act No. 2-2018, and as a consequence to support the file for the contracting with the Puerto Rico Aqueduct and Sewer Authority.*

_____

Por: _____

(Firma y Nombre del Declarante)
(Signature and Name of Declarant)

Afidávit Número_____
Affidavit Number _____

JURADO Y SUSCRITO ante mí por _____, de las circunstancias personales anteriormente mencionadas y a quien [identifico mediante licencia de conducir número_____/a quien conozco personalmente] [*seleccione la que aplique*], en San Juan, Puerto Rico, hoy__ de _____ de 20___.

SWORN AND SUBSCRIBED *before me by _____ of the aforesaid personal circumstances and whom [I identify with a driver's license number_____/personally known to me][select as applicable], in San Juan, Puerto Rico this ____ day of _____ of 20____.*

SELLO NOTARIO
NOTARY SEAL

_____

NOTARIO PÚBLICO

8. DECLARACIÓN JURADA LEY 42 - 2018

LEY 42 DE 21 DE ENERO DE 2018, LEY DE PREFERENCIA PARA CONTRATISTAS Y PROVEEDORES LOCALES DE CONSTRUCCIÓN

COMPARECE_____, un (a) _____
(nombre del negocio o compañía) (corporación, sociedad o negocio individuo)

organizada y existente bajo las leyes de _____, representada(o)
(estado, territorio o país)

en este acto por _____, mayor de edad, _____,
(nombre en letra de molde) (estado civil)

y vecino de _____, y **bajo juramento** declaro lo siguiente:
(domicilio) (País)

1. Que soy la persona de las circunstancias antes expresadas.

2. Que ocupo el cargo de _____ en la compañía o negocio antes mencionado y estoy debidamente facultado(a) para suscribir la presente Declaración Jurada.

3. Que la compañía o negocio al cual represento interesa someter una oferta para la Subasta Número _____ o Solicitud de Propuestas de la Autoridad de Acueductos y Alcantarillados ("Autoridad").

4. Que certifico que la compañía o negocio al cual represento cumple con todos los requisitos y parámetros para ser considerado un Negocio Local o Proveedor Local de servicios de construcción, según definido en los Art. 2(B) y (C) de la Ley 42 de 21 de enero de 2018, "Ley de Preferencia para Contratistas y Proveedores Locales de Construcción" y que el volumen de ventas e ingresos que genera este negocio o compañía proviene de su Operación Sustancial en Puerto Rico, según definido en el Art. 2(D) de la Ley 42-2018, que su principal centro de negocios es en Puerto Rico, por más de seis (6) años de establecida en Puerto Rico, específicamente desde el_____ de _____.

5. Que reconozco que en la eventualidad que la Autoridad determine que este negocio o compañía no cumple con los requisitos para reclamar el por ciento de preferencia que establece la Ley 42-2018, antes de la adjudicación de la subasta o de la firma del contrato, la Autoridad podría excluirle de la misma. Si dicho hallazgo ocurriera luego de otorgarse el contrato, la Autoridad podría rescindir el mismo de inmediato.

6. Que reconozco que en caso de que se impugne la legalidad de la subasta o cualquier otro procedimiento adjudicativo, tal impugnación no tendrá el efecto de suspender la validez y exigibilidad de las obligaciones contraídas en la subasta o en otros procedimientos adjudicativos, salvo que un Tribunal competente emita una orden fundamentada para paralizar los procesos.

7. Que suscribo esta declaración para que tenga todos los efectos legales pertinentes.

Y PARA QUE ASÍ CONSTE, juro y suscribo la presente declaración en _____, Puerto Rico, a _____ de _____ de _____.

_____

Firma representante autorizado

Testimonio Núm.: _____

Jurado y suscrito ante mí por _____, en representación de _____, de las circunstancias personales antes expresadas y a quien do fe de identificar mediante _____.

En _____, Puerto Rico, a _____ de _____ de 20____.

_____

NOTARIO PÚBLICO

9. CERTIFICACIÓN SOBRE EL USO DE CEMENTO HECHO EN PUERTO RICO (OE 2018-033)

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

Yo, _____, _____ (Posición) de _____ (Compañía), en cumplimiento con la OE-2018-033, certifico que el cemento a utilizarse en el proyecto de referencia fue producido en Puerto Rico conforme a las disposiciones de la Ley Núm. 109 de 12 de julio de 1985; incluyendo el cemento utilizado por los subcontratistas del proyecto de construcción. Reconozco que esto será requisito para la concesión del contrato.

En _____, Puerto Rico, a _____ de _____ de _____.

_____

_____

FIRMA

10. FEMA DECLARATION CLAUSE

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

Lobbying Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S.C. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure."

The Contractor,_____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

_____
Signature of Contractor's Authorized Official

_____
Name and Title of Contractor's Authorized Official

_____
Date

11. FEMA CONFLICT OF INTEREST AND UNFAIR COMPETITIVE ADVANTAGE CERTIFICATION

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST) YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

Identify any conflicts of interest or unfair competitive advantages (collectively called Conflict Situations) by completing this Certification under penalty of false statement by checking either Box No. 1 (Individuals) or Box No. 2 (Firms) below, and Box No. 3 as necessary. If there is a known or potential Conflict Situation, Box No. 3 should be checked, and the required supplementary information provided.

1. Individuals

☐ I certify that I do not have a potential or known Conflict Situations as specified in the [Request for Proposal or Qualifications] documents, or under Puerto Rico Law and Federal Regulations, for the subject project, except as disclosed in Box No. 3 and the attachments to this Certification.

2. Firms

☐ My signature certifies that I am authorized to sign as a Representative for the Firm and to the best of my knowledge, information and belief, and after thorough review of the firm's books and records and after reasonable inquiry with knowledgeable persons within the firm, this firm:

a) Has no business or personal relationships with any other companies or persons that could be considered as a conflict of interest or potential conflict of interest to **PRASA**,

b) Has no principals, officers, agents, employees, or representatives of this firm that have any business or personal relationships with any other companies or persons that could be considered as a conflict of interest or a potential conflict of interest to **PRASA**,

c) Has no unfair competitive advantage resulting from work that this firm, its current staff, any key personnel or subconsultants have done to date, pertaining to any and all work or services to be performed as a result of this request and any resulting contract with **PRASA**, except as disclosed in Box No. 3 and the attachments to this Certification.

3. Disclosure

☐ I am notifying Central Office of Recovery, Reconstruction, and Resiliency (COR3) of the existence of one or more potential or actual Conflict Situation(s). I have attached to this Certification a document (limited to three pages) with (a) all relevant facts and (b) identified proposed actions to be taken to avoid, neutralize, or mitigate such Conflict Situation (e.g. communications barriers, restraint or restriction upon future contracting activities, or other precaution).

I understand that if at any time I learn of a previously unknown potential or actual conflict of interest or perceived unfair competitive advantage, I will submit a new Certification to COR3 and the appropriate **PRASA** contact person for that phase of the project, updating my previous statements and certifications.

Signature: _____ Date: _____
Name (type/print):_____ Title: _____
Legal Name of Firm: _____
Address: _____
Telephone: (_____) _____

A.4 ALLOWANCES FORM

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR
CIP: 4-79-7005
BID NUMBER: 27-SP-021

Allowance I: Consist of possible mitigation and/or repair works needed as results of the lead study, for the amount of **TWO THOUSAND FIVE HUNDRED DOLLARS ($2,500.00)**. This allowance covers possible differing or unforeseen subsurface or physical conditions that were not reasonably anticipated or documented at the time of bidding. Such conditions may include, but are not limited to, hidden structural issues, concealed utilities, subsurface obstructions, hazardous materials requiring removal or remediation, or code compliance requirements not evident at the time of bid, among others. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

Allowance II: Consist of possible mitigation and/or repair works needed as results of the asbestos study, for the amount of **TWO THOUSAND FIVE HUNDRED DOLLARS ($2,500.00)**. This allowance covers possible differing or unforeseen subsurface or physical conditions that were not reasonably anticipated or documented at the time of bidding. Such conditions may include, but are not limited to, hidden structural issues, concealed utilities, subsurface obstructions, hazardous materials requiring removal or remediation, or code compliance requirements not evident at the time of bid, among others. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

Allowance III: Consist of the tree cut mitigation, which will be mitigated through the alternative of monetary compensation, arborist and/or tree mitigation authorized inspector onsite service fee, preparation of required reports, and tree removal and disposal, subject to prior Engineer and PRASA approval, for the amount of **TEN THOUSAND DOLLARS ($10,000.00).** This allowance covers any tree removal, disposal, monetary compensation and authorized professional fees not included in the tree inventory report and/or the bid drawings. Any impact or increase in tree removal caused by the contractor's means and methods is not covered by this allowance. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of

the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

Allowance IV – Consist of an allowance to cover future coordination with LUMA fee costs on all sites within the entire project, for the amount of **TEN THOUSAND DOLLARS ($10,000.00)**. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

Allowance V – Consist of an allowance to cover SCADA integration costs, for the amount of **TWENTY THOUSAND DOLLARS ($20,000.00)**. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

Allowance VI – An allowance for Unforeseen Conditions shall be included in the Contract Sum for the amount of **FIVE HUNDRED SEVENTY-EIGHT THOUSAND FOUR HUNDRED TWENTY-SEVEN DOLLARS ($578,427.00).** This allowance covers possible differing or unforeseen subsurface or physical conditions that were not reasonably anticipated or documented at the time of bidding. Such conditions may include, but are not limited to, hidden structural issues, concealed utilities, subsurface obstructions, hazardous materials requiring removal or remediation, or code compliance requirements not evident at the time of bid, among others. The allowance amount shall include all costs associated with the performance of such work, including labor, equipment required to deliver and install the work, unloading and handling at the site, materials, subcontractors, permitting fees and all applicable patents, taxes, workers' compensation insurance, and contractor's overhead and profit. Insurance and bonds shall be included as part of the Lump Sum Contract Price as defined in Article 10.3.6. Any unused balance of the allowance shall be deducted from the final Contract Sum by Change Order at the time of project closeout. Estimates for expenditures under this allowance shall be submitted in the Labor, Equipment, Material, Subcontractor, and Others (LEMSO) format for evaluation and require approval by the Owner's representative.

A.5 ALTERNATIVE FORM

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

No alternatives have been contemplated.

A.6 SUPPLEMENTARY GENERAL CONDITIONS

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE (FAAST)
YAUCO, PR

CIP: 4-79-7005
BID NUMBER: 27-SP-021

ARTICLE 1. – SUPPLEMENTARY GENERAL CONDITIONS

The following articles reflect the requirements of the above-mentioned project. *(Note: Words/sentences in Italic represent the new wording to the article.)*

1. Article 1.1.1.14 – as presented in the General Conditions.
2. Article 1.1.1.50 – as presented in Article 6.8.
3. Article 1.1.1.67 – as presented in the General Conditions.
4. Article 1.3.1.1 – as presented in the General Conditions.
5. Article 1.3.4 – as presented in the General Conditions.
6. Article 2.1.4– as presented in the General Conditions.
7. Article 2.4.5.1 – as presented in the General Conditions.
8. Article 3.2.1.1 – as presented in Volume B, B.4, Article 1 and Article 2.
9. Article 3.2.3.1 – as presented in Volume B, B.4, Article 1 and Article 2.
10. Article 3.3.1 – as presented in Volume B, B.4, Article 1 and Article 2.
11. Article 3.5.1.1 – as presented in Volume B, B.4, Article 1 and Article 2.
12. Article 3.5.2 – as presented in Volume B, B.4, Article 1 and Article 2.
13. Article 3.5.2.3 – as presented in Volume B, B.4, Article 1 and Article 2.
14. Article 3.6.2 – as presented in Volume B, B.4, Article 1 and Article 2.
15. Article 3.7.1 – as presented in Volume B, B.4, Article 1 and Article 2.
16. Article 3.7.1.3 – as presented in Volume B, B.4, Article 1 and Article 2.
17. Article 3.7.1.8 – as presented in Volume B, B.4, Article 1 and Article 2.
18. Article 3.7.1.9 – as presented in Volume B, B.4, Article 1 and Article 2.
19. Article 3.7.2.1 – as presented in Volume B, B.4, Article 1 and Article 2.

20. Article 3.7.3 – as presented in Volume B, B.4, Article 1 and Article 2.

21. Article 3.9.1 – as presented in Volume B, B.4, Article 1 and Article 2.

22. Article 4.1.1 shall read as follows:

4.1.1 Owner shall furnish the Site, *as indicated herein after.*

4. The land and rights of way furnished by the owner for the Work are as follows: (Latest Revision of Drawings)

SITE	***DESCRIPTION***
Predio "A"	*240.8904 SQ. MTS.*

Or

ROW#	***LOCATION***	***DESCRIPTION***
Servidumbre No. 1	State Road PR-374 Km. 12 Interior	*185.7119 SQ. MTS.*
Servidumbre No. 2	State Road PR-374 Km. 12 Interior	*16.6758 SQ. MTS.*
Servidumbre No. 3	State Road PR-374 Km. 12 Interior	*277.5477 SQ. MTS.*
Servidumbre No. 4	State Road PR-374 Km. 12 Interior	*24.8666 SQ. MTS.*
Servidumbre No. 5	State Road PR-374 Km. 12 Interior	*36.8015 SQ. MTS.*
Servidumbre No.6	State Road PR-374 Km. 12 Interior	*9.2083 SQ. MTS.*
Servidumbre No. 7	State Road PR-374 Km. 12 Interior	*122.3061 SQ. MTS.*
Servidumbre No. 8	State Road PR-374 Km. 12 Interior	*90.8651 SQ. MTS.*
Servidumbre No. 9	State Road PR-374 Km. 12 Interior	*37.6577 SQ. MTS.*
Servidumbre No. 10	State Road PR-374 Km. 12 Interior	*115.0286 SQ. MTS.*
Servidumbre No. 11	State Road PR-374 Km. 12 Interior	*15.3273 SQ. MTS.*
Servidumbre No. 12	State Road PR-374 Km. 12 Interior	*203.9155 SQ. MTS.*

5. The selected Contractor shall provide, at his own expense, for the use of any additional land or rights of way required for him for the construction of the Work and shall police such lands in a manner satisfactory to PRASA.

23. Article 4.2.1 – list, if applicable.

24. Article 4.5.1 – list, if applicable.

25. Article 4.7.3 – as presented in the General Conditions.

26. Article 5.1.2 – as presented in the General Conditions.

27. Article 5.1.4 – as presented in the General Conditions.

28. Article 5.2.1.1 – as presented in the General Conditions.

29. Article 5.8.1 - as presented in the General Conditions.

30. Article 6.1.2 – as presented in the General Conditions.

31. Article 6.3.1 – as presented in the General Conditions.

32. Article 6.4.1.1 – as presented in the General Conditions.

33. Article 6.4.4.1 – as presented in the General Conditions.

34. Article 6.4.4.5.1 – as presented in the General Conditions.

35. Article 6.8.1 – Delete in its entirety and replace by the following article:

6.8 Permits

6.8.1. Contractor shall deliver to PRASA, prior to starting with the Construction phase and at his own expense, all necessary permits, licenses, and endorsements from the proper authorities including U.S.A. Federal, Commonwealth of Puerto Rico, Municipal and private companies with jurisdiction over the Work. Contractor shall give all notices required by Laws and Regulations, shall pay all fees and charges incidental to the due and lawful prosecution of the Work, and shall comply with all U.S.A. and Puerto Rico laws and regulations, and municipal ordinances relating thereto. Copies of all said stamps, permits, licenses, endorsements, notices, receipts, and authorizations shall be filed with PRASA, through its approved representative.

6.8.2. During the execution of the Project, Contractor, at his own expense shall obtain, implement, maintain, and renew all the necessary permits, approvals, endorsements and authorizations of any kind required from the Commonwealth of Puerto Rico, the United States Governmental, Municipal Authorities, or other private or government agencies with jurisdiction over the Project, including but not limiting to the following:

.1. Consolidated General Permit that includes: Erosion and Sediment Control Plan (Plan-CES), Air Emission Control Dust (PFE) permit for construction activities, and Non-Hazardous Solid Waste Generating Activity (DS-3) permit from the Puerto Rico Environmental Quality Board (EQB). Contractor shall prepare the plan for the control of erosion and sedimentation applicable to this project, along with the required engineering certification in accordance with applicable Laws and Regulations. Copy of the certified plan approved by the EQB shall be submitted to Engineer.

.2. Incidental Earth Movement Permit from the Department of Natural and Environmental Resources.

.3. If there is to result any discharge of runoff waters to any body of water resulting from any Construction activity, the Contractor shall submit to the US EPA a Notice of Intent of the National Pollutant Discharge Elimination Systems (NPDES) permit in accordance with Federal Code Regulation No. 40, Section 122.26 (b) (14) (x). Contractor shall comply with all applicable requirements.

If required by Laws and Regulations Contractor and Subcontractors shall prepare and implement a Pollution Prevention Plan (PPP). A copy of this plan shall be submitted to PRASA. This plan cover discharges of storm water runoff from Construction sites which disturb one (1) or more acres of land. After the storm water Pollution Prevention Plan is prepared and the necessary controls are installed, the Contractor and Subcontractor will be responsible for inspecting and maintaining them until Final Acceptance. The Contractor should have a professional engineer who will be responsible for periodically inspecting and certifying that the Pollution Prevention Plan has been properly installed and implemented.

.4. In the event that any emergency energy generator is to be used, an emission source construction permit and operation permit (Permiso de Fuente de Emisión, PFE) shall be obtained from the EQB for the installation and operation of the same. A Spill Prevention Control and Counter Measures or Emergency Plan shall be prepared and submitted to PRASA and EQB.

5. If any hydrocarbon storage tank is to be installed the Water Quality Area of EQB shall be consulted. Contractor shall comply with applicable regulations and obtain required permits.

.6. Other environmental clearances and approvals. Contractor shall consult the regulatory agencies, comply with applicable regulations and obtain required permits.

.7. Permits for the relocation of utilities from each utility company affected.

.8. Notification, coordination and complying with all regulations for excavation and demolition work which are required by the Center for the Coordination of Excavations and Demolitions (Centro de Coordinación de Excavaciones y Demoliciones, CCED) of the Public Service Commission.

6.8.3 Contractor shall be the only entity responsible, at his own expense, in performing the Works necessary to comply with all permits, endorsements, approvals or renovations and shall pay all penalties imposed on Contractor for not complying with Laws and Regulations, and charges incidental to the due and lawful prosecution of the Work. Contractor shall provide at his own expense all required notices, drawings, specifications, engineering and other professional certifications, and others, required by private, Municipal, Puerto Rico and Federal agencies to obtain required permits, approvals, renewals (if applicable) and others.

6.8.4 In the event that any Work to be performed by Contractor under the above mentioned permits, approvals, endorsements and authorizations is found to be unsatisfactory and is not approved by the aforementioned governmental authorities, and Contractor refuses to correct said deficiencies without due cause, then PRASA or said governmental agencies may proceed with the corrective work, and the cost thereof shall

be charged to Contractor and shall be withheld by PRASA from any money due to Contractor under the subject construction contract.

36. Article 6.11.5.2 – as presented in the General Conditions.

37. Article 6.11.5.2.2 – as presented in the General Conditions.

38. Article 6.16.4- as presented in the General Conditions.

39. Article 6.17.1.1 – as presented in the General Conditions.

40. Article 6.18.5.1.2 – as presented in the General Conditions.

41. Article 6.18.5.3.1.2 shall read as follows:

    6.18.5.3.1.2 Unless otherwise provided in the Contract Documents, direct payment will be made for development, preparation, erosion control, hauling and restoration of material sources or related work areas and sites, *as long as such payment is part of the lump sum quoted for the Work.*

42. Article 6.18.5.7.2 – as presented in the General Conditions.

43. Article 6.18.5.7.6 – as presented in the General Conditions.

44. Article 6.18.5.7.8 – as presented in the General Conditions.

45. Article 6.18.5.7.11 – as presented in the General Conditions.

46. Article 6.18.7.1 – as presented in the General Conditions.

47. Article 6.19.3 shall read as follows:

    6.19.3 The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be free from faults and defects and in conformance with the Contract Documents for the time periods specified in Article 3, or for one (1) year, whichever is longer. *The guarantee starts after project Final Acceptance, as indicated in the Certificate of Final Acceptance. The guarantee period indicated in technical specifications will take effect after project Final Acceptance (this condition prevails over those mention on technical specifications). If at any time within guarantee period after project Final Acceptance it is found that any piece of equipment or item of Work does not comply with this guarantee, Contractor shall renew or replace it, or do whatever is necessary to remedy the fault. He shall, during the same period, repair promptly all breaks, failures or defects that develop in his Work as a result of faulty material or workmanship furnished by him.*

48. Article 6.21.1.1 – as presented in the General Conditions.

49. Article 6.21.1.1.4 – as presented in the General Conditions.

50. Article 8.1.2.1- as presented in the General Conditions.

51. Article 9.3.1.6- shall read as follows:

9.3.1.6 Additional time will be allowed due to severe weather conditions, which render the performance of work impossible or-if, it alters the programmed Schedule of the Project.

52. Article 9.5.1 – as presented in the General Conditions.

53. Article 9.6.1 shall not apply for this project.

54. Article 10.3.1 – as presented in the General Conditions.

55. Article 10.3.6 – as presented in the General Conditions.

56. Article 12.3.1.1 – as presented in the General Conditions.

57. Article 12.3.1.3 shall read as follows:

12.3.1.3The sampling of materials for testing will be performed by Contractor personnel.

58. Article 12.3.1.3.2– as presented in the General Conditions.

59. Article 12.3.3 shall read as follows:

12.3.3 Contractor shall employ and pay for the services of an independent testing laboratory(ies) to perform all inspections, tests, or approvals required by the Contract Documents except:

60. Article 12.3.3.1.1– as presented in the General Conditions.

61. Article 13.2.1.1 – as presented in the General Conditions.

62. Article 13.2.1.4.7 – as presented in the General Conditions.

63. Article 13.2.2.1.1 – as presented in the General Conditions.

64. Article 13.2.4.1 shall read as follows:

13.2.4.1. Sixty (60) days after Owner's approval of the Application for Payment, with Owner's Representative's recommendation, the amount recommended will (subject to the provisions of paragraph 13.2.4) become due, and when due, shall be paid by Owner to Contractor.

65. Article 13.7.3.1 shall read as follows:

13.7.3.1. Sixty (60) days after Owner's approval of the Application for Final Payment, with accompanying documentation, the amount recommended by Owner's Representative will become due, and when due, shall be paid by Owner to Contractor.

66. Article 14.5.2– as presented in the General Conditions.

67. Article 17.2.3 – as presented in the General Conditions.

68. Article 17.3.1 – as presented in the General Conditions.

ARTICLE 2. – SPECIAL CONDITIONS

The following articles reflect the requirements of the above-mentioned project. *(Note: Words/sentences in Italic represent the new wording to the article.)*

1. Article 1.1.1.42 – as presented in the General Conditions.

2. Article 2.1.4– as presented in the General Conditions.

3. Article 2.2.1 – see Agreement Form.

4. Article 2.3.3.1 shall read as follows:

   2.3.3.1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents*) and unless such an interpretation of the provisions of the Contract Documents would result in violation of the intention of such standard, specification, manual, code or instruction to protect life and property, and unless such standard, specification, manual, code or instruction are of common knowledge in the industry*; or

5. Article 3.3.2.1 – as presented in Volume B, B.4, Article 1 and Article 2.

6. Article 3.3.2.2 – as presented in Volume B, B.4, Article 1 and Article 2.

7. Article 4.2.1 – as presented in Volume A.

8. Article 4.2.2 – as presented in the General Conditions.

9. Article 4.2.3 – as presented in the General Conditions.

10. Article 4.7.1 – no Hazardous Environmental Condition is identified at the site.

11. Article 5.2.3 as presented in the General Conditions.

12. Article 6.2.2 – as presented in the General Conditions.

13. Article 6.3.2.3. – as presented in the General Conditions.

14. Article 6.7.2 – as presented in the General Conditions.

15. Article 6.10.1.2- Contractor shall pay municipal construction taxes at the rates prevailing at the time of the bid.

16. Article 6.11.5.2 – as presented in the General Conditions.

17. Article 6.18.5.7.1 – as presented in the General Conditions.

18. Article 6.18.5.7.3 – as presented in the General Conditions.

19. Article 6.18.5.7.4 – as presented in the General Conditions.

20. Article 6.18.5.7.5 – as presented in the General Conditions.

21. Article 6.18.5.7.6 – as presented in the General Conditions.

22. Article 6.18.5.7.8 – as presented in the General Conditions.

23. Article 6.18.5.7.11 – as presented in the General Conditions.

24. Article 6.18.7.2 – as presented in the General Conditions.

ARTICLE 3.FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) CLAUSES AND OTHER REQUIREMENTS

A. **Conflicts of Interest.** No employee, officer, or agent of **PRASA** or the Government shall participate in the selection, or in the award or administration of a contract, supported by Federal funds, if a conflict of interest, real or apparent, would be involved.

B. **Interest by Members of Local Authority and Governing Body**: Since **PRASA** is part of the Government of Puerto Rico, or a local authority, no member of the local government or employee, officer or public official who exercises any functions or responsibilities with respect to the project shall, during his tenure, and for one year thereafter, have any interest, direct, or indirect, in this Contract or the proceeds thereof, unless the corresponding waiver from the Office of Governmental Ethics has been obtained.

C. **Covenant against Contingent Fees**: The Contractor warrants that there is no person nor employee that will receive upon the Execution of this Contract a commission, percentage, brokerage, or contingent fee. Breach of this warrantee shall give **PRASA** the right to terminate this Contract or, at its discretion, to deduct from the Contractor's fee the amount of such commission, brokerage, or contingent fee.

D. **Personal Conflicts of Interest:** The Contractor will establish safeguards to prohibit employees from using their positions for a purpose that is, or gives the appearance of, a conflict of interest.

E. **Organizational Conflicts of Interest ("OCI"):**

1. An organizational conflict of interest arises where a person, because of other activities or relationships with other persons, is unable or potentially unable to render impartial assistance of advice to **PRASA**, the person's objectivity in performing the contract work is or might be otherwise impaired, or when a person has an unfair competitive advantage.
2. The Contractor shall take precautions to ensure that no OCI arise in the performance of this Contract.
3. In the event that the Contractor believes that it or any of its potential Subcontractors may have an OCI it shall notify **PRASA**, in writing, within five (5) work days after it becomes aware of the potential or actual OCI. The written notification shall identify the nature and circumstances of the perceived conflict and propose appropriate measures to eliminate or mitigate the OCI. **PRASA** will review the circumstances and the proposed mitigation plan and notify the Contractor stating whether: (i) no mitigation is required; (ii) the conflict cannot be mitigated; or (3) the conflict can be mitigated and **PRASA** accepts the proposed measures, or recommends other and/or additional measures.

4. The failure of the Contractor to identify such perceived conflicts may result in the contract award being rescinded or the Contract being terminated.

F. <u>Conflict of Interest/Unfair Advantage:</u> All existing consultants, contractors, and subcontractors of Central Office of Recovery, Reconstruction, and Resiliency (COR3) who have participated or have had contact to non-public information related to the services or scope of work contained herein that would place them in an unfair advantage or conflict are precluded from responding to this procurement. COR3 considers that it is important to avoid any perceived and/or real unfair advantages or conflicts. COR3 will evaluate for Proposer, and the Proposer's key personnel, its subcontractors and any other individuals associated with the Proposal whether they have a Conflict Situation. To that end, the Proposer must complete and submit a Conflict of Interest and Unfair Competitive Advantage Certification (**Exhibit A**) for itself, and a separate set of forms for each of its key personnel. Any other individuals or subcontractors participating in the Proposer's team, who are aware of an existing or potential Conflict Situation, shall make a disclosure on the Certification Form and forward it to **PRASA** for submittal to COR3. Failure of the Proposer, Key Personnel, or those with known Conflict Situations to submit the Certification Form(s) may result in the disqualification of the Proposer. Whenever a Proposer, its key personnel, any subcontractor or any individual associated with a Proposer is found to have a Conflict Situation, it shall be disclosed on the Certification Form and the attachments. COR3 will review the Proposer's suggested actions to be taken to avoid, neutralize, or mitigate such Conflict Situation, and if found acceptable, the matter will be consider resolved and the Proposer will be permitted to continue in the procurement process with the suggested actions. If, COR3 does not find the Proposer's suggested actions acceptable or sufficient to avoid, neutralize or mitigate a Conflict Situation, then COR3 will communicate to the Proposer that an unresolved Conflict Situation may exist. The Proposer may offer additional measures to resolve the matter. Proposers unable to resolve a Conflict Situation finding will not be permitted to continue in the procurement process. It is the responsibility of each proposer to police itself related to Conflict Situations. The Proposer agrees that if, at any time during the procurement process, or even after award of the contract, an individual or organizational Conflict Situation develops or is discovered, the Proposer shall make an immediate and full disclosure to **PRASA** and COR3 using the prescribed form. Such disclosure shall include a description of the action that the Proposer has taken or proposes to take to avoid or mitigate the conflict or potential conflict.

G. PROVISIONS APPLICABLE FOR CONTRACTS OVER $100,000.00

1. Contract Work Hours and Safety Standards Act

a. Where applicable,[1] all contracts awarded by the NFE of more than $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with statutory requirements on work hours and safety standards.[2] Under 40 U.S.C. § 3702, each contractor must base wages for every mechanic and laborer on a standard 40-hour work week. Work over 40 hours is allowed, so long as the worker is paid at least one and a half times the base pay rate for all hours worked over 40 hours in the work week. Additionally, for construction work, under 40 U.S.C. § 3704, work surroundings and conditions for laborers and mechanics must not be unsanitary or unsafe. Relevant definitions are at 40 U.S.C. § 3701 and 29 C.F.R. §5.2.

[1] *See* 40 U.S.C. §§ 3701-3708.
[2] 40 U.S.C. §§ 3702, 3704. The Contract Work Hours and Safety Standards Act is supplemented by Department of Labor regulations at 29 C.F.R. Part 5. *See* 2 C.F.R. Part 200, Appendix II, § E.

b. Applicability. This required contract provision applies to all procurements over $100,000 that involve the employment of mechanics, laborers, and construction work.[3] These requirements *do not* apply to the purchase of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.[4]

c. Additional Requirements If applicable per the standard described above, the non-federal entity must include the provisions at 29 C.F.R. § 5.5(b)(1)-(4), verbatim, into all applicable contracts, and all applicable contractors must include these provisions, in full, into any subcontracts.[5] In addition to the required language from 29 C.F.R. § 5.5(b)(1)-(4), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any other statutes cited in 29 C.F.R. § 5.1, the NFE must also insert a clause meeting the requirements of 29 C.F.R. § 5.5(c). Specific language is not required, but FEMA has provided suggested language below.

d. For the required contract provision, the language from 29 C.F.R. § 5.5(b)(1)-(4) is provided here for ease of reference:

"Compliance with the Contract Work Hours and Safety Standards Act.

(1) *Overtime requirements.* No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) *Withholding for unpaid wages and liquidated damages.* **PRASA** and or the Commonwealth of Puerto Rico shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime

[3] 41 C.F.R. Part 60-1.3
[4] 2 C.F.R. Part 200, Appendix II, § E.
[5] 29 C.F.R. § 5.5(b)(1), (4).

contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section."

e. For contracts that are only subject to Contract Work Hours and Safety Standards Act and are not subject to the other statutes in 29 C.F.R. § 5.1 where an additional contract provision is required, FEMA suggests including the following language:

"Further Compliance with the Contract Work Hours and Safety Standards Act.

(1) The contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.

(2) Records to be maintained under this provision shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Homeland Security, the Federal Emergency Management Agency, and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job."

2. **Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended).**

a. NFEs who intend to award contracts of more than $100,000, and their contractors who intend to award subcontracts of more than $100,000, must include a contract provision prohibiting the use of federal appropriated funds to influence officers or employees of the federal government. Contractors that apply or bid for a contract for more than $100,000 must also file the required certification regarding lobbying.[6] Each tier certifies to the tier above that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an employee of a federal agency, a Member of Congress, an employee of Congress, or an employee of a Member of Congress in connection with receiving any federal contract, grant, or other award covered by 31 U.S.C. § 1352.The required certification form is found in FEMA regulations.[7]

Each tier must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal funding. These disclosures are forwarded from tier to tier, all the way up to the federal awarding agency.[8]

b. Applicability. The Byrd Anti-Lobbying Amendment clause and certification are required for contracts of more than $100,000, and for subcontracts of more than $100,000.

c. The following provides a sample contract clause:

"Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)

Contractors who apply or bid for an award of more than $100,000 shall file the required certification attached as Exhibit B to this Contract. Each tier certifies to the tier above

[6] *See* 2 C.F.R. Part 200, Appendix II, § I (citing 31 U.S.C. § 1352); 44 C.F.R. § 18.110.

[7] See 44 C.F.R. §§ 18.100, 18.110; 44 C.F.R. Part 18, Appendix A. FEMA's regulations at 44 C.F.R. Part 18 implement the requirements of 31 U.S.C. § 1352 and provides, in Appendix A to Part 18, a copy of the certification that is required to be completed by each entity as described in 31 U.S.C. § 1352.

[8] See 44 C.F.R. §§ 18.100, 18.110; 44 C.F.R. Part 18, Appendix B. The specific form for disclosures is referenced in Appendix B to 44 C.F.R. Part 18 and is SF-LLL, also available at https://www.grants.gov/web/grants/forms/sf-424-family.html

that it will not and has not used federally appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the federal awarding agency."

H. ADDITIONAL PROVISIONS APPLICABLE FOR CONTRACTS OVER $150,000.00

For all contracts over $150,000.00 this provisions will apply in addition to the provisions set forth above detailed.

1.Clean Air Act and the Federal Water Pollution Control Act.

a. For contracts over $150,000, contracts must contain a provision requiring contractors to comply with the Clean Air Act[9] and the Federal Water Pollution Control Act.[10] Violations must be reported to FEMA and the Regional Office of the Environmental Protection Agency (EPA).[11]

b. Applicability - This contract provision is required for all procurements over $150,000.

c. The following provides a contract clause: "Clean Air Act"

The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §7401 *et seq.*

The contractor agrees to report each violation to the **PRASA** and understands and agrees that the **PRASA** will, in turn, report each violation as required to assure notification to the Commonwealth of Puerto Rico, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with federal assistance provided by FEMA.

d. The following provides a contract clause: "Federal Water Pollution Control Act"

The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the federal Water Pollution Control Act, as amended, 33 U.S.C. § 1251 *et seq.*

The contractor agrees to report each violation to the **PRASA** and understands and agrees that the **PRASA** will, in turn, report each violation as required to assure notification to the Commonwealth of Puerto Rico, Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with federal assistance provided by FEMA."

2, **Bonding.** If the construction and facility improvement contracts and subcontracts is in excess of $150,000; The Contractor shall provide: (i) a performance bond for 100 percent of the contract price; and (ii) a payment bond for 100 percent of the contract price. Exceptions to these requirements may only be made with the express approval of the Federal awarding agency and/or the **PRASA**.

[9] 42 U.S.C. §§ 7401-7671q. This also includes all applicable standards, orders, or regulations issued pursuant to the Clean Air Act.
[10] 33 U.S.C. §§ 1251-1387, as amended.
[11] 2 C.F.R. Part 200, Appendix II, § G.

I. ADDITIONAL PROVISIONS APPLICABLE TO ALL CONTRACTS REGARDLESS OF THE CONTRACT AMOUNT.

1. **FEMA Disaster Assistance Survivor/Registrant Data**. If the Contractor has access to Disaster Assistance Survivor/Registrant data, or any other personally identifiable information, the Contractor shall comply with the provisions of the Terms and Conditions for Sharing FEMA Disaster Assistance Survivor/Registrant Data with State Governments set forth in in the FEMA-Government Contract for FEMA-4336-DR-PR and FEMA-4339-DR-PR.

2. **Costs.** All costs incurred by the Contractor in performance of this Contract must be in accord with the cost principles of 2 C.F.R. pt. 200, Subpart E. **PRASA** shall not be required to make payments to the Contractor for costs which are found to be contrary to the cost principles 2 C.F.R. pt. 200, Subpart E.

3. **Financial Management System.** The Contractor's financial management system shall provide for the following:
   a. accurate, current and complete disclosure of the financial results of this Contract;
   b. effective internal control structure over all funds, property and other assets. Sufficient to allow. the Contractor to adequately safeguard all such assets and shall ensure that they are used solely for authorized purposes;
   c. accounting records supported by source documentation;

4. **Penalties, Fines, and Disallowed Costs.** In the event that any U.S. Federal agency or the Commonwealth of Puerto Rico disallows or demands repayment for costs incurred in the performance of this Contract due to an act or omission by the Contractor, the Contractor shall be solely responsible for such penalty, disallowed costs, or repayment demand, and shall reimburse **PRASA** in full within ten (10) days of receiving notice from **PRASA** of such penalty, disallowance, or repayment demand. Any monies paid by the Contractor pursuant to this provision shall not relieve the Contractor of liability to **PRASA** for damages sustained by **PRASA** by virtue of any other provision of this Contract.

5. **Debarment, Suspension, and Ineligibility.**
   a. NFEs contractors and subcontractors are subject to debarment and suspension regulations.[12] Applicable contracts and subcontracts must include a provision requiring compliance with debarment and suspension regulations.[13]
   b. Applicability. The debarment and suspension clause is required for all contracts and subcontracts for $25,000 or more, all contracts that require the consent of an official of a federal agency, and all contracts for federally required audit services.[14] NFEs, even for procurements under $25,000, must also comply with the regulation requiring non- state entities to only award contracts to responsible vendors.[15]

[12] 2 C.F.R. Part 180 (implementing Executive Order 12549, Debarment and Suspension (1986) and Executive Order 12689, Debarment and Suspension (1989)); 2 C.F.R. Part 3000 (Department of Homeland Security regulations for Nonprocurement Debarment and Suspension, implementing 2 C.F.R. Part 180).
[13] 2 C.F.R. § 180; 2 C.F.R. Part 200, Appendix II, § H; 2 C.F.R. § 3000.332.
[14] 2 C.F.R. § 180.220(b); 2 C.F.R. § 3000.220.
[15] 2 C.F.R. § 200.318(h). For contracts and subcontracts under $25,000, a contract provision is only required if those contracts or subcontracts are for federally required audit services or require the consent of a federal agency. However, even where a contract provision is not required, non-state entities must still ensure they are only awarding contracts to responsible vendors.

c. Additional Requirements. The debarment and suspension regulations restrict awards, subawards, contracts, and subcontracts with parties that are debarred, suspended, or otherwise excluded, or declared ineligible for participation in federal assistance programs and activities.[16]

If applicable, a contract or subcontract must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM). SAM Exclusions is the list maintained by the General Services Administration that contains the names of parties that are debarred, suspended, or otherwise excluded, or declared ineligible under statutory or regulatory authority other than Executive Order 12549.[17] SAM Exclusions can be accessed at www.sam.gov.[18]

In general, an "excluded" party cannot receive a federal grant award or a contract considered to be a "covered transaction," which includes parties that receive federal funding indirectly such as subawards and subcontracts. The key to the exclusion is whether there is a covered transaction. A covered transaction is a nonprocurement transaction at either a primary or secondary tier.[19]

Specifically, a covered transaction includes the following contracts for goods or services under FEMA grant and cooperative agreement programs:

- The contract is at least $25,000.
- The contract requires the approval of FEMA, regardless of amount.
- The contract is for federally required audit services.
- It is a subcontract for $25,000 or more.[20]

d. The following provides a debarment and suspension clause. It also incorporates an optional method of verifying that contractors are not excluded or disqualified[21]:

"Suspension and Debarment

This contract is a covered transaction for purposes of 2 C.F.R. Part 180 and 2 C.F.R. Part 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

The contractor must comply with 2 C.F.R. Part 180, subpart C and 2C.F.R. Part 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

This certification is a material representation of fact relied upon by **P*RASA***. If it is later determined that the contractor did not comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, in addition to remedies available to Commonwealth of Puerto Rico and **PRASA**, the federal government may pursue available remedies, including but not limited to suspension and/or debarment.

[16] *See* 2 C.F.R. Part 200, Appendix II, § H; 2 C.F.R. § 200.213. *See also* 2 C.F.R. Parts 180, 3000.
[17] *See* 2 C.F.R. Part 200, Appendix II, § H.
[18] 2 C.F.R. § 180.530.
[19] The regulations at 2 C.F.R. Parts 180 and 3000 are titled "nonprocurement" because they do not apply to procurements by the federal government but rather to federal financial assistance. There are separate debarment and suspension regulations covering procurements by the federal government. However, although the term "covered transactions" under 2 C.F.R. Parts 180 and 3000 *does not* include contracts awarded by the federal government, it *does* include some contracts awarded by recipients and subrecipients.
[20] *See* 2 C.F.R. §§ 180.220, 3000.220.
[21] Per 2 C.F.R. § 180.300, non-federal entity about to enter into an applicable contract, or a contractor about to entire into an applicable subcontract, must verify that the contractor or subcontractor is not excluded or disqualified by doing one of three things: 1) check SAM Exclusions; 2) collect a certification from the contractor or subcontractor; or 3) add a clause or condition to the contract or subcontract. The additional suggested language in this sample clause is for purposes of this requirement.

The bidder or proposer agrees to comply with the requirements of 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions."

6. **Reporting Requirements.** The Contractor shall complete and submit all reports, in such form and according to such schedule, as may be required by **PRASA**.

7. **Review of laws.** The Contractor certifies that it will access online and read each law that is cited in the afore mentioned clauses and that in the event it cannot access the online version it will notify **PRASA** in order to obtain printed copy of the laws. Not requiring printed copy of the laws to **PRASA** will be evidence that the Contractor was able to find it online and read it as required.

8. **Notice of Federal Emergency Management Agency (FEMA) Reporting Requirements and Regulations:**
   a. As a condition of FEMA funding under major disaster declarations FEMA-4336-DR-PR and FEMA-4339-DR-PR, FEMA requires the Government of Puerto Rico and Client to provide various financial and performance reporting. The Contractor agrees to provide all information, documentation, and reports necessary to satisfy these reporting requirements. Failure by the Consultant to provide information necessary to satisfy these reporting requirements may result in loss of Federal funding for this Contract, and such failure shall be a material breach of this Contract.
   b. Applicable Regulations and Policy. Applicable regulations, FEMA policy, and other sources setting forth these reporting requirements include, but are not limited to: 2 C.F.R. § 327 (Financial Reporting); 2 C.F.R. § 200.328 (Monitoring and Reporting Program Performance); Performance and financial reporting requirements set forth in 2 C.F.R. Part 206.

9. **Access to Records.**
   a. The Contractor agrees to provide **PRASA**, the Commonwealth of Puerto Rico, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this Contract for the purposes of making audits, examinations, excerpts, and transcriptions.
   b. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.
   c. The Contractor agrees to provide the FEMA Administrator or his authorized representatives access to work sites pertaining to the work being completed under the Contract.
   d. In compliance with the Disaster Recovery Act of 2018, **PRASA** and the Contractor acknowledge and agree that no language in this contract is intended to prohibit audits or internal reviews by the FEMA Administrator or the Comptroller General of the United States.

10. **Records Retention.** The Contractor agrees to maintain all books, records, accounts and reports required under this contract for a period of not less than three years after the date of termination or expiration of this contract, except in the event of litigation or settlement of claims arising from the performance of this contract, in which case contractor agrees to maintain same until the Commonwealth of Puerto Rico, **PRASA**, the FEMA Administrator, the Comptroller General of the United States, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related to the litigation or settlement of claims.

11. **Program Fraud and False or Fraudulent Statements or Related Acts.** The Contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Contractor's actions pertaining to this Contract.

12. **Procurement of Recovered Materials.**

a. An NFE that is a state agency or an agency of a political subdivision of a state, and the NFE's contractors must comply with Section 6002 of the Solid Waste Disposal Act.[22] Applicable NFEs must include a contract provision requiring compliance with this requirement.[23] This includes contracts awarded by a state agency or political subdivision of a state and its contractors for certain items, as designated by the EPA, with a purchase price greater than $10,000.[24] Indian Tribal Governments and nonprofit organizations are not required to comply with this provision. Additional requirements are listed below.

b. Applicability. This required contract provision applies to all procurements over $10,000 made by a state agency or an agency of a political subdivision of a state and its contractors.

c. Additional Requirements. The requirements include:
   - Procuring only items designated in EPA guidelines[25] that contain the highest practical percentage of recovered materials consistent with maintaining competition, where the purchase price of the item is greater than $10,000, or the value of the amount of items purchased in the preceding fiscal year was greater than $10,000;
   - Procuring solid waste management services in a way that maximizes energy and resource recovery; and
   - Establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.[26]

d. The following provides a contract clause:
   "In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—
      - Competitively within a timeframe providing for compliance with the contract performance schedule;
      - Meeting contract performance requirements; or
      - At a reasonable price.

[22] Pub. L. No. 89-272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962). 2 C.F.R. § 200.323.
[23] *See* 2 C.F.R. Part 200, Appendix II, § J (citing 2 C.F.R. § 200.323).
[24] *See* 2 C.F.R. Part 200, Appendix II, § J; 2 C.F.R. § 200.323; 40 C.F.R. Part 247.
[25] 40 C.F.R. Part 247.
[26] 42 U.S.C. § 6962; 2 C.F.R. § 200.323.

Information about this requirement, along with the list of EPA-designated items, is available at EPA's Comprehensive Procurement Guidelines webpage: https://www.epa.gov/smm/comprehensive- procurement-guideline-cpg-program.

The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act."

13. Energy Conservation. The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

14. Equal Opportunity.

a. Any contract that uses federal funds to pay for construction work is a "federally assisted construction contract" and must include the equal opportunity clause found in 2 C.F.R. Part 200, unless otherwise stated in 41 C.F.R. Part 60.[27]

b. Applicability. This contract provision is required for all procurements that meet the definition of a "federally assisted construction contract."

c. Key Definitions

- *Federally Assisted Construction Contract:* The regulation at 41 C.F.R. § 60-1.3 defines a *federally assisted construction contract* as "any agreement or modification thereof between any applicant and a person for construction work which is paid for in whole or in part with funds obtained from the Government or borrowed on the credit of the Government pursuant to any federal program involving a grant, contract, loan, insurance or guarantee, or undertaken pursuant to any federal program involving such grant, contract, loan, insurance, or guarantee, or any application or modification thereof approved by the Government for a grant, contract, loan, insurance, or guarantee under which the applicant itself participates in the construction work."
- *Construction Work:* The regulation at 41 C.F.R. § 60-1.3 defines *construction work* as "the construction, rehabilitation, alteration, conversion, extension, demolition or repair of buildings, highways, or other changes or improvements to real property, including facilities providing utility services. The term also includes the supervision, inspection, and other onsite functions incidental to the actual construction."
- *Contract:* The regulation at 41 C.F.R. § 60-1.3 defines *contract* as "any Government contract or subcontract or any federally assisted construction contract or subcontract."
- Additional definitions pertaining to this contract provision can be found at 41 C.F.R. § 60-1.3.

d. Required Language. The regulation at 41 C.F.R. § 60-1.4(b) requires, except as otherwise provided or exempted in 41 C.F.R. Part 60, the insertion of the following contract clause:

"During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places,

[27] *See* 2 C.F.R. Part 200, Appendix II, § C.

available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by **PRASA**, the Commonwealth of Puerto Rico, and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the

administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided,* that if the applicant so participating is a state or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings."

15. **Age Discrimination Act of 1975.** The Contractor shall comply with the provisions of the Age Discrimination Act of 1975. No person in the United States shall, on the basis of age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under, any program or activity receiving federal financial assistance.

16. **Americans with Disabilities Act.** The Contractor shall comply with the appropriate areas of the Americans with Disabilities Act of 1990 as enacted and from time to time amended, and any other applicable federal regulation. A signed, written certificate stating compliance with the Americans with Disabilities Act may be requested at any time during the term of this Contract.

17. **Title VI of the Civil Rights Act of 1964.** The Contractor shall comply with the provisions of Title VI of the Civil Rights Act of 1964. No person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.

18. **Section 504 of the Rehabilitation Act of 1973, as Amended.** The Contractor agrees that no otherwise qualified individual with disabilities shall, solely by reason of his disability, be denied the benefits, or be subjected to discrimination including discrimination in employment, any program or activity that receives the benefits from the federal financial assistance.

19. **Drug-Free Workplace.** The Contractor shall maintain a drug-free work environment in accordance with the Drug-Free Workplace Act of 1988 (41 U.S.C. § 8101 et seq.), and implementing regulations at 2 C.F.R Part 3001.

20. **Contracting with Small and Minority Firms, Women's Business Enterprises, and Labor Surplus Area Firms.**
    a. **Definitions.**
        i. Small Business. A business qualifies as a small business under the Small Business Administration criteria and size standards at 13 C.F.R. Part 121.
        ii. Women's Business Enterprise. A business that is: (a) at least 51 percent owned by one or more women; and (b) whose management and daily operations are controlled by one or more women.
        iii. Minority Business: A business that is (a) at least 51 percent owned by one or more minority group members; and (b) whose management and daily operations are controlled by one or more minority group members.
        iv. Labor Area Surplus Firm. A labor surplus area firm is a firm that, together with its first tier Subcontractors, will perform substantially in localities that have a "civilian average annual unemployment rate during the previous two calendar years of 20 percent or more above the average annual civil unemployment rate for all states" during that same period. 20 C.F.R. §§ 654.4-654.5.
    b. The Contractor must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.
    c. Affirmative steps must include:
        i. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
        ii. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
        iii. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
        iv. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;
        v. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and
        vi. Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (i) through (v) of this section.

21. **Compliance with Federal Laws, Regulations and Executive Orders and Acknowledgement of Federal Funding.** This is an acknowledgement that FEMA financial assistance will be used to fund all or a portion of the contract. The Contractor will comply will all applicable federal law, regulations, executive orders, FEMA policies, procedures, and directives.

22. **Provisions Required by Law Deemed Inserted.** Each and every provision required by law, regulation, executive order, policy, procedure, directive, Federal grant award or agreement, or cooperative agreement with any Federal agency to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein.

23. **Agreement to Execute Other Required Documents.** Contractor and all Sub Contractors, by entering into the Contract, understand and agree that funding for the Services is provided under Federal programs with specific contracting requirements. To the extent any such requirement is not otherwise set forth herein, Contractor agrees to execute such amendments or further agreements as may be necessary to ensure that PRASA received Federal funding for this Contract.

24. **U.S. Department of Homeland Security Seal, Logo, and Flags.** The Contractor shall not use the U.S. Department of Homeland Security seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre- approval. The contractor shall include this provision in any subcontracts

25. **No Obligation by the Federal Government.** The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

26. **Remedies.**
    1. Standard. Contracts for more than the simplified acquisition threshold ($250,000) must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. See 2 CFR. Part 200, Appendix II, Paragraph A.
    2. Applicability. This requirement applies to all FEMA grant and cooperative agreement programs.

27. **Termination for Cause and Convenience.**
    a. Standard. All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be affected and the basis for settlement. See 2 CFR. Part 200, Appendix II, Paragraph B.
    b. Applicability. This requirement applies to all FEMA grant and cooperative agreement programs.

28. **Davis Bacon Act and Copeland Anti-Kickback Act.**
    a. This statute requires that contractors must pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in the Secretary of Labor's wage determination. Additionally, contractors are required to pay wages at least once per

week.[28] Additional requirements are listed below, and relevant definitions are at 29 C.F.R. § 5.2. NFEs should refer to the applicable NOFO or other program guidance or contact their applicable FEMA grant representative for additional information on how to implement this requirement.

b. Applicability. When required by the federal program legislation, prime construction contracts over $2,000 awarded by NFEs must include a provision for compliance with the Davis-Bacon Act.[29]

c. The Davis-Bacon Act only applies to the Emergency Management Performance Grant Program[30], Homeland Security Grant Program[31], Nonprofit Security Grant Program[32], Tribal Homeland Security Grant Program[33], Port Security Grant Program[34], Transit Security Grant Program[35], Intercity Passenger Rail Program[36], and Rehabilitation of High Hazard Potential Dams Program[37]. Unless otherwise stated in a program's authorizing statute, it *does not* apply to other FEMA grant and cooperative agreement programs, including the PA Program.

It applies to all Public Assistance Grants where the State and/or Subrecipient match is paid by Department of Housing and Urban Development (HUD) Community Development Block Grant – Disaster Recovery (CDBG-DR) funding. It does not apply to other FEMA grant and cooperative agreement programs, including the Public Assistance Program.

d. Additional Requirements If applicable, in addition to the requirements mentioned in the beginning of this section, the NFE must do the following:

- Place a copy of the Department of Labor's current prevailing wage determination in each solicitation. Contracts or subcontracts must be awarded on the condition that the prevailing wage determination is accepted. The non-federal entity must report all suspected or reported violations to the federal awarding agency.[38]
- Include a provision for compliance with the Copeland "Anti-Kickback" Act for all

[28] *See id.*; 40 U.S.C. §§ 3141-3144 and 3146-3148. The Davis-Bacon Act is supplemented by Department of Labor regulations at 29 C.F.R. Part 5 (Labor Standards Provisions Applicable to Contracts Covering federally Financed and Assisted Construction)

[29] 2 C.F.R. Part 200, Appendix II, §D.

[30] *See* section 611(j)(9) of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), Pub. L. No. 93-288 (codified as amended at 42 U.S.C. § 5196(j)(9)).

[31] *See* section 2008(b)(4)(B)(ii) of the Homeland Security Act of 2002, Pub. L. No. 107-296 (codified as amended at 6 U.S.C. § 609(b)(4)(B)(ii)) (citing to section 611(j)(9) of the Stafford Act).

[32] *Id.* The Davis-Bacon Act only applies to the Nonprofit Security Grant Program (NSGP) where that program is funded as a carve-out of the appropriations for the Homeland Security Grant Program (HSGP). *See, e.g.,* Department of Homeland Security Appropriations Act, 2020, Pub. L. No. 116-93, Title III, Protection, Preparedness, Response, and Recovery, Federal Emergency Management Agency, Federal Assistance §§ 1-2. *Compare id. with* section 2009 of the Homeland Security Act of 2002 (6 U.S.C. § 609a) (authorizing NSPG as a stand-alone program where the Davis-Bacon Act does not apply, but as of the date of publication of this document, NSGP has not been funded as a standalone program).

[33] *See* section 2008(b)(4)(B)(ii) of the Homeland Security Act of 2002.

[34] *See* section 102 of the Maritime Transportation Security Act of 2002 (MTSA), Pub. L. No. 107-295 (codified as amended at 46 U.S.C. § 70107); 46 U.S.C. § 70107(b)(2). While the MTSA requires that PSGP construction activities are carried out consistent with section 611(j)(8) of the Stafford Act, a subsequent amendment to the Stafford Act by section 3 of Pub. L. No. 109-308 in 2006 redesignated the text of section 611(j)(8) to 611(j)(9). The cross-reference in the MTSA has not been updated.

[35] *See* section 1406 of the Implementing Recommendations of the 9/11 Commission Act of 2007 (9/11 Act), Pub. L. No. 110-53 (6 U.S.C. § 1135) (applying the requirements of section 49 U.S.C. § 5307); 49 U.S.C. § 5333 (applying the Davis-Bacon Act to grants provided under 49 U.S.C. § 5307).

[36] *See* section 1513(h) of the 9/11 Act (6 U.S.C. § 1163(h)) (citing to 49 U.S.C. § 24312, which requires compliance with the Davis-Bacon Act).

[37] *See* section 8A(d)(2)(E) of the National Dam Safety Program Act (codified as amended at 33 U.S.C. § 467f- 2(d)(2)(E)) (requiring compliance with 42 U.S.C. § 5196(j)(9), which is section 611(j)(9) of the Stafford Act that applies the Davis-Bacon Act).

[38] 2 C.F.R. Part 200, Appendix II, §D.

contracts subject to the Davis-Bacon Act.[39] *See* Required Contract Provisions, Section 5. Copeland Anti-Kickback Act in this Guide for additional information. According to 29 C.F.R. § 5.5(a)(5), the regulatory requirements for the Copeland "Anti-Kickback" Act are incorporated by reference into the required contract provision, so a separate contract provision is not necessary. However, the NFE may include a separate contract provision specific to the Copeland "Anti-Kickback" Act.

- Per Department of Labor's implementing regulations for the Davis-Bacon Act, the NFEs contractor and any subcontractors are required to insert, or incorporate by reference, the clauses contained at 29 C.F.R. § 5.5(a)(1)-(10)[40] into any subcontracts.
- Follow the other requirements of the Davis-Bacon Act and implementing regulations.[41]

e. Required Language[42] If applicable per the standard described above, the NFE must include the provisions at 29 C.F.R. § 5.5(a)(1)-(10) in full into all applicable contracts, and all applicable contractors must include these provisions in full in any subcontracts.[43]

f. Copeland "Anti-Kickback" Act The Copeland "Anti-Kickback" Act prohibits workers on construction contracts from giving up wages that they are owed.[44] Additional requirements are listed below, and relevant definitions are at 29 C.F.R. § 3.2. The applicable implementing regulations are intended to assist with enforcement of the Davis-Bacon Act's minimum wage provisions as well as various statutes with similar minimum wage provisions for federally assisted construction.[45]

i. Applicability For all prime construction contracts above $2,000, when the Davis-Bacon Act also applies[46], NFEs must include a provision in contracts and subcontracts for compliance with the Copeland "Anti- Kickback" Act.[47] This requirement applies to all prime construction contracts above $2,000 in situations where the Davis-Bacon Act also applies.[48] In situations where the Davis-Bacon Act does not apply, neither does the Copeland "Anti-Kickback" Act. As described in section A.4 regarding the Davis-Bacon Act, this provision only applies to certain FEMA grant and cooperative agreement programs. Please reference that list discussed above. Of note, it does not apply to the PA Program.

ii. Additional Requirements If applicable, the NFE must do the following:

- Include a provision for compliance with the Copeland "Anti-Kickback" Act.[49] According to the Davis-Bacon Act implementing regulations, the requirements for the Copeland "Anti-Kickback" Act are incorporated into the required contract provision for the Davis-Bacon Act by reference.[50] Therefore, a separate contract provision is not necessary. However, the NFE may include a separate contract provision specific to the Copeland "Anti-Kickback" Act with language suggested below.
- The Copeland "Anti-Kickback Act" prohibits each contractor or subcontractor from any form of persuading a person employed in construction, completion, or

[39] 2 C.F.R. Part 200, Appendix II, §D.
[40] 29 C.F.R. § 5.5(a)(6).

[41] 40 U.S.C. §§ 3141-3144, 3146-3148; 29 C.F.R. Part 5.
[42] 29 C.F.R. § 5.5(a).
[43] 29 C.F.R. § 5.5(a)(1), (6).
[44] *See id.*; 40 U.S.C. § 3145. The Copeland "Anti-Kickback" Act is supplemented by Department of Labor regulations at 29 C.F.R. Part 3 (Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States).
[45] *See* 29 C.F.R. § 3.1.
[46] *See* 2 C.F.R. Part 200, Appendix II, § D; 29 C.F.R. §§ 3.1, 3.3(c).
[47] 2 C.F.R. Part 200, Appendix II, § D.
[48] *See* 2 C.F.R. Part 200, Appendix II, § D; 29 C.F.R. § 3.3(c).
[49] *See* 29 C.F.R. § 3.11.
[50] 29 C.F.R. § 5.5(a)(5).

repair of public work to give up any part of their rightful compensation. The NFE must report all suspected or reported violations of the Copeland "Anti-Kickback Act" to FEMA.[51]

- Each contractor and subcontractor must provide weekly reports of the wages paid during the prior week's payroll period to each employee covered by the "Copeland Anti-Kickback" Act and the Davis-Bacon Act. The reports must be delivered to a representative of a federal or state agency in charge at the building or work site by the contractor or subcontractor within seven days of the payroll period's payment date.[52]
- Follow the other requirements of the Copeland "Anti-Kickback" Act and implementing regulations.

iii. The following provides a contract clause: "Compliance with the Copeland "Anti-Kickback" Act.

Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. Part 3 as may be applicable, which are incorporated by reference into this contract.

Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.

Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12."

29. <u>Rights to Inventions Made Under a Contract or Agreement.</u>

a. <u>Stafford Act Disaster Grants</u>. This requirement applies to all Public Assistance Grants where the State and /or Subrecipient match is paid by Department of Housing and Urban Development (HUD) Community Development Block Grant– Disaster Recovery (CDBG-DR) funding. Otherwise, it does not apply to the Public Assistance, Hazard Mitigation Grant Program, Fire Management Assistance Grant Program, Crisis Counseling Assistance and Training Grant Program, Disaster Case Management Grant Program, and Federal Assistance to Individuals and Households – Other Needs Assistance Grant Program, as FEMA awards under these programs do not meet the definition of "funding agreement."

b. If the FEMA award meets the definition of "funding agreement" under 37 CFR §401.2(a) and the non-Federal entity wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the non-Federal entity must comply with the requirements of 37 CFR Part 401 (Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements), and any implementing regulations issued by FEMA. See 2 CFR. Part 200, Appendix II, Paragraph F.

[51] *See* 2 C.F.R. Part 200, Appendix II, § D.
[52] *See* 29 C.F.R. § 3.4.

c. The regulation at 37 CFR § 401.2(a) currently defines "funding agreement" as any contract, grant, or cooperative agreement entered into between any Federal agency, other than the Tennessee Valley Authority, and any contractor for the performance of experimental, developmental, or research work funded in whole or in part by the Federal government. This term also includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under a funding agreement as defined in the first sentence of this paragraph.

30. Buy American Construction Materials

a. Buy American Act. This clause implements 41 U.S.C. 8301-8305, Buy American Act ("Act"), by providing a preference for domestic construction material. Contractor or Design-Builder Contractor shall use only domestic construction material in performing this contract, unless (a) an available exception under the Act has been expressly petitioned for specific construction material, reviewed and granted (during the procurement/bid process only) by the Owner's Representative or **PRASA**, or (b) the material is included as an "Excepted Material" in Paragraph g of this Section.

b. Definitions. For purposes of this Contract, the following words shall have the following meaning:

i. "article, material, or supply" are articles, materials, supplies, goods, products and other tangible items, including construction materials, that are purchased through the formal solicitation procedures and which materials are to be used by a contractor or subcontractor in the performance of this Contract.

ii. "construction material" is article, material, or supply used by a contractor or subcontractor for incorporation into the building or work as required in the performance of this Contract;

iii. "domestic construction material" is construction material that is made in America or in Puerto Rico, or that is American-sourced or American-made or that is Puerto Rico-sourced or Puerto Rico-made;

iv. "foreign construction material" is construction material that is made or sourced by a foreign country and that is not domestic construction material;

v. "made in America" means sourced from or made in the 50 States, the District of Columbia, and outlying areas including Puerto Rico.

c. Requesting Inapplicability or Exception. The Contractor or Design-Builder Contractor will submit construction material costs in its Bid Proposal in compliance with the Act. For any request of waiver during the procurement or bid process, inapplicability, or exception of compliance with the Act, Design-Builder Contractor or Contractor shall submit a written request to **PRASA** through the Question System in *Portal AAA* at the bidding process, with at least twenty (20) calendar days before the bid opening. If **PRASA** approves the request, it will be informed by Addendum. If **PRASA** does not emit an opinion or if it the request is not made during the term established herein, it will be understood as rejected and the construction material to be included in Contractor's or Design-Builder Contractor's Proposal must comply with the Act. Request of waiver shall include the following information for evaluation:

i. the specific basis for exception requested for consideration under 41 U.S.C. 8303-8305 or 48 CFR 25.400-25.402 and taking into consideration the dispositions of the FAR Subpart 25.1 (Buy American-Supplies).

ii. description and costs of the material in compliance with the Act and an explanation of the reason that justifies the substitution of material, other than costs savings.
iii. description of each foreign construction material that Contractor or Design-Builder Contractor seeks to use in substitution of the material (including unit of measure, quantity and price in U.S. dollars);
iv. description of the equivalent domestic construction material, if any are available (including unit of measure, quantity and price in U.S. dollars); and
v. any additional information, e.g. regarding price, quality or availability of materials, that may be used in evaluating the cost comparison between the foreign and domestic material, or any other necessary to justify the request, as requested by **PRASA** or Owner's Representative.

d. Price. The price of construction material shall include all delivery costs of the material and all taxes applicable.

e. Foreign Materials Noncompliant. The final decision to grant a waiver or exception to compliance with the Act rests solely with the Owner, Owner's Representative, the Government of Puerto Rico, FEMA, or COR3. The final determination is not subject to the General Conditions, or the contract claims process. If the Act is applicable and no waiver is granted, or if an exception does not apply and the Contractor or Design-Builder Contractor uses foreign construction materials, this will be considered a violation of the Contract. The Contractor or Design-Builder Contractor will be responsible for any damages or consequences that may arise from this action. For a request to use foreign construction materials after this Contract is executed, the Design-Builder Contractor or Contractor shall submit a written request to the Owner's Representative and include the information and evidence described above in this Section for evaluation. Additionally, the Contractor or Design-Builder Contractor should provide a comparison between the cost of the materials provided during the bidding, contracting phase and the cost of the materials subject to the petition. If a waiver is granted after Contract execution or if it is determined that an exception applies, the Design-Builder Contractor or Contractor, in accordance with the internal guidance and policy followed by the Owner or Government of Puerto Rico, will have the Owner's Representative modify this Contract through a Change Order to reflect the applicable cost deductible or change in cost. After the execution of the Change Order, the approved material shall be deemed to have been included as a permitted foreign material under Paragraph g of this Section.

f. Waiver Application after Contract execution. Following execution of the Agreement, **PRASA** will not evaluate or approve any waiver application, other than by basis of non-availabity of material, per FAR 25.103(b). The Contractor or Design-Builder Contractor shall submit an application to the Owner's Representative, including the information necessary for evaluation according to FAR 25.103-25.104 in addition to any applicable legal dispositions established in this Section or any other, and provide any necessary information required by the Owner's Representative or Contracting Officer for evaluation. Design-Builder Contractor or Contractor will certify and provide information demonstrating that the material quoted in its Proposal was in compliance with the Act and was available at the time of submitting its Proposal and that after the date of execution of the Contract the material was not available. This is an imperative condition in order to evaluate the application. If the Contractor or Design-Builder Contractor does not receive in writing an approval of the waiver request within twenty (20) calendar days of submitted, the request shall be deemed to have

been rejected, and Contractor or Design-Builder Contractor shall comply and purchase the material in compliance with the Act. The final determination whether or not the waiver is granted is not subject to the General Conditions, or the contract claims process, and for no reason the waiver request may cause delays or justification for an extension of the Contract Time.

g. Excepted Materials. The following materials have been approved for use by Government of Puerto Rico for this Contract: [N/A].

31. Subcontracting.

a. Except as otherwise set forth herein with respect to the Provider's affiliates and named subcontractors described in the Provider's proposal, the Provider shall not subcontract the services under this Agreement, or contract third-party experts or other persons to render the services under this Agreement, without prior written authorization from **PRASA**. A request to hire another service provider shall specify the issues in which the subcontracted provider would take part. All subcontractors must provide the Provider with its certificate of formation and operating agreement, and Good Standing Certificates as proof that that they are duly authorized to do business in Puerto Rico and have complied with its annual corporation repost filing obligations. Provider shall ensure and certify to **PRASA** that all its authorized subcontractors comply with Puerto Rico Laws and Regulations, specifically those provisions related to the required Government Certifications.

b. A subcontract award (see 2 CFR 180.220) must not be made to parties listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p.189) and 12689 (3 CFR part 1989 Comp., p.235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

c. Provider shall include all of the above-detailed provisions in any and all subcontract agreements and shall be responsible to **PRASA** for its compliance.

32. Prohibition on Contracting for Covered Telecommunications Equipment or Services

a. Section 889(b)(1) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY2019 NDAA) and 2 C.F.R. § 200.216, as implemented by FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), prohibit the obligation or expending of federal award funds on certain telecommunication products or from certain entities for national security reasons. Effective August 13, 2020, FEMA recipients and subrecipients, as well as their contractors and subcontractors, *may not* obligate or expend any FEMA award funds to:

i. Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

ii. Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system; or

iii. Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component

of any system, or as critical technology as part of any system.

b. Applicability - For purchases in support of FEMA declarations and awards issued on or after November 12, 2020, all FEMA recipients and subrecipients, and their contractors and subcontractors, are required to include this contract provision in all FEMA-funded contracts and subcontracts, including any purchase orders.[53] FEMA strongly encourages the use of this contract clause for any contracts where FEMA funding will be used regardless of whether the funding is from FEMA declarations or awards issued on or after November 12, 2020.

c. The following provides the clause that a state agency or agency of a political subdivision of a state and its contractors can include in contracts:

"Prohibition on Contracting for Covered Telecommunications Equipment or Services

(a) *Definitions.* As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), as used in this clause—

(b) *Prohibitions.*

(1) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.

(2) Unless an exception in paragraph (c) of this clause applies, the contractor and its subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to:

(i) Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(ii) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(iii) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or

(iv) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

(c) *Exceptions.*

(1) This clause does not prohibit contractors from providing—

(i) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(ii) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

[53] 2 C.F.R. Part 200, Appendix II, § K (citing 2 C.F.R. § 200.216).

(2) By necessary implication and regulation, the prohibitions also do not apply to:
(i) Covered telecommunications equipment or services that:
i. Are *not used* as a substantial or essential component of any system; *and*
ii. Are *not used* as critical technology of any system.
(ii) Other telecommunications equipment or services that are not considered covered telecommunications equipment or services.

(d) Reporting requirement.

(1) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:
(i) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.
(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) *Subcontracts.* The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments."

33. <u>Domestic Preferences for Procurements</u>

a. As appropriate, and to the extent consistent with law, NFEs should, to the greatest extent practicable under a federal award, provide a preference for the purchase, acquisition, or use of goods, products or materials produced in the United States. This includes, but is not limited to, iron, aluminum, steel, cement, and other manufactured products.[54]

b. <u>Applicability</u>. For purchases in support of FEMA declarations and awards issued on or after November 12, 2020, all FEMA recipients and subrecipients are required to include in all contracts and purchase orders for work or products a contract provision encouraging domestic preference for procurements.[55]

c. <u>The following provides the clause that a state agency or agency of a political subdivision of a state and its contractors can include in contracts:</u>

[54] *See* 2 C.F.R. § 200.322.

[55] 2 C.F.R. Part 200, Appendix II, § L (citing 2 C.F.R. § 200.322). The requirements of 2 C.F.R. § 200.322 must also be included in all subawards

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

For purposes of this clause:

Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber."

ARTICLE 4. – HUD GENERAL PROVISIONS AND OTHER FEDERAL STATUTES, REGULATIONS, AND PRDOH REQUIREMENTS

NON-FEDERAL MATCH PROGRAM

PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

HUD GENERAL PROVISIONS AND OTHER FEDERAL STATUTES, REGULATIONS, AND PRDOH REQUIREMENTS

For every project funded in part or in full by Community Development Block Grant – Disaster Recovery (CDBG-DR/MIT) funds

Given that the Subrecipient Agreements (SRA) signed between PRASA and Puerto Rico Department of Housing (PRDOH), Contract No. PRDOH 2022-DR0157 and Contract No. PRDOH 2023-DR0006, as amended, involves funds for which the U.S. Department of Housing and Urban Development (HUD) is the oversight agency, the following terms and conditions may apply to the SRA. In addition, PRASA, as SUBRECIPIENT and Contractor, shall comply with the Federal Labor Standards Provisions set forth in Form HUD-4010 Attached hereby in **Appendix A** or available at https://www.hudexchange.info/resource/2490/hud-form-4010-federal-labor-standards-provisions/ .

PRASA shall include these terms and conditions in its contracts or purchase orders directly servicing the SRA. In compliance with this requirement, the following terms and conditions are incorporated into the present Agreement and are made an integral part of it. These provisions are applicable to the **CONTRACTOR** and shall be included in every subcontract issued by it, so that such provisions will be binding upon each and every one of its subcontractors, flowing down such terms to all lowered-tiered subcontractors. Further, the **CONTRACTOR** and each and every one of its subcontractors shall provide and subscribe all required documentation, as it may be required, in order for PRASA to comply with the provisions of the SRA.

These general provisions, including Form HUD-410, may be updated from time to time. It is the sole responsibility of the **CONTRACTOR** and its subcontractors to be aware of any changes hereto, to amend and implement such changes and to ensure subcontracts terms and conditions are modified as necessary, if any.

General Provisions:

1. PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and clause required by law to be inserted in this Agreement shall be deemed to be inserted herein and the Agreement shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Agreement shall forthwith be physically amended to make such insertion or correction.

2. STATUTORY AND REGULATORY COMPLIANCE

The **CONTRACTOR** shall comply with all laws and regulations applicable to the Community Development Block Grant-Disaster Recovery funds appropriated by the Supplemental Appropriations for Disaster Relief Requirements, 2017 (Pub. L. 115-56), approved September 8, 2017 (Appropriations Act), as amended, including but not limited to the applicable Office of Management and Budget Circulars, which may impact the administration of funds and/or set forth certain cost principles, including if certain expenses are allowed.

3. BREACH OF SUBRECIPIENT AGREEMENT TERMS

PRDOH reserves its right to all administrative, contractual, or legal remedies, including but not limited to suspension or termination of the SRA, in instances where the SUBRECIPIENT or the **CONTRACTOR** violate or breach any SRA term. If the SUBRECIPIENT or the **CONTRACTOR** violate or breach any SRA term, they shall be subject to such sanctions and penalties as may be appropriate. The duties and obligations imposed by the SRA documents, and the rights and remedies available thereunder, shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

4. REPORTING REQUIREMENTS

The **CONTRACTOR** shall complete and submit all reports, in such form and according to such schedule, as may be required by PRASA, the PRDOH and/or the Government of Puerto Rico. The **CONTRACTOR** shall cooperate with all PRASA, the PRDOH and/or the Government of Puerto Rico efforts to comply with HUD requirements and regulations pertaining to reporting, including but not limited to 2 C.F.R. § 200.328 and 24 C.F.R. § 570.507, when applicable.

5. SMALL AND MINORITY FIRMS, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS

The **CONTRACTOR** will take necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used in subcontracting when possible. Steps include, but are not limited to:

(i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
(ii) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;
(iii) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;

(iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises; and
(v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce.

Additionally, for contracts of $10,000 or more, the **CONTRACTOR** shall file Form HUD 2516 (Contract and Subcontract Activity) with PRASA on a quarterly basis.

6. RIGHTS TO INVENTIONS MADE UNDER A CONTRACT OR AGREEMENT

Contracts or agreements for the performance of experimental, developmental, or research work shall provide for the rights of the Federal Government and the recipient in any resulting invention in accordance with 37 C.F.R. Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms under Government Grants, Contracts and Cooperative Agreements", and any implementing regulations issued by HUD.

7. DEBARMENT, SUSPENSION, AND INELIGIBILITY

The **CONTRACTOR** represents and warrants that it and its subcontractors are not debarred or suspended or otherwise excluded from or ineligible for participation in Federal assistance programs subject to 2 C.F.R. Part 2424. The **CONTRACTOR** shall comply with subpart C of 2 C.F.R. part 180, as supplemented by subpart C of 2 C.F.R. part 2424, and include a similar term or condition in lower-tier covered transactions.

The **CONTRACTOR** is responsible for determining if any subcontractor is excluded, disqualified suspended or debarred for participating in Federal Assistance Programs.

Pursuant to 2 CFR 2424.300, the **CONTRACTOR** is responsible for determining whether they are entering into a covered transaction with an excluded or disqualified person/firm for subcontracts expected to equal or exceed $25,000.

The **CONTRACTOR** shall verify debarment or suspension of subcontractors by checking the Excluded Parties List System (EPLS), registration in SAM.GOV or collecting a certification from the subcontractor participant/firm that neither it nor its principals are debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation. If **CONTRACTOR** decides to use EPLS to check the subcontractor's unique identifier and receive a "no records" response, this is not an acceptable debarment check per HUD and a certification will be required. The **CONTRACTOR** must maintain in its files the documentation to substantiate a subcontractor is not excluded/debarred and shall provide the documentation to PRASA.

8. CONFLICTS OF INTEREST

The **CONTRACTOR** shall notify to PRASA as soon as possible if this Agreement or any aspect related to the anticipated work under this Agreement raises an actual or potential

conflict of interest, if applicable. The **CONTRACTOR** shall explain the actual or potential conflict in writing in sufficient detail so that PRASA is able to assess such actual or potential conflict. The **CONTRACTOR** shall provide to PRASA any additional information necessary to fully assess and address such actual or potential conflict of interest. The **CONTRACTOR** shall accept any reasonable conflict mitigation strategy employed by PRASA, including but not limited to the use of an independent subcontractor(s) to perform the portion of work that gives rise to the actual or potential conflict.

9. SUBCONTRACTING

When subcontracting, the **CONTRACTOR** shall solicit for and contract with such subcontractors in a manner providing for fair competition. Some of the situations considered to be restrictive of competition include, but are not limited to:

(i) Placing unreasonable requirements on firms in order for them to qualify to do business;
(ii) Requiring unnecessary experience and excessive bonding;
(iii) Noncompetitive pricing practices between firms or between affiliated Companies;
(iv) Noncompetitive awards to consultants that are on retainer contracts,
(v) Organizational conflicts of interest;
(vi) Specifying only a brand name product instead of allowing an equal product to be offered and describing the performance of other relevant requirements of the procurement; and
(vii) Any arbitrary action in the procurement process.

The **CONTRACTOR** represents to PRASA that all work shall be performed by personnel experienced in the appropriate and applicable profession and areas of expertise, taking into account the nature of the work to be performed under this Agreement.

The **CONTRACTOR** will include these HUD General Provisions in every subcontract issued by it, so that such provisions will be binding upon each of its subcontractors as well as the requirement to flow down such terms to all lower-tiered subcontractors.

10. ASSIGNABILITY

The **CONTRACTOR** shall not assign any interest in this Agreement and shall not transfer any interest in the same (whether by assignment or novation) without prior written approval of PRASA.

11. COPELAND "ANTI-KICKBACK" ACT (Applicable to all construction or repair contracts)

Salaries of personnel performing work under this Agreement shall be paid unconditionally and not less often than once a month without payroll deduction or rebate on any account except only such payroll deductions as are mandatory by law or permitted by the applicable regulations issued by the Secretary of Labor pursuant to the Copeland

"Anti-Kickback Act" of 1934, 48 Stat. 948; (codified at 18 U.S.C. §874; and 40 U.S.C. §3145). The **CONTRACTOR** shall comply with all applicable "Anti-Kickback" regulations and shall insert appropriate provisions in all subcontracts covering work under this Agreement to ensure compliance by subcontractors with such regulations, and shall be responsible for the submission of affidavits required of subcontractors thereunder except as the Secretary of Labor may specifically provide for variations of or exemptions from the requirements thereof.

12. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT (Applicable to construction contracts exceeding $2,000 and contracts exceeding $2,500 that involve the employment of mechanics or laborers.)

The **CONTRACTOR** shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. §§3701-3708) as supplemented by Department of Labor regulations (29 C.F.R. Part 5).

All laborers and mechanics employed by the **CONTRACTOR** or subcontractors shall receive overtime compensation in accordance with and subject to the provisions of the CWHSSA, and the **CONTRACTOR** and subcontractors shall comply with all regulations issued pursuant to that act and with other applicable Federal laws and regulations pertaining to labor standards.

13. DAVIS-BACON ACT (Applicable to construction contracts exceeding $2,000 when required by Federal program legislation.)

The **CONTRACTOR** shall comply with the Davis Bacon Act (40 U.S.C. §3141 *et seq.*) as supplemented by Department of Labor regulations (29 C.F.R. Part 5).

All laborers and mechanics employed by the **CONTRACTOR** or subcontractors, including employees of other governments, on construction work assisted under this Agreement, and subject to the provisions of the federal acts and regulations listed in this paragraph, shall be paid wages at rates not less than those prevailing on similar construction in the locality as determined by the Secretary of Labor in accordance with the Davis Bacon Act. Refer to clause number 60 of this document.

On a semi-annual basis, the **CONTRACTOR** shall submit Form HUD 4710 (Semi-Annual labor Standards Enforcement Report) to PRASA.

14. TERMINATION FOR CAUSE (Applicable to contracts exceeding $10,000)

If, through any cause, the **CONTRACTOR** shall fail to fulfill in a timely and proper manner his or her obligations under this Agreement, or if the **CONTRACTOR** shall violate any of the covenants, agreements, or stipulations of this Agreement, PRASA shall thereupon have the right to terminate this Agreement by giving written notice to the **CONTRACTOR** of such termination and specifying the effective date thereof, **at least five (5) days** before the effective date of such termination. In such event, all finished or unfinished documents,

data, studies, surveys, drawings, maps, models, photographs, and reports prepared by the **CONTRACTOR** under this Agreement shall, at the option of PRASA, become the PRASA's property and the **CONTRACTOR** shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder. Notwithstanding the above, the **CONTRACTOR** shall not be relieved of liability to PRASA, the Government of Puerto Rico and PRDOH for damages sustained by PRASA, the Government of Puerto Rico and/or PRDOH by virtue of any breach of the Agreement by the **CONTRACTOR**, and PRASA, the Government of Puerto Rico and/or PRDOH may withhold any payments to the **CONTRACTOR** for the purpose of set-off until such time as the exact amount of damages due to PRASA, the Government of Puerto Rico and/or PRDOH from the **CONTRACTOR** is determined.

15. TERMINATION FOR CONVENIENCE (Applicable to contracts exceeding $10,000)

PRASA may terminate this Agreement at any time by giving at least a **ten (10) days'** notice in writing to the **CONTRACTOR**. If the Agreement is terminated by PRASA as provided herein, the **CONTRACTOR** will be paid for the time provided and expenses incurred up to the termination date.

16. SECTION 503 OF THE REHABILITATION ACT OF 1973 (Applicable to contracts exceeding $10,000)

The **CONTRACTOR** shall comply with Section 503 of the Rehabilitation Act of 1973 (29 U.S.C. §793), as amended, and any applicable regulations.

Equal Opportunity for Workers with Disabilities:

1) The **CONTRACTOR** will not discriminate against any employee or applicant for employment because of physical or mental disability in regard to any position for which the employee or applicant for employment is qualified. The **CONTRACTOR** agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with disabilities without discrimination based on their physical or mental disability in all employment practices, including the following:

   (i) Recruitment, advertising, and job application procedures;
   (ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring;
   (iii) Rates of pay or any other form of compensation and changes in compensation;
   (iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;
   (v) Leaves of absence, sick leave, or any other leave;
   (vi) Fringe benefits available by virtue of employment, whether or not administered by the **CONTRACTOR**;
   (vii) Selection and financial support for training, including apprenticeship, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the **CONTRACTOR** including social or recreational programs; and
(ix) Any other term, condition, or privilege of employment.

2) The **CONTRACTOR** agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

3) In the event of the **CONTRACTOR**'s noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

4) The **CONTRACTOR** agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, provided by or through the contracting officer. Such notices shall state the rights of applicants and employees as well as the **CONTRACTOR**'s obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants with disabilities. The **CONTRACTOR** must ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the **CONTRACTOR** may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair).

5) The **CONTRACTOR** will notify each labor organization or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the **CONTRACTOR** is bound by the terms of Section 503 of the Rehabilitation Act of 1973, as amended, and is committed to take affirmative action to employ and advance in employment individuals with physical or mental disabilities.

6) The **CONTRACTOR** will include the provisions of this clause in every subcontract or purchase order in excess of $10,000, unless exempted by the rules, regulations, or orders of the Secretary issued pursuant to Section 503 of the Rehabilitation Act of 1973, as amended, as amended, so that such provisions will be binding upon each subcontractor or vendor. The **CONTRACTOR** will take such action with respect to any subcontract or purchase order as the Deputy Assistant Secretary for Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance.

17. EQUAL EMPLOYMENT OPPORTUNITY (Applicable to construction contracts and subcontracts exceeding $10,000)

The **CONTRACTOR** shall comply with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 C.F.R. Subpt. B, Ch. 60).

During the performance of this Agreement, the **CONTRACTOR** agrees as follows:

1) The **CONTRACTOR** shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The **CONTRACTOR** shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

2) The **CONTRACTOR** shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by Contracting Officer setting forth the provisions of this non-discrimination clause. The **CONTRACTOR** shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

3) The **CONTRACTOR** will, in all solicitations or advertisements for employees placed by or on behalf of the **CONTRACTOR**, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

4) The **CONTRACTOR** will send to each labor union or representative of workers with which he or she has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers representative of the **CONTRACTOR**'s commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5) The **CONTRACTOR** will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor.

6) The **CONTRACTOR** will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to books, records and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

7) In the event of the **CONTRACTOR**'s non-compliance with the non-discrimination clause of this Agreement or with any of such rules, regulations or orders, this Agreement may be cancelled, terminated or suspended in whole or in part and the **CONTRACTOR** may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order 11246 and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

8) **CONTRACTOR** shall incorporate the provisions of 1 through 7 above in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor so that such provisions shall be binding on such subcontractor. The **CONTRACTOR** will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for non-compliance, provided, however, that in the event the **CONTRACTOR** becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the **CONTRACTOR** may request the United States to enter into such litigation to protect the interests of the United States.

18. CERTIFICATION OF NONSEGREGATED FACILITIES (Applicable to construction contracts exceeding $10,000)

The **CONTRACTOR** certifies that it does not maintain or provide for its establishments, and that it does not permit employees to perform their services at any location, under its control, where segregated facilities are maintained. It certifies further that it will not maintain or provide for employees any segregated facilities at any of its establishments, and it will not permit employees to perform their services at any location under its control where segregated facilities are maintained. The **CONTRACTOR** agrees that a breach of this certification is a violation of the equal opportunity clause of this Agreement.

As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are, in fact, segregated on the basis of race, color, religion, or national origin because of habit, local custom, or any other reason.

The **CONTRACTOR** further agrees that (except where it has obtained for specific time periods) it will obtain identical certification from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the equal opportunity clause; that it will retain such certifications in its files; and that it will forward the preceding notice to such proposed subcontractors (except where proposed subcontractors have submitted identical certifications for specific time periods).

19. CERTIFICATION OF COMPLIANCE WITH CLEAN AIR AND WATER ACTS (Applicable to contracts exceeding $100,000)

The **CONTRACTOR** and all subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 U.S.C. § 7401 *et seq.*, the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1251 *et seq.*, and the regulations of the Environmental Protection Agency with respect thereto, at 40 C.F.R. Ch. I, Subch. C, Pt. 60, Subpt. B and Ch. I, Subch. C, Pt. 93, Subpt. B, as amended, Section 508 of the Federal Water Pollution Control Act (33 U.S.C. § 1368) and Executive Order 11738 of September 10, 1973.

In addition to the foregoing requirements, all nonexempt contractors and subcontractors shall furnish to the owner, the following:

1) A stipulation by the **CONTRACTOR** or subcontractors, that any facility to be utilized in the performance of any nonexempt contract or subcontract, is not listed on the Excluded Party Listing System pursuant to Ch. I, Subch. C, Pt. 93, Subpt. B or on the List of Violating Facilities issued by the Environmental Protection Agency (**EPA**) pursuant to 40 C.F.R. Ch. I, Subch. C, Pt. 60, Subpt. B, as amended.

2) Agreement by the **CONTRACTOR** to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 U.S.C. §7414) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 U.S.C. §1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

3) A stipulation that as a condition for the award of the Agreement, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized, or to be utilized for the Agreement, is under consideration to be listed on the Excluded Party Listing System or the EPA List of Violating Facilities.

4) Agreement by the **CONTRACTOR** that he or she will include, or cause to be included, the criteria and requirements in paragraph (1) through (4) of this section in every nonexempt subcontract and requiring that the **CONTRACTOR** will take such action as the government may direct as a means of enforcing such provisions.

20. ANTI-LOBBYING (Applicable to contracts exceeding $100,000)

By the execution of this Agreement, the **CONTRACTOR** certifies, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the **CONTRACTOR**, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or

cooperative agreement, the **CONTRACTOR** shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.

3) The **CONTRACTOR** shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that the **CONTRACTOR** shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

21. BONDING AND INSURANCE REQUIREMENTS (Applicable to construction and facility improvement contracts exceeding $100,000)

The **CONTRACTOR** shall comply with 2 C.F.R. §200.326 minimum bonding requirements:

1) A bid guarantee from each bidder equivalent to five percent (5%) of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his or her bid, execute such contractual documents as may be required within the time specified.

2) A performance bond on the part of the **CONTRACTOR** for one hundred percent (100%) of the Agreement price. A "performance bond" is one executed in connection with a contract to secure fulfillment of the **CONTRACTOR**'s obligations under such agreement.

3) A payment bond on the part of the **CONTRACTOR** for one hundred percent (100%) of the Agreement price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the agreement.

Also, the **CONTRACTOR** shall carry sufficient insurance coverage and bonding from insurers licensed to conduct business in the Government of Puerto Rico to protect all contract assets from loss due to any cause, including but not limited to theft, fraud, and/or physical damage. The Government of Puerto Rico, the Puerto Rico Department of Housing, the Puerto Rico Aqueduct and Sewer Authority (PRASA), and the U.S. Department of Housing and Urban Development shall be named as additional insured on all such insurance. The **CONTRACTOR** shall meet all other insurance requirements as PRASA may impose from time to time. In addition, all insurance carriers and bonding companies shall meet minimum size and financial stability/financial rating requirements as may be imposed by the PRDOH or PRASA from time to time. Certificates of insurance

shall be provided to the PRASA and full and complete copies of the policies and/or bonds shall be provided to the PRDOH and PRASA, upon its request for same.

22. SECTION 3 OF THE HOUSING AND URBAN DEVELOPMENT ACT OF 1968

A. The work to be performed under this Agreement is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. §1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this Agreement agree to comply with HUD's regulations in 24 C.F.R. Part 75, which implement Section 3. As evidenced by their execution of this Agreement, the parties to this Agreement certify that they are under no contractual or other impediment that would prevent them from complying with the in 24 C.F.R. Part 75 regulations.

C. The **CONTRACTOR** agrees to send to each labor organization or representative of workers with which the **CONTRACTOR** has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the **CONTRACTOR**'s commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

D. The **CONTRACTOR** agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 C.F.R. Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 C.F.R. Part 75. The **CONTRACTOR** will not subcontract with any subcontractor where the **CONTRACTOR** has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 C.F.R. Part 75.

E. The **CONTRACTOR** acknowledges that subcontractors are required to meet the employment, training, and contracting requirements of 24 C.F.R. 75.19, regardless of whether Section 3 language is included in recipient or **CONTRACTOR** agreements, program regulatory agreements, or contracts signed after this Agreement.

F. The **CONTRACTOR** will certify that any vacant employment positions, including training positions, that are filled: (1) after the **CONTRACTOR** is selected but before the Agreement is executed, and (2) with persons other than those to whom the regulations

of 24 C.F.R. Part 75 require employment opportunities to be directed, were not filled to circumvent the **CONTRACTOR**'s obligations under 24 C.F.R. Part 75.

G. Noncompliance with HUD's regulations in 24 C.F.R. Part 75 may result in sanctions, termination of this Agreement for default, and debarment or suspension from future HUD assisted contracts.

H. With respect to work performed in connection with Section 3 covered Indian housing assistance, Section 7(b) of the Indian Self-Determination and Education Assistance Act (46 U.S.C. § 5307) also applies to the work to be performed under this Agreement. Section 7(b) requires that to the greatest extent feasible: (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this Agreement that are subject to the provisions of Section 3 and Section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with Section 7(b).

I. The **CONTRACTOR** agrees to submit, and shall require its subcontractors to submit to them, quarterly reports to PRASA detailing the total number of labor hours worked on the Section 3 Project, the total number of labor hours worked by Section 3 Workers, and the total number of hours worked by Targeted Section 3 Workers, and any affirmative efforts made during the quarter to direct hiring efforts to low- and very low-income persons, particularly persons who are Section 3 Workers and Targeted Section 3 Workers.

23. UNIFORM RELOCATION ASSISTANCE AND REAL PROPERTY ACQUISITION POLICIES ACT (URA)

Every project funded in part or in full by Community Development Block Grant – Disaster Recovery (CDBG-DR/MIT) funds, and all activities related to that project, are subject to the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (URA), as amended, 42 U.S.C. §4601 *et seq.*, and section 104(d) of the Housing and Community Development Act of 1992, as amended (HCDA), 42 U.S.C. §5304(d), except where waivers or alternative requirements have been provided by the U.S. Department of Housing and Urban Development (HUD).

The implementing regulations for URA are at 49 C.F.R. Part 24, and the regulations for section 104(d) are at 24 C.F.R. Part 42, subpart C. Additionally, HUD has established regulations specific to CDBG-funded housing activities at 24 C.F.R. § 570.606. PRDOH has also established the Uniform Relocation Assistance Guide & Residential Anti Displacement and Relocation Assistance Plan (URA & ADP Guide) which provides guidance and requirements regarding URA compliance and minimizing displacement that are applicable to all CDBG-DR/MIT programs. The primary purpose of these laws and regulations is to provide uniform, fair, and equitable treatment of persons whose real property is acquired or who are displaced in connection with federally funded projects.

When CDBG-DR/MIT funds are planned, intended, or used for any activity or phase of a project and the phases are interdependent, URA applies to that activity or project. This includes any property acquisition, even if CDBG-DR/MIT funds are not used to fund the purchase, if the contract to acquire property is executed with the intention of seeking CDBG-DR/MIT funds to complete the project or an interdependent phase of the project. The **CONTRACTOR** is responsible for ensuring URA compliance throughout the design, proposal, and implementation of any project that includes real property acquisition or displacement of residential or business occupants.

24. FAIR HOUSING ACT

The **CONTRACTOR** shall comply with the provisions of the Fair Housing Act of 1968, as amended. The Act prohibits discrimination in the sale or rental of housing, the financing of housing or the provision of brokerage services against any person on the basis of race, color, religion, sex, national origin, disability, or familial status. The Equal Opportunity in Housing Act prohibits discrimination against individuals on the basis of race, color, religion, sex or national origin in the sale, rental, leasing or other disposition of residential property, or in the use or occupancy of housing assisted with Federal funds.

25. ENERGY POLICY AND CONSERVATION ACT

The **CONTRACTOR** shall comply with mandatory standards and policies relating to energy efficiency as contained in the Government of Puerto Rico's energy conservation plan, issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6201 *et seq*).

26. POLITICAL ACTIVITY

The **CONTRACTOR** agrees to comply with mandatory standards and policies relating to Hatch Political Activity Act (Hatch Act), 5 U.S.C. §§1501–1508, which limits the political activity of employees.

The **CONTRACTOR** shall comply with the Hatch Act and shall ensure that no funds provided, nor personnel employed under this Agreement, shall be in any way or to any extent engaged in the conduct of political activities in violation of the Hatch Act, 5 U.S.C. §§1501–1508.

The Hatch Act applies to political activities of certain state and local employees. As a PRDOH's SUBRECIPENT, PRASA may participate in any of the following activities: be a candidate in nonpartisan elections; attend political meetings and conventions; contribute money; campaign in partisan elections; and hold office in political parties.

The SUBRECIPIENT may not do the following activities: be a candidate in partisan elections; use official influence to interfere in elections; coerce political contributions from subordinates in support of political parties or candidates the office of special counsel operates a website that provides guidance concerning hatch act issues.

27. HEALTH AND SAFETY STANDARDS

All parties participating in this project agree to comply with Sections 3702 and 3704(a) of the Contract Work Hours and Safety Standards Act (CWHSSA), 40 U.S.C. §§3702 and 3704. Section 3704(a) of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions, which are unsanitary, hazardous, or dangerous to his or her health and safety as determined under construction, safety, and health standards promulgated by the Secretary of Labor. These requirements do not apply to a contract to acquire a commercial product (as defined in 41 U.S.C. §103) or a commercial service (as defined in 41 U.S.C. §103a).

28. PERSONNEL

The **CONTRACTOR** represents that it has, or will secure at its own expense, all personnel required in performing the services under this Agreement. Such personnel shall not be employees of, or have any contractual relationship with, the contracting party. All the services required hereunder will be performed by the **CONTRACTOR** or under its supervision, and all personnel engaged in the work shall be fully qualified and shall be authorized or permitted under State and local law to perform such services. No person who is serving sentence in a penal or correctional institution shall be employed on work under this Agreement.

29. WITHHOLDING OF WAGES

If in the performance of this Agreement, there is any underpayment of wages by the **CONTRACTOR** or by any subcontractor thereunder, PRASA may withhold from the **CONTRACTOR** out of payment due to him or her an amount sufficient to pay to employees underpaid the difference between the wages required thereby to be paid and the wages actually paid such employees for the total number of hours worked. The amounts withheld may be disbursed by PRASA for and on account of the **CONTRACTOR** or subcontractor to the respective employees to whom they are due.

30. CLAIMS AND DISPUTES PERTAINING TO WAGE RATES

Claims and disputes pertaining to wage rates or to classifications of professional staff or technicians performing work under this Agreement shall be promptly reported in writing by the **CONTRACTOR** to PRASA for the latter's decision, which shall be final with respect thereto.

31. DISCRIMINATION BECAUSE OF CERTAIN LABOR MATTERS

No person employed on the services covered by this Agreement shall be discharged or in any way discriminated against because he or she has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable hereunder to his or her employer.

32. INTEREST OF MEMBERS OF LOCAL PUBLIC AGENCY AND OTHERS

The **CONTRACTOR** agrees to establish safeguards to prohibit employees from using positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have a family, business, or other tie. The **CONTRACTOR** will be aware of and avoid any violation of the laws of this State which prohibit municipal officers and employees from having or owning any interest or share, individually or as agent or employee of any person or corporation, either directly or indirectly, in any contract made or let by the governing authorities of such municipality for the construction or doing of any public work, or for the sale or purchase of any materials, supplies or property of any description, or for any other purpose whatsoever, or in any subcontract arising therefrom or connected therewith, or to receive, either directly or indirectly, any portion or share of any money or other thing paid for the construction or doing of any public work, or for the sale or purchase of any property, or upon any other contract made by the governing authorities of the municipality, or subcontract arising therefore or connected therewith.

The **CONTRACTOR** will also be aware of and avoid any violation of the laws of this State which prescribe a criminal penalty for any public officer who has an interest in any contract passed by the board of which he or she is a member during the time he or she was a member and for one year thereafter.

33. INTEREST OF CERTAIN FEDERAL OFFICERS

No member of, or delegate to, the Congress of the United States and no Resident Commissioner shall be admitted any share or part of this Agreement or to any benefit to arise therefrom.

34. INTEREST OF CONTRACTOR

The **CONTRACTOR** agrees that it presently has no interest and shall not acquire any interest, direct or indirect, in the above described project or any parcels therein or any other interest which would conflict in any manner or degree with the performance of the Work hereunder. The **CONTRACTOR** further agrees that no person having any such interest shall be employed in the performance of this Agreement.

35. RELIGIOUS ACTIVITY

The **CONTRACTOR**, in compliance with 24 C.F.R. 570.200(j) and 24 C.F.R. §5.109(c), agrees to provide equal participation to faith-based organizations in HUD programs and activities and to abstain from disfavoring any faith-based organization, including by failing to select a faith-based organization, disqualifying an faith-based organization, or imposing any condition or selection criterion that otherwise disfavors or penalizes an faith-based organizations in the selection process using any funds related to this Agreement.

36. FLOOD DISASTER PROTECTION ACT OF 1973

The **CONTRACTOR** will ensure that procedures and mechanisms are put into place to monitor compliance with all flood insurance requirements as found Section 202(a) of the Flood Disaster Protection Act of 1973, 42 U.S.C. 4106, and the regulations in 44 C.F.R. Parts 59 through 79 and 24 C.F.R. §570.605.

37. LEAD BASED PAINT

The **CONTRACTOR** must comply with the regulations regarding lead-based paint found at 24 C.F.R. Part 35, Subpt. A on LEAD-BASED PAINT POISONING PREVENTION IN CERTAIN RESIDENTIAL STRUCTURES with regards to all housing units assisted using CDBG-DR/MIT funds.

38. VALUE ENGINEERING (Applicable to construction contracts exceeding $2,000 when required by Federal Program legislation.)

The **CONTRACTOR** must comply with the regulations regarding systematic and organized approach to analyze functions of systems, equipment, facilities, services, and materials to ensure they achieve their essential functions at the lowest cost consistent to life cycle in execution, reliability, quality, and safety, in accordance with 2 C.F.R. §200.318(g).

39. GENERAL COMPLIANCE

The **CONTRACTOR** shall comply with all applicable provisions of the Housing and Community Development Act of 1974, as amended, and the regulations at 24 C.F.R. §570, as modified by the Federal Register notices that govern the use of CDBG-DR/MIT funds available under this Agreement. See Federal Register Notice 83 FR 5844 (February 9, 2018). Notwithstanding the foregoing, (1) the **CONTRACTOR** does not assume any applicable of the PRDOH's responsibilities for environmental review, decision making, and action, described in 24 C.F.R. Part 58 and (2) the **CONTRACTOR** does not assume any applicable of the PRDOH's responsibilities for initiating the review process under the provisions of 24 C.F.R. Part 52.

The **CONTRACTOR** shall also comply with all other applicable Federal, state and local laws, regulations, and policies that govern the use of the CDBG-DR/MIT funds in complying with its obligations under this Agreement, regardless of whether CDBG-DR/MIT funds are made available to the **CONTRACTOR** on an advance or reimbursement basis. This includes without limitation, applicable Federal Registers; 2 C.F.R. Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards; Community Development Act of 1974; 24 C.F.R. Part 570 Community Development Block Grant; applicable waivers; Fair Housing Act, 24 C.F.R. Part 35, Subpt. A; 24 C.F.R. Part 58; 24 C.F.R. Part 75; National Historic Preservation Act, and any other applicable state laws or regulations, including the requirements related to nondiscrimination, labor standards and the environment; and Action Plan amendments and HUD's guidance on the funds.

Where waivers or alternative requirements are provided for in the applicable Federal Register Notice dated February 9, 2018, at 83 FR 5844 or any future Federal Register Notice published by HUD ("HUD Notices"), such requirements, including any regulations referenced therein, shall apply.

The **CONTRACTOR** also agrees to comply with all other applicable Federal, State, and local laws, regulations, HUD Notices, policies, and guidelines, whether existing or to be established, provided the same are applied to activities occurring after the date the policy or guideline was established, governing the Grant Funds provided under this Agreement. In the event a conflict arises between the provisions of this Agreement and any of the foregoing, the Federal, State, and local laws, regulations, HUD Notices, policies, and guidelines shall control and this Agreement shall be interpreted in a manner so as to allow for the terms contained herein to remain valid and consistent with such Federal, State, and local laws, regulations, HUD Notices, policies and guidelines.

The **CONTRACTOR** shall also comply with applicable PRASA's and PRDOH's policies and guidelines as established in Program Guidelines and their amendments, if any, as found in the CDBG-DR Website (www.cdbg-dr.pr.gov) which are herein included and made integral part of this Agreement, as it may be updated from time to time.

40. DUPLICATION OF BENEFITS

The **CONTRACTOR** shall not carry out any of the activities under this Agreement in a manner that results in a prohibited duplication of benefits as defined by Section 312 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. §5155) and described in Appropriations Act. The **CONTRACTOR** must comply with HUD's requirements for duplication of benefits, imposed by Federal Register notice on the PRDOH, which are published in a separate notices entitled: "Clarification to Duplication of Benefits Requirements Under the Stafford Act for Community Development Block Grant (CDBG) Disaster Recovery Grantees" (November 16, 2011, 76 FR 71060); "Updates to Duplication of Benefits Requirements Under the Stafford Act for Community Development Block Grant (CDBG) Disaster Recovery Grantees" (June 20, 2019, 84 FR 28836); and "Applicability of Updates to Duplication of Benefits Requirements Under the Stafford Act for Community Development Block Grant (CDBG) Disaster Recovery Grantees," (June 20, 2019, 84 FR 28848). The **CONTRACTOR** shall carry out the activities under this Agreement in compliance with PRDOH's procedures to prevent duplication of benefits.

41. DRUG-FREE WORKPLACE

The **CONTRACTOR** must comply with drug-free workplace requirements in 2 C.F.R. §§182.200 through 182.230 of the Drug-Free Workplace Act of 1988, 41 U.S.C. §§8101-8106.

42. HOLD HARMLESS

The **CONTRACTOR** shall and hereby agrees to hold harmless, defend (with counsel acceptable to PRASA) and indemnify PRASA, the Government of Puerto Rico, PRDOH,

HUD and each and all of its successors, affiliates, or assigns, and any of their employees, officers, directors, attorneys, consultants, agents, managers, and affiliates, from and against any and all damages, costs, attorneys' fees, claims, expenses, injuries, property damage, causes of action, violations of law, violations of this Agreement, and losses of any form or nature arising from or related to the conduct of the **CONTRACTOR** in the performance of the efforts called for in this Agreement. This indemnity shall expressly include, but is not limited to, the obligation of the **CONTRACTOR** to indemnify and reimburse PRASA for any and all attorneys' fees and other litigation or dispute resolution costs incurred or to be incurred in PRASA's enforcement of this Agreement or any portion thereof against the **CONTRACTOR** or otherwise arising in connection with the **CONTRACTOR**'s breach, violation, or other noncompliance with this Agreement. This clause shall survive indefinitely the termination of this Agreement for any reason.

43. PRDOH RECOGNITION

Unless otherwise directed by PRASA, the **CONTRACTOR** shall ensure recognition of the role of HUD and the PRDOH in providing funding, services, and efforts through this Agreement. Unless otherwise directed by PRASA, all activities, facilities, and items utilized pursuant to this Agreement shall be prominently labeled as to role of HUD and of the PRDOH. In addition, the **CONTRACTOR** shall include a reference to the support provided herein in all publications made possible with funds made available under this Agreement. PRASA reserves the right to direct specific reasonable recognition requirements on a case-by-case basis, including but not limited, to the size and content, waiver, removal or addition of such recognition.

44. LOGOS CLAUSE

The **CONTRACTOR** will not use the name of PRASA or PRDOH, seals, logos, emblems or any distinctive trademark/ trade name, without the prior written express authorization of PRASA.

45. UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS

The **CONTRACTOR** shall comply with the applicable provisions in 2 C.F.R. Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200.

46. FINANCIAL & PROGRAM MANAGEMENT

The SUBRECIPIENT shall expend and account for all CDBG-DR/MIT funds received under this Agreement in accordance with 2 C.F.R. § 200.302 and 2 C.F.R. § 200.303 and agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls, and maintain necessary source documentation for all costs incurred.

The SUBRECIPIENT shall administer its program in conformance with Cost Principles as outlined in 2 C.F.R. §200.400 through 2 C.F.R. §200.476, as applicable. These principles shall be applied for all costs incurred whether charged on a direct or indirect basis.

47. DOCUMENTATION AND RECORD KEEPING

The **CONTRACTOR** shall maintain all records required by applicable law to be maintained, including but not limited to the Federal regulations specified in (1) 2 C.F.R. Part 200; (2) 24 C.F.R. §570.506; and (3) the applicable HUD Notices that are pertinent to the activities to be funded under this Agreement, as well as any additional records required by PRASA. Such records shall include but not be limited to:

a. Records providing a full description of each activity undertaken;
b. Records demonstrating that each activity undertaken meets one of the National Objectives of the CDBG-DR/MIT programs, as modified by the HUD Notices;
c. Records required to determine the eligibility of activities;
d. Records required to document the acquisition, improvement, use, or disposition of real property acquired or improved with CDBG-DR/MIT funds;
e. Records documenting compliance with the fair housing and equal opportunity components of the CDBG-DR/MIT program;
f. Financial records as required by (1) 24 C.F.R. §570.502; and (2) 2 C.F.R. Part 200;
g. Other records necessary to document compliance with Subpart K of 24 C.F.R. Part 570.

48. ACCESS TO RECORDS

PRASA, the Government of Puerto Rico, the PRDOH, HUD, the Comptroller General of the United States, or any of their duly authorized representatives, shall have at any time and from time to time during normal business hours, access to any work product, books, documents, papers, and records of the **CONTRACTOR** which are related to this Agreement, for the purpose of inspection, audits, examinations, and making excerpts, copies and transcriptions.

49. RECORD RETENTION AND TRANSMISSION OF RECORDS TO THE PRDOH

The **CONTRACTOR** shall retain all official records on programs and individual activities shall be retained for the greater of **five (5) years**, starting from the closeout of this Agreement. If any other laws and regulations as described in 24 C.F.R. §570.490 applies to a project, the record retention period may be extended. All records involved in litigation, claims, audits, negotiations, or other actions, which have started before the expiration date of their retention, will be kept until completion of the action and resolution of all issues or the end of the regular **five (5) years period**, whichever is longer. (See 2 C.F.R. §200.334 and 24 C.F.R. §570.490(d).)

Records shall be made available to PRASA upon request.

50. CLIENT DATA AND OTHER SENSITIVE INFORMATION

In the event that the **CONTRACTOR** comes to possess client data and other sensitive information as a result of this Agreement, then the **CONTRACTOR** shall maintain client data demonstrating client eligibility for services provided. Such data shall include, but not be limited to, client name, address, income level or other basis for determining eligibility, and description of service provided. Such information shall be made available to PRASA monitors or their designees for review upon request.

The **CONTRACTOR** must comply with 2 C.F.R. §200.303 and shall take reasonable measures to safeguard protected personally identifiable information, as defined in 2 C.F.R. §200.82, and other information PRASA, HUD or the PRDOH designates as sensitive or the **CONTRACTOR** considers sensitive consistent with applicable Federal, state, local, and tribal laws regarding privacy and obligations of confidentiality. Additionally, the **CONTRACTOR** must comply with the *PRDOH CDBG-DR Personally Identifiable Information, Confidentiality, and Nondisclosure Policy*, as found in the CDBG-DR Website (https://cdbg-dr.pr.gov/en/download/personally-identifiable-informationconfidentiality-and-nondisclosure-policy/), which is herein included and made integral part of this Agreement, as it may be updated from time to time

The **CONTRACTOR** shall comply with all State or local requirements concerning the privacy of personal records, consistent with 24 C.F.R. §570.508 (local governments) and §570.490(c) (States).

51. CLOSE-OUT

The SUBRECIPIENT's obligation to PRDOH shall not end until all close-out requirements are completed. Activities during this close-out period may include, but are not limited to: making final payments, disposing of program assets (including the return of all unused materials, equipment, unspent cash advances, program income balances, and accounts receivable to the PRDOH), properly addressing Program Income (as that term is defined in Section VI (A)(19) of the HUD Notice 83 FR 5844, 5856 (February 9, 2018, as may be amended by HUD)), balances, and accounts receivable to the PRDOH), determining the custodianship of records, and the SUBRECIPIENT certification of compliance with the terms of this Agreement. Notwithstanding the foregoing, the terms of this Agreement shall remain in effect during any period that the SUBRECIPIENT has control over CDBG-DR/MIT funds, including Program Income.

Notwithstanding the terms of 2 C.F.R. §200.343, upon the expiration of this Agreement, the SUBRECIPIENT shall transfer to the recipient any CDBG-DR/MIT funds on hand at the time of expiration and any accounts receivable attributable to the use of CDBG-DR/MIT funds, further, any real property under the SUBRECIPIENT's control that was acquired or improved in whole or in part with CDBG-DR/MIT funds (including CDBGDR/MIT funds provided to the SUBRECIPIENT in the form of a loan) shall be treated in accordance with 24 C.F.R. § 570.503(b)(7).

52. AUDITS AND INSPECTIONS

All **CONTRACTOR** records with respect to any matters covered by this Agreement shall be made available to PRASA, the PRDOH, HUD, and the Comptroller General of the United States, or any of their authorized representatives, at any time during normal business hours, as often as deemed necessary, to audit, examine, and make excerpts or transcripts of all relevant data. Any deficiencies noted in audit reports must be fully cleared by the **CONTRACTOR** within **thirty (30) days** after receipt by the **CONTRACTOR**. Failure of the **CONTRACTOR** to comply with the above audit requirements shall constitute a violation of this Agreement and may result in the withholding of future payments and/or termination.

53. SINGLE AUDIT

The SUBRECIPIENT must be audited as required by 2 C.F.R. Part 200, Subpt. F, when the SUBRECIPIENT's Federal awards expended during the respective fiscal year equaled or exceeded the threshold set forth in 2 C.F.R. §200.501 (Audit requirements). Once said threshold is reached or exceeded, the SUBRECIPIENT shall notify the PRDOH and shall report that event in the corresponding monthly progress report, as provided in Part VI - Performance, Monitoring, and Reporting, Subpart B (Reporting) of this Agreement.

The SUBRECIPIENT shall procure or otherwise arrange for the audit to be conducted for that year, as required in 2 C.F.R. §200.501(a)-(b); moreover, that it is properly performed and submitted when due in accordance with provisions that include but are not limited to those set forth in 2 C.F.R. §200.512 (Report submission), as stated in 2 C.F.R. §200.508(a) (Auditee responsibilities).

Among other relevant provisions, the SUBRECIPIENT shall comply with: (a) the Electronic submission of data and reports to the Federal Audit Clearinghouse (FAC) (2 C.F.R. §200.512(d)) and; (b) ensuring that reports do not include protected personally identifiable information as set forth in 2 C.F.R. §200.512(a)(2)).

54. INSPECTIONS AND MONITORING

The **CONTRACTOR** shall permit PRASA, PRDOH and auditors to have access to the **CONTRACTOR**'s records and financial statements as necessary for PRASA and PRDOH to meet the requirements of 2 C.F.R. Part 200.

55. CORRECTIVE ACTIONS

The PRDOH may issue management decisions and may consider taking enforcement actions including but not limited to corrective actions in 24 C.F.R. §570.910 if noncompliance is detected during monitoring and audits. The PRDOH may require the SUBRECIPIENT to take timely and appropriate action on all deficiencies pertaining to the Federal award provided to the SUBRECIPIENT from the pass-through entity detected through audits, on-site reviews, and other means. A timely and appropriate action shall be predicated on reasonable standard wherein the SUBRECIPIENT utilizes all available

resources to correct the noted issue or issues. In response to audit deficiencies or other findings of noncompliance with this Agreement, the PRDOH may impose additional conditions on the use of the CDBG-DR/MIT funds to ensure future compliance or provide training and technical assistance as needed to correct noncompliance.

56. PROCUREMENT AND CONTRACTOR OVERSIGHT

The SUBRECIPIENT shall ensure that every process of procurement of goods and services that may involve the use of CDBG-DR/MIT funds for local match adheres to the same procurement requirements that apply to procurements performed by local governments using Federal Emergency Management Agency's Public Assistance Program funds ("FEMA PA funds"). Therefore, the SUBRECIPIENT must comply with the federal procurement rules and regulations found in 2 C.F.R. §200.317, §200.322 and §200.326 and in accordance with the PRASA's Organic Law,

The SUBRECIPIENT shall maintain oversight of all activities under this Agreement and shall ensure that for any procured contract or Agreement, as applicable, its contractors perform according to the terms and conditions of the procured contracts or Agreements, and the terms and conditions of this Agreement.

PRDOH must obtain and maintain records to document how the procurement performed by the SUBRECIPIENT complied with FEMA PA procurement requirements, as amended from time to time. Additionally, if not completed by FEMA, PRDOH may need to take additional steps to evaluate the cost or price of the goods or services procured by the SUBRECIPIENT. To enable PRDOH to perform these activities, the SUBRECIPIENT agrees to make available to PRDOH any and all documentation related to such performed procurement processes upon request.

57. NONDISCRIMINATION

The **CONTRACTOR** shall comply with 24 C.F.R. Part 6, which implements the provisions of Section 109 of Title I of the Housing and Community Development Act of 1974, 42 U.S.C. §5309. Section 109 provides that no person in the United States shall, on the ground of race, color, national origin, religion, or sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with Federal financial assistance.

The **CONTRACTOR** shall adhere to the prohibitions against discrimination on the basis of age under the Age Discrimination Act of 1975, 42 U.S.C. §§6101-6107 (**Age Discrimination Act**) and the prohibitions against discrimination on the basis of disability under Section 504 of the Rehabilitation Act of 1973, 29 U.S.C. §794 (Section 504). Section 109 of the Housing and Community Development Act of 1974 makes these requirements applicable to programs or activities funded in whole or in part with CDBG-DR/MIT funds. Thus, the **CONTRACTOR** shall comply with regulations of 24 C.F.R. Part 8, which implement Section 504 for HUD programs, and the regulations of 24 C.F.R. Part 146, which implement the Age Discrimination Act for HUD programs.

The **CONTRACTOR** shall ensure that all CDBG-DR/MIT activities conducted by itself or its contractors are consistent with the applicable federal and local legal provisions, regulations, and policies that prohibit discrimination on the basis of race, creed, color, national origin, religion, sex, disability, familial status, actual or perceived sexual orientation or gender identity, marital status, or age, as established in the CDBG-DR Fair Housing and Equal Opportunity (FHEO) Policy for CDBG-DR Programs.[1]

58. ARCHITECTURAL BARRIERS ACT AND THE AMERICANS WITH DISABILITIES ACT

The **CONTRACTOR** shall ensure that its Activities are consistent with requirements of Architectural Barriers Act and the Americans with Disabilities Act.

The Architectural Barriers Act of 1968, 42 U.S.C. §§4151-4156, requires certain Federal and Federally funded buildings and other facilities to be designed, constructed, or altered in accordance with standards that ensure accessibility to, and use by, physically handicapped people. A building or facility designed, constructed, or altered with funds allocated or reallocated under this part after December 11, 1995, and that meets the definition of "residential structure" as defined in 24 C.F.R. § 40.2 or the description of "facilities" in 41 C.F.R. § 102–76.60 are subject to the requirements of the Architectural Barriers Act of 1968 and shall comply with the Uniform Federal Accessibility Standards (appendix A to 24 C.F.R. Part 40 for residential structures, and 41 C.F.R. Subt. C, Ch. 102, for general type buildings).

The Americans with Disabilities Act of 1990 ("ADA"), 42 U.S.C. § 12101 *et seq.* (**ADA**), provides comprehensive civil rights to individuals with disabilities in the areas of employment, public accommodations, State and local government services, and telecommunications. It further provides that discrimination includes a failure to design and construct facilities for first occupancy no later than January 26, 1993, that are readily accessible to and usable by individuals with disabilities. Further, the ADA requires the removal of architectural barriers and communication barriers that are structural in nature in existing facilities, where such removal is readily achievable—that is, easily accomplishable and able to be carried out without much difficulty or expense.

The **CONTRACTOR** agrees to comply with the non-discrimination in employment and contracting opportunities laws, regulations, and executive orders referenced in 24 C.F.R. §570.607, as revised by Executive Order 13279. The applicable non- discrimination provisions in Section 109 of the HCDA are still applicable.

59. TITLE VI OF THE CIVIL RIGHTS ACT OF 1964 (24 C.F.R. PART 1)

1) <u>General Compliance:</u>

[1] Follow the link for document access at the CDBG-DR Website: https://cdbg-dr.pr.gov/en/download/fairhousingandequal-opportunity-fheo-policy-for-cdbg-dr-programs/.

The **CONTRACTOR** shall comply with the requirements of Title VI of the Civil Rights Act of 1964, 42 U.S.C. §2000d *et seq.*, and 24 C.F.R. §570.601 and §570.602. No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity funded by this Agreement. The specific nondiscrimination provisions at 24 C.F.R. §1.4 apply to the use of these funds. The **CONTRACTOR** shall not intimidate, threaten, coerce, or discriminate against any person for the purpose of interfering with any right or privilege secured by Title VI of the Civil Rights Act of 1964 or 24 C.F.R. Part 1, or because he or she has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under 24 C.F.R. Part 1. The identity of complainants shall be kept confidential except to the extent necessary to carry out the purposes of 2 C.F.R. Part 1, including the conduct of any investigation, hearing, or judicial proceeding arising thereunder.

2) **Assurances and Real Property Covenants:**

As a condition to the approval of this Agreement and the extension of any Federal financial assistance, the **CONTRACTOR** assures that the program or activities described in this Agreement shall be conducted and the housing, accommodations, facilities, services, financial aid, or other benefits to be provided shall be operated and administered in compliance with all requirements imposed by or pursuant to this 2 C.F.R. Part 1.

If the Federal financial assistance under this Agreement is to provide or is in the form of personal property or real property or interest therein or structures thereon, the **CONTRACTOR**'s assurance herein shall obligate the **CONTRACTOR** or, in the case of a subsequent transfer, the transferee, for the period during which the property is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits, or for as long as the recipient retains ownership or possession of the property, whichever is longer. In all other cases the assurance shall obligate the **CONTRACTOR** for the period during which Federal financial assistance is extended pursuant to the contract or application.

This assurance gives the PRDOH and the United States a right to seek judicial enforcement of the assurance and the requirements on real property.

In the case of real property, structures or improvements thereon, or interests therein, acquired with Federal financial assistance under this Agreement or acquired with CDBG-DR/MIT funds and provided to the **CONTRACTOR** under this Agreement, the instrument effecting any disposition by the **CONTRACTOR** of such real property, structures or improvements thereon, or interests therein, shall contain a covenant running with the land assuring nondiscrimination for the period during which the real property is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits.

If the **CONTRACTOR** receives real property interests or funds or for the acquisition of real property interests under this Agreement, to the extent that rights to space on, over, or under any such property are included as part of the program receiving such assistance, the nondiscrimination requirements of this part 1 shall extend to any facility located wholly or in part in such space.

3) Women- and Minority-Owned Businesses (W/MBE)

The **CONTRACTOR** shall take the affirmative steps listed in 2 C.F.R. §200.321(b)(1) through (6) to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible when the **CONTRACTOR** procures property or services under this Agreement. As used in this Agreement, the terms "small business" means a business that meets the criteria set forth in Section 3(a) of the Small Business Act, as amended, 15 U.S.C. §632(a), and "minority and women's business enterprise" means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, "minority group members" are Afro-Americans, Spanish-speaking, Spanish surnamed or Spanish heritage Americans, Asian- Americans, and American Indians. The **CONTRACTOR** may rely on written representations by businesses regarding their status as minority and female business enterprises in lieu of an independent investigation.

In compliance with the CDBG-DR/MIT Minority and Women-Owned Business Enterprise Policy (M/WBE Policy), the **CONTRACTOR** shall complete a utilization plan to identify how they plan on successfully achieving the contracting goals for MBE and WBE's. **CONTRACTOR** shall also complete quarterly reporting to provide information on contracting opportunities and payouts provided to WBE or MBE contractors or subcontractors. **CONTRACTOR** shall also document their efforts and submit those to PRASA on a quarterly basis. See the M/WBE Policy, as found in the CDBG-DR Website (www.cdbg-dr.pr.gov) which is herein included and made integral part of this Agreement, as it may be updated from time to time.

4) Notifications

The **CONTRACTOR** will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or worker's representative of the **CONTRACTOR**'s commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5) Equal Employment Opportunity and Affirmative Action (EEO/AA) Statement

The **CONTRACTOR** shall, in all solicitations or advertisements for employees placed by or on behalf of the **CONTRACTOR**, state that it is an Equal Opportunity or Affirmative Action employer.

60. LABOR STANDARDS

The **CONTRACTOR** shall comply with the in labor standards in Section 110 of the Housing and Community Development Act of 1974, 42 U.S.C. §5310, and ensure that all laborers and mechanics employed by contractors or subcontractors in the performance of construction work financed in whole or in part with assistance received under this Agreement shall be paid wages at rates not less than those prevailing on similar construction in the locality as determined by the Secretary of Labor in accordance with the Davis Bacon Act, as amended (40 U.S.C. §3141, et seq.), and 29 C.F.R. Parts 1, 3, 5, 6, and 7, provided, that this requirement shall apply to the rehabilitation of residential property only if such property contains not less than eight (8) units. The wage rates are attached hereby as **Appendix B.** The wage rates are constantly changing. It is the sole responsibility of the **CONTRACTOR** and its subcontractors to pay the current applicable wages in Appendix B and to be aware of any changes to the wage rates hereto, to implement such changes and to ensure subcontracts terms and conditions are modified as necessary.

Wage determinations may be obtain from the U.S. Department of Labor's web site, https://sam.gov or www.dol.gov.

The **CONTRACTOR** agrees to comply with 18 U.S.C. §874 and it's implementing regulations of the U.S. Department of Labor at 29 C.F.R. Part 3 and Part 5. The **CONTRACTOR** shall maintain documentation that demonstrates compliance with applicable hour and wage requirements. Such documentation shall be made available to PRASA for review upon request.

The **CONTRACTOR** is prohibited from using funds provided herein or personnel employed in the administration of the program for: political activities; inherently religious activities; lobbying; political patronage; or nepotism activities.

The **CONTRACTOR** shall comply with the Fair Labor Standards Act (FLSA), 29 U.S.C. § 201-219, which establishes minimum wage, overtime pay, recordkeeping, and child labor standards affecting full-time and part-time workers in the private sector and in Federal, State, and local governments. FLSA is hereby attached as **Appendix C.** The FLSA may be amended from time to time. It is the sole responsibility of the **CONTRACTOR** and its subcontractors to be aware of any changes hereto, to amend and implement such changes and to ensure subcontracts terms and conditions are modified as necessary, if any.

61. CONDUCT

1) Contracts

   a. Monitoring: As applicable, the SUBRECIPIENT will monitor all contracted services on a regular basis to assure contract compliance. Results of monitoring efforts shall be

summarized in written reports and supported with documented evidence of follow-up actions taken to correct areas of noncompliance.

b. Content: The SUBRECIPIENT shall cause all of the provisions of the SRA in its entirety to be included in and made a part of any contract executed in the performance of this Agreement, as applicable.
c. Selection Process: The SUBRECIPIENT shall ensure that all contracts awarded after the execution of this Agreement and in the performance of such, follow the procurement policies and procedures described in the paragraph 56 (Procurement and Contractor Oversight) of this Exhibit.
d. Notification: The SUBRECIPIENT shall notify and provide a copy of any and all contracts related to this Agreement and CDBG-DR/MIT funds to the Contract Administration Area of the PRDOH CDBG-DR/MIT Legal Division within **three (3) days** of its execution.

2) Conflict of Interest

The SUBRECIPIENT agrees to abide by the provisions of 2 C.F.R. Part 200, as applicable, and 24 C.F.R. §570.611, which include (but are not limited to) the following:

a. It is presumed that the SUBRECIPIENT is subject to state and local ethic laws and regulations related to the conduct of its officers, employees or agents engaged in the award and administration of this Agreement.
b. In the event the SUBRECIPIENT is not, the SUBRECIPIENT shall maintain written standards of conduct governing the performance of its employees engaged in the award and administration of this Agreement. No employee, officer, or agent shall participate in the selection, award, or administration of a contract supported by Federal funds if a real or apparent conflict of interest would be involved. Such a conflict would rise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of the Parties indicated herein, has a financial or other interest in the firm selected for an award. The officers, employees, and agents of the recipient shall neither solicit nor accept gratuities, favors, or anything of monetary value from contractors, or Parties to sub Agreements. However, recipients may set standards for situations in which the financial interest is not substantial, or the gift is an unsolicited item of nominal value. The standards of conduct shall provide for disciplinary actions to be applied for violations of such standards by officers, employees, or agents of the recipient.
c. No covered persons who exercise or have exercised any functions or responsibilities with respect to CDBG-DR/MIT assisted activities, or who are in a position to participate in a decision-making process or gain inside information with regard to such activities, may obtain a financial interest in any contract, or have a financial interest in any contract, subcontract, or Agreement with respect to the CDBG-DR/MIT assisted activity, or with respect to the proceeds from the CDBG-DR/MIT assisted activity, either for themselves or those with whom they have business or immediate family ties, during their tenure or for a period of **one (1) year** thereafter. For purposes of this paragraph, a "covered person" includes any person who is an

employee, agent, consultant, officer, or elected or appointed official of the PRDOH, the SUBRECIPIENT, or any designated public agency.

d. Clause of Governmental Ethics Certification of Absence of Conflict of Interests - The **CONTRACTOR** certifies that: (1) No public servant of PRASA has pecuniary interest in this contract. (2) No public servant of PRASA has solicited or accepted, directly or indirectly, for him (her), for any member of his family unit or for any other person, gifts, allowances, favors, services, donations loans or any other thing of monetary value. (3) No public servant of PRASA related to this transaction, asked for or accepted any good of economic value, from any person or organization as payment for the duties and responsibilities of his employment. (4) No public servant of PRASA has solicited, directly or indirectly, for him (her), any member of his family unit, neither for any other person, business or organization, any good of economic value, including gifts, loans, promises, favors or services in exchange for his(her) obligations and performance of said public employment, to influence or favor any organization. (5) No public servant of PRASA has kinship relationship, within the fourth degree of consanguinity and second by affinity, with nobody in public employment that has faculty to influence and to participate in the institutional decisions of this Agreement.

62. CITIZEN GRIEVANCES

If the **CONTRACTOR** receives any complaint or grievance, it shall refer said complaint or grievance immediately to PRASA.

63. TECHNICAL ASSISTANCE AND TRAININGS

The **CONTRACTOR** shall attend any and all technical assistance and/or trainings that PRASA and the PRDOH requires from time to time at its discretion. Failure to attend may be considered as cause for termination.

64. DISASTER RELIEF ACCOUNT

Pursuant to Federal Register Vol. 85, No. 17, 85 FR 4681 (January 27, 2020), PRDOH must comply with an additional requirement imposed by an Order of October 26, 2017, granted by the United States District Court for the District of Puerto Rico, as may be amended from time to time. As required by the Order, grant funds or disaster relief funds received by the Commonwealth of Puerto Rico or other Non-Federal Entities (as defined by 2 C.F.R. § 200.69) shall be deposited solely into a Disaster Relief Account.

As a result thereof, under the terms of the beforementioned Court order and under the conditions of this Agreement, any and all CDBG-DR/MIT funds subawarded by PRDOH to its SUBRECIPIENTs shall be deposited into a new, separate, non-co-mingled, unencumbered account held in the name of the SUBRECIPIENT. The funds shall be used solely for eligible activities. Further, the SUBRECIPIENT shall provide and make available to PRDOH any and all documentation related to such account.

65. ADDITIONAL SPECIFIC CONDITIONS

Notwithstanding the special conditions established in this Agreement and its exhibits, in accordance with 2 C.F.R. §200.208, PRASA reserves the right and authority to impose additional specific conditions under any of the following circumstances:

a) At the PRDOH's sole discretion when PRASA and PRDOH finds that **CONTRACTOR** has a history of failure to comply with the general or specific terms and conditions applicable to the CDBG-DR and/or CDBG-MIT funds allocated under this Agreement.
b) When **CONTRACTOR** fails to meet expected performance goals under this Agreement.
c) When **CONTRACTOR** poses an increased risk for noncompliance based on factors including, but not limited to, financial stability, quality of management systems, history of performance under Federal awards, history of timeliness under Federal awards, history of conformance with terms and conditions of previous federal awards, and reports and findings from audits.
d) When, in the PRDOH's sole discretion, such conditions are necessary to ensure timely and compliant performance under the CDBG-DR/MIT Program.

Such additional specific conditions may include but are not limited to, withholding of authority to proceed to the next phase of an otherwise eligible Project, requiring additional detailed financial reports, requiring additional project monitoring, requiring the **CONTRACTOR** to obtain technical or management assistance, establishing additional prior approvals, or any other condition PRASA and PRDOH deems reasonable and necessary to safeguard Federal funds or the PRASA's and PRDOH's interests.

Notice of additional specific conditions shall include, but not be limited to, the nature of the additional requirements, the reason why the additional requirements are being imposed, the nature of the action needed to remove the additional requirement (if applicable), and the time allowed for completion of the actions (if applicable).

66. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 (OSH ACT)

The **CONTRACTOR** shall comply with the Occupational Safety and Health Act of 1970 (OSH Act) as supplemented by the Department of Labor regulations. This Act created the Occupational Safety and Health Administration (OSHA). OSHA sets and enforces protective standards of safety and health in the workplace. Under the OSH Act, employers have a responsibility to provide a safe workplace.

Employers must comply with the 29 CFR 1910 General Obligations Clause of the OSH Act. This clause requires employers to maintain their workplaces free from serious recognized hazards. This includes the adoption of safety and health guidelines and the subsequent training of the employer's workforce in these.

The **CONTRACTOR** whose Scope of Work includes construction activities must comply with the General Clauses, and also with provisions of 29 CFR 1926 "Construction Health and Safety Regulations". It shall be a condition of any contract for construction, alteration

and/or repair, including painting and decorating, that no contractor or subcontractor for any part of the contract work shall require any worker or mechanic employed in the performance of the contract to work in an environment or in unhealthy, hazardous or dangerous working conditions to their health or safety.

67. INDEPENDENT CONTRACTOR

Nothing contained in this Agreement is intended to, or shall be construed in any manner, as creating or establishing the relationship of employer/employee between the Parties, or with PRDOH. The **CONTRACTOR** shall at all times remain an "independent contractor" with respect to the efforts to be performed under this Agreement. PRASA shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance, as the Subrecipient is an independent entity.

68. ADDITIONAL CLAUSES REQUIRED

The **CONTRACTOR** must comply with the following clauses, and must include them in every subcontract that it may use to carry out the work for the benefit of PRASA:

a) The work performed by the **CONTRACTOR** and subcontractors must be in accordance with the applicable terms of the Agreement between the PRDOH and PRASA;
b) Nothing contained in this contract agreement shall impair the rights of the PRDOH;
c) Nothing contained in this contract will create any contractual relation between the **CONTRACTOR**, subcontractor and the PRDOH;
d) The **Contractor** specifically agrees to be bound by the confidentiality provision regarding Personally Identifiable Information set forth in the Agreement between PRDOH and PRASA and shall include this clause in any subcontract.
e) PRASA will be responsible for ensuring all contract work is performed consistent with federal and state regulations and/or policies to be eligible for reimbursement of the approved work;
f) PRASA will monitor all contracted services on a regular basis to assure contract compliance, and that results of monitoring efforts will be summarized in written reports to PRDOH and supported with documented evidence of follow-up actions taken to correct areas of noncompliance;
g) This contract awarded, for the performance of the services, before mentioned, was awarded on a fair and open competition basis in accordance with applicable procurement requirements;
h) All Federal flow down provisions are included in this agreement per Federal guidelines;
i) The applicable provisions set forth in 2 C.F.R. § 200.101, are part of this contract and are incorporated by reference.

69. ACTIVE REGISTRATION ON SAM.GOV

The **CONTRACTOR** must have and maintain an ACTIVE REGISTRATION on the System for Award Management (SAM), and shall renew their registration at least two (2) months before the expiration date.

The debarment and suspension regulations restrict awards, subawards, contracts, and subcontracts with parties that are debarred, suspended, or otherwise excluded, or declared ineligible for participation in federal assistance programs and activities.

END OF DOCUMENT

Appendix A

HUD-4010
Federal Labor Standards Provisions

U.S. Department of Housing and Urban Development
Office of Davis-Bacon and Labor Standards

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

1. Minimum wages and fringe benefits

i. All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in 29 CFR 5.5(d) and (e), the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(v) of these contract clauses; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under 29 CFR 5.5(a)(1)(ii)) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

ii. **Frequently recurring classifications**

A. In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to 29 CFR 5.5(a)(1)(ii), provided that:

1. The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;
2. The classification is used in the area by the construction industry; and
3. The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

B. The Administrator will establish wage rates for such classifications in accordance with 29 CFR 5.5(a)(1)(ii)(A)(3). Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

iii. **Conformance**

A. The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be

classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

1. The work to be performed by the classification requested is not performed by a classification in the wage determination; and
2. The classification is used in the area by the construction industry; and
3. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

B. The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

C. If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

D. In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

E. The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under 29 CFR 5.5 (a)(1)(iii)(C) and (D). The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to 29 CFR 5.5 (a)(1)(iii)(C) or (D) must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

iv. **Fringe benefits not expressed as an hourly rate**
Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

v. **Unfunded plans**
If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in 29 CFR 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

vi. **Interest** In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. **Withholding**
   I. **Withholding requirements**
   The U. S. Department of Housing and Urban Development may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in 29 CFR 5.5(a) for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work (or otherwise working in construction or development of the project under a development statute) all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in 29 CFR 5.5(a)(3)(iv), HUD may on its own initiative and after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
   II. **Priority to withheld funds**
   The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:
      A. A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
      B. A contracting agency for its reprocurement costs;
      C. A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
      D. A contractor's assignee(s);
      E. A contractor's successor(s); or
      F. A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.
3. **Records and certified payrolls**
   I. **Basic record requirements**
      A. **Length of record retention.** All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.
      B. **Information required** Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.
      C. **Additional records relating to fringe benefits.** Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(v) that the wages of any laborer or mechanic include the amount of any

costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

D. **Additional records relating to apprenticeship** Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

ii. **Certified payroll requirements**

A. **Frequency and method of submission** The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to HUD if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the certified payrolls to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system

B. **Information required** The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i)(B), except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.*, the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the sponsoring government agency (or the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records).

C. **Statement of Compliance** Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

1. That the certified payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information and basic records are being maintained under 29 CFR 5.5 (a)(3)(i), and such information and records are correct and complete;
2. That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly

from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

D. **Use of Optional Form WH-347** The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by 29 CFR 5.5(a)(3)(ii)(C).

E. **Signature** The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

F. **Falsification** The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

G. **Length of certified payroll retention** The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iii. **Contracts, subcontracts, and related documents** The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

iv **Required disclosures and access**

A. **Required record disclosures and access to workers** The contractor or subcontractor must make the records required under 29 CFR 5.5(a)(3)(i)–(iii), and any other documents that HUD or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by 29 CFR 5.1, available for inspection, copying, or transcription by authorized representatives of HUD or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

B. **Sanctions for non-compliance with records and worker access requirements** If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to 29 CFR 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

C. **Required information disclosures** Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to HUD if the agency is a party to

the contract, or to the Wage and Hour Division of the Department of Labor. If the Federal agency is not such a party to the contract, the contractor, subcontractor, or both, must, upon request, provide the full Social Security number and last known address, telephone number, and email address of each covered worker to the applicant, sponsor, owner, or other entity, as the case may be, that maintains such records, for transmission to HUD, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. **Apprentices and equal employment opportunity**
   i. **Apprentices**
      A. **Rate of pay** Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
      B. **Fringe benefits** Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.
      C. **Apprenticeship ratio** The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to 29 CFR 5.5(a)(4)(i)(D). Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in 29 CFR 5.5(a)(4)(i)(A), must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.
      D. **Reciprocity of ratios and wage rates** Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.
   ii **Equal employment opportunity** The use of apprentices and journeyworkers under this part must be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
5 **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6 **Subcontracts.** The contractor or subcontractor must insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (11), along with the applicable wage determination(s) and such other clauses or contract modifications as the U.S. Department of Housing and
Urban Development may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate.

7 **Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8 **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9 **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. **Certification of eligibility.**

i. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

ii. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or 29 CFR 5.12(a).

iii. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11 **Anti-retaliation** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

i. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

ii. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5;

iii. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5; or

iv. Informing any other person about their rights under the DBA, Related Acts, or 29 CFR parts 1, 3, or 5.

B. **Contract Work Hours and Safety Standards Act (CWHSSA)**

The Agency Head must cause or require the contracting officer to insert the following clauses set forth in 29 CFR 5.5(b)(1), (2), (3), (4), and (5) in full, or (for contracts covered by the Federal Acquisition Regulation) by reference, in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses must

be inserted in addition to the clauses required by 29 CFR 5.5(a) or 4.6. As used in this paragraph, the terms "laborers and mechanics" include watchpersons and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in 29 CFR 5.5(b)(1) the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchpersons and guards, employed in violation of the clause set forth in 29 CFR 5.5(b)(1), in the sum of $31 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in 29 CFR 5.5(b)(1).
3. **Withholding for unpaid wages and liquidated damages**

I. **Withholding process** The U.S Department of Housing and Urban Development or the recipient of Federal assistance may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in 29 CFR 5.5(b) on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in 29 CFR 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

II **Priority to withheld funds** The Department has priority to funds withheld or to be withheld in accordance with 29 CFR 5.5(a)(2)(i) or (b)(3)(i), or both, over claims to those funds by:

A. A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
B. A contracting agency for its reprocurement costs;
C. A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
D. A contractor's assignee(s);
E. A contractor's successor(s); or
F. A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901-3907.

4. ***Subcontracts.*** The contractor or subcontractor must insert in any subcontracts the clauses set forth in 29 CFR 5.5(b)(1) through (5) and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in 29 CFR 5.5(b)(1) through (5). In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss,

due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5 **Anti-retaliation** It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

i. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in 29 CFR part 5;

ii. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or 29 CFR part 5;

iii. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or 29 CFR part 5; or

iv. Informing any other person about their rights under CWHSSA or 29 CFR part 5.

C. **CWHSSA required records clause** In addition to the clauses contained in 29 CFR 5.5(b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other laws referenced by 29 CFR 5.1, the Agency Head must cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor must maintain regular payrolls and other basic records during the course of the work and must preserve them for a period of 3 years after all the work on the prime contract is completed for all laborers and mechanics, including guards and watchpersons, working on the contract. Such records must contain the name; last known address, telephone number, and email address; and social security number of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid; daily and weekly number of hours actually worked; deductions made and actual wages paid. Further, the Agency Head must cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph must be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview workers during working hours on the job.

D. **Incorporation of contract clauses and wage determinations by reference** Although agencies are required to insert the contract clauses set forth in this section, along with appropriate wage determinations, in full into covered contracts, and contractors and subcontractors are required to insert them in any lower-tier subcontracts, the incorporation by reference of the required contract clauses and appropriate wage determinations will be given the same force and effect as if they were inserted in full text.

E. **Incorporation by operation of law** The contract clauses set forth in this section (or their equivalent under the Federal Acquisition Regulation), along with the correct wage determinations, will be considered to be a part of every prime contract required by the applicable statutes referenced by 29 CFR 5.1 to include such clauses, and will be effective by operation of law, whether or not they are included or incorporated by reference into such contract, unless the Administrator grants a variance, tolerance, or exemption from the application of this paragraph. Where the clauses and applicable wage determinations are effective by operation of law under this paragraph, the prime contractor must be compensated for any resulting increase in wages in accordance with applicable law.

F. HEALTH AND SAFETY

The provisions of this paragraph (F) are applicable where the amount of the prime contract exceeds **$100,000.**

1. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
2. The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.
3. The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

Appendix B

"General Decision Number: PR20260001 01/02/2026

Superseded General Decision Number: PR20250001

State: Puerto Rico

Construction Type: Building

Counties: Puerto Rico Statewide.

BUILDING CONSTRUCTION (does not include single family homes and apartments up to and including 4 stories).

Modification Number	Publication Date
0	01/02/2026

SUPR1993-001 10/29/1993

	Rates	Fringes
BRICKLAYER	$ 7.25	.42
CARPENTER	$ 7.25	.34
CEMENT MASON/CONCRETE FINISHER	$ 7.25	.31
ELECTRICIAN (Including HVAC control wiring)	$ 7.25	
IRONWORKER	$ 7.25	
Laborer, Unskilled	$ 7.25	
PAINTER	$ 7.25	
PIPEFITTER	$ 7.25	
PLUMBER (Including HVAC work)	$ 7.25	.31
Power equipment operators:		
Cranes	$ 7.25	
Diggers	$ 7.25	
Loaders	$ 7.25	.26
Traxcavator	$ 7.25	
Sheet metal worker (Including HVAC duct work)	$ 7.25	.31
TRUCK DRIVER	$ 7.25	.30

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey

is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260002 01/02/2026

Superseded General Decision Number: PR20250002

State: Puerto Rico

Construction Types: Heavy and Highway

Counties: Adjuntas, Coamo, Culebra, Jayuya, Las Marias, Maricao, Salinas, Santa Isabel, Utuado and Vieques Counties in Puerto Rico.

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS.

Modification Number	Publication Date
0	01/02/2026

SUPR2024-001 05/26/1995

	Rates	Fringes
CARPENTER	$ 7.25	.50
CEMENT MASON/CONCRETE FINISHER	$ 7.25	.47
ELECTRICIAN	$ 7.25	.80
IRONWORKER	$ 7.25	
Laborers:		
Laborers (unskilled)	$ 7.25	.43
Pipelayers	$ 7.25	
Line Construction:		
Linemen	$ 7.25	.84
Telephone linemen: Ground & Pole	$ 7.25	
PIPEFITTER	$ 7.25	
PLUMBER	$ 7.25	
Power equipment operators:		
Asphalt Luters	$ 7.25	3.11
Backhoe	$ 8.25	.59
Bulldozer	$ 7.25	.99
Crane	$ 7.25	1.43
Diggers	$ 7.25	
Grader	$ 7.25	1.06
Greaser/Oilers	$ 7.25	
Loaders	$ 7.25	.92
Mechanics	$ 7.25	.76
Paver	$ 7.25	3.15
Roller	$ 7.25	3.14
SCRAPERS:		
18 CY and over	$ 8.10	.59
less than 18 CY	$ 7.80	.59
less than 185 HP	$ 8.00	.59
Screedman	$ 8.80	3.13
TRACTORS:		
185 HP and over	$ 8.10	.59
SCRAPERS		

TRUCK DRIVER.....$ 7.25

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this

classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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Wage and Hour Division
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200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260004 01/02/2026

Superseded General Decision Number: PR20250004

State: Puerto Rico

Construction Type: Highway

County: Aguada County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-007 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.69	0.70
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.85	0.00
LABORER: Common or General	$ 8.56	0.43
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.48	0.80
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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U.S. Department of Labor
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Washington, DC 20210

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Wage and Hour Division
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Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260005 01/02/2026

Superseded General Decision Number: PR20250005

State: Puerto Rico

Construction Type: Highway

County: Aguadilla County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-008 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.69	0.70
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.85	0.00
LABORER: Common or General	$ 8.02	0.42
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.48	0.80
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
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OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
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Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

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The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260006 01/02/2026

Superseded General Decision Number: PR20250006

State: Puerto Rico

Construction Type: Highway

County: Bayam&#65533;n County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-009 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.16	0.75
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.92	0.43
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260007 01/02/2026

Superseded General Decision Number: PR20250007

State: Puerto Rico

Construction Type: Highway

County: Caguas County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-010 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.50	0.50
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.96	0.43
OPERATOR:		
Backhoe/Excavator/Trackhoe	$ 11.00	1.22
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

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Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260008 01/02/2026

Superseded General Decision Number: PR20250008

State: Puerto Rico

Construction Type: Highway

County: Canovanas County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-011 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.78	0.43
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
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Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

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Washington, DC 20210

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Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260009 01/02/2026

Superseded General Decision Number: PR20250009

State: Puerto Rico

Construction Type: Highway

County: Carolina County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-012 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 8.83	0.57
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.83	0.77
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

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Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260010 01/02/2026

Superseded General Decision Number: PR20250010

State: Puerto Rico

Construction Type: Highway

County: Ciales County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-013 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.89	0.47
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260011 01/02/2026

Superseded General Decision Number: PR20250011

State: Puerto Rico

Construction Type: Highway

County: Moca County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-014 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.69	0.70
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.85	0.00
LABORER: Common or General	$ 8.23	0.43
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.48	0.80
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
"

"General Decision Number: PR20260012 01/02/2026

Superseded General Decision Number: PR20250012

State: Puerto Rico

Construction Type: Highway

County: Morovis County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-015 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.92	0.43
OPERATOR:		
Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

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            200 Constitution Avenue, N.W.
            Washington, DC 20210

Regarding any other wage determination matter such as
conformance decisions, requests for initial decisions should be
directed to the WHD Branch of Construction Wage Determinations.
Requests can be submitted via email to BCWD-Office@dol.gov or
by mail to:

            Branch of Construction Wage Determinations
            Wage and Hour Division
            U.S. Department of Labor
            200 Constitution Avenue, N.W.
            Washington, DC 20210

2) If an initial decision has been issued, then any interested
party (those affected by the action) that disagrees with the
decision can request review and reconsideration from the Wage
and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7).
Requests for review and reconsideration can be submitted via
email to dba.reconsideration@dol.gov or by mail to:

            Wage and Hour Administrator
            U.S. Department of Labor
            200 Constitution Avenue, N.W.
            Washington, DC 20210

The request should be accompanied by a full statement of the
interested party's position and any information (wage payment
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the requestor considers relevant to the issue.

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Review Board (formerly the Wage Appeals Board).  Write to:

            Administrative Review Board
            U.S. Department of Labor
            200 Constitution Avenue, N.W.
            Washington, DC 20210.

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          END OF GENERAL DECISION
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"General Decision Number: PR20260013 01/02/2026

Superseded General Decision Number: PR20250013

State: Puerto Rico

Construction Type: Highway

County: Naguabo County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-016 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.54	0.87
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING: Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.98	0.94
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260014 01/02/2026

Superseded General Decision Number: PR20250014

State: Puerto Rico

Construction Type: Highway

County: Naranjito County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-017 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 8.02	0.57
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$	8.28	0.53
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....$	9.81	0.95
TRUCK DRIVER: Dump Truck.....$	9.74	0.61
TRUCK DRIVER: Pickup Truck.....$	9.21	0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

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Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260015 01/02/2026

Superseded General Decision Number: PR20250015

State: Puerto Rico

Construction Type: Highway

County: Sabana Grande County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-018 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.66
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.64	0.91
LABORER: Common or General	$ 7.82	0.88
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.62	0.73
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

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b) an existing published wage determination
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d) an initial conformance (additional classification and rate) determination

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260016 01/02/2026

Superseded General Decision Number: PR20250016

State: Puerto Rico

Construction Type: Highway

County: San Juan County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-019 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.81	0.63
CEMENT MASON/CONCRETE FINISHER	$ 8.91	0.53
ELECTRICIAN	$ 8.80	1.01
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.25	0.38
LABORER: Common or General	$ 8.19	0.58
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.37	0.71
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 8.68	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.25 0.61

TRUCK DRIVER: Pickup Truck.....$ 9.36 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

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Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

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END OF GENERAL DECISION
"

"General Decision Number: PR20260017 01/02/2026

Superseded General Decision Number: PR20250017

State: Puerto Rico

Construction Type: Highway

County: San Sebastian County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-020 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.69	0.70
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.85	0.00
LABORER: Common or General	$ 7.82	0.88
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.48	0.80
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

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The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260018 01/02/2026

Superseded General Decision Number: PR20250018

State: Puerto Rico

Construction Type: Highway

County: Trujillo Alto County in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-021 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING:		
Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 7.71	0.43
OPERATOR:		
Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was

updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260019 01/02/2026

Superseded General Decision Number: PR20250019

State: Puerto Rico

Construction Type: Highway

Counties: Aguas Buenas, Aibonito, Arecibo, Barceloneta, Barranquitas, Camuy, Catano, Cayey, Cidra, Comerio, Corozal, Dorado, Florida, Guaynabo, Gurabo, Hatillo, Humacao, Juncos, Las Piedras, Loiza, Manati, Maunabo, Orocovis, Quebradillas, Rio Grande, San Lorenzo, Toa Alta, Toa Baja, Vega Alta, Vega Baja and Yabucoa Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-031 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
HIGHWAY/PARKING LOT STRIPING: Laborer	$ 8.25	0.56
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 8.02	0.57
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25

OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14
TRAFFIC CONTROL: Flagger	$ 8.28	0.53
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper	$ 9.81	0.95
TRUCK DRIVER: Dump Truck	$ 9.40	0.85
TRUCK DRIVER: Pickup Truck	$ 9.21	0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for

the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch

of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260020 01/02/2026

Superseded General Decision Number: PR20250020

State: Puerto Rico

Construction Type: Highway

Counties: Anasco, Isabela, Lares and Rincon Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-032 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.69	0.70
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.85	0.00
LABORER: Common or General	$ 8.10	0.43
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.48	0.80
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14

TRAFFIC CONTROL: Flagger.....$	8.27	0.57
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....$	9.81	0.95
TRUCK DRIVER: Dump Truck.....$	9.17	0.60
TRUCK DRIVER: Pickup Truck.....$	9.12	0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

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Union Average Rate Identifiers

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A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.

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            Washington, DC 20210

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            Branch of Construction Wage Determinations
            Wage and Hour Division
            U.S. Department of Labor
            200 Constitution Avenue, N.W.
            Washington, DC 20210

2) If an initial decision has been issued, then any interested
party (those affected by the action) that disagrees with the
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and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7).
Requests for review and reconsideration can be submitted via
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            Washington, DC 20210

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interested party may appeal directly to the Administrative
Review Board (formerly the Wage Appeals Board).  Write to:

            Administrative Review Board
            U.S. Department of Labor
            200 Constitution Avenue, N.W.
            Washington, DC 20210.

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          END OF GENERAL DECISION
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"General Decision Number: PR20260021 01/02/2026

Superseded General Decision Number: PR20250021

State: Puerto Rico

Construction Type: Highway

Counties: Arroyo, Ceiba, Fajardo, Guayama, Luquillo and Patillas Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-033 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.61
CEMENT MASON/CONCRETE FINISHER	$ 8.60	0.47
ELECTRICIAN	$ 8.80	1.22
IRONWORKER, STRUCTURAL	$ 8.25	0.57
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.40	0.61
LABORER: Common or General	$ 8.02	0.57
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.49	0.76
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.65	0.73
OPERATOR: Bulldozer	$ 10.88	0.91
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.88	3.15
OPERATOR: Roller	$ 9.67	3.14

TRAFFIC CONTROL: Flagger.....$ 8.28 0.53

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.40 0.85

TRUCK DRIVER: Pickup Truck.....$ 9.21 0.48

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260022 01/02/2026

Superseded General Decision Number: PR20250022

State: Puerto Rico

Construction Type: Highway

Counties: Cabo Rojo, Lajas and San German Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-034 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.66
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.64	0.91
LABORER: Common or General	$ 8.65	0.75
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.62	0.73
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14

TRAFFIC CONTROL: Flagger.....$	8.27	0.57
TRAFFIC CONTROL: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....$	9.81	0.95
TRUCK DRIVER: Dump Truck.....$	9.17	0.60
TRUCK DRIVER: Pickup Truck.....$	9.12	0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

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Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260023 01/02/2026

Superseded General Decision Number: PR20250023

State: Puerto Rico

Construction Type: Highway

Counties: Guanica, Guayanilla, Penuelas and Yauco Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-035 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.62
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.04	0.66
LABORER: Common or General	$ 7.76	0.68
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.34	0.75
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14

TRAFFIC CONTROL: Flagger.....$ 8.27 0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.35 0.83

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

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Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
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d) an initial conformance (additional classification and rate) determination

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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Washington, DC 20210

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260024 01/02/2026

Superseded General Decision Number: PR20250024

State: Puerto Rico

Construction Type: Highway

Counties: Hormigueros and Mayaguez Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-036 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.66
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 8.64	0.91
LABORER: Common or General	$ 8.30	0.60
OPERATOR: Backhoe/Excavator/Trackhoe	$ 9.62	0.73
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14
TRAFFIC CONTROL: Flagger	$ 8.27	0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.17 0.60

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

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Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
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c) an initial WHD letter setting forth a position on a wage determination matter
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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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U.S. Department of Labor
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U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260025 01/02/2026

Superseded General Decision Number: PR20250025

State: Puerto Rico

Construction Type: Highway

Counties: Juana Diaz, Ponce and Villalba Counties in Puerto Rico.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0222-003 09/01/2023

	Rates	Fringes
ELECTRICIAN		
Lineperson	$ 45.80	8.05 + 24.5%

SUPR2019-037 05/14/2024

	Rates	Fringes
CARPENTER	$ 8.75	0.62
CEMENT MASON/CONCRETE FINISHER	$ 8.52	0.58
ELECTRICIAN	$ 10.19	1.07
IRONWORKER, STRUCTURAL	$ 8.25	0.59
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 9.04	0.66
LABORER: Common or General	$ 7.25	0.76
OPERATOR: Backhoe/Excavator/Trackhoe	$ 10.34	0.75
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 9.38	0.65
OPERATOR: Bulldozer	$ 10.82	0.90
OPERATOR: Crane	$ 12.11	0.91
OPERATOR: Equipment Greaser (Grease Truck)	$ 9.54	1.15
OPERATOR: Grader/Blade	$ 12.53	1.25
OPERATOR: Mechanic	$ 10.19	0.94
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 10.41	3.15
OPERATOR: Roller	$ 9.31	3.14

TRAFFIC CONTROL: Flagger.....$ 8.27 0.57

TRAFFIC CONTROL:
Laborer-Cones/
Barricades/Barrels -
Setter/Mover/Sweeper.....$ 9.81 0.95

TRUCK DRIVER: Dump Truck.....$ 9.35 0.83

TRUCK DRIVER: Pickup Truck.....$ 9.12 0.46

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.

Washington, DC 20210

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Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260035 01/02/2026

Superseded General Decision Number: PR20250035

State: Puerto Rico

Construction Type: Heavy

County: San Juan County in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

SUPR2019-001 05/14/2024

	Rates	Fringes
CARPENTER	$ 10.33	0.50
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
ELECTRICIAN	$ 12.00	0.55
LABORER: Common or General	$ 8.48	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.38	0.94
TRUCK DRIVER: Dump Truck	$ 10.06	1.16

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for

this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

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U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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Branch of Construction Wage Determinations
Wage and Hour Division
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200 Constitution Avenue, N.W.
Washington, DC 20210

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Wage and Hour Administrator
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The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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"General Decision Number: PR20260036 01/02/2026

Superseded General Decision Number: PR20250036

State: Puerto Rico

Construction Type: Heavy

Counties: Aguada, Aguadilla, Anasco, Cabo Rojo, Hormigueros, Isabela, Juana Diaz, Lajas, Lares, Mayaguez, Moca, Ponce, Rincon, Sabana Grande, San German, San Sebastian and Villalba Counties in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0349-004 09/04/2023

	Rates	Fringes
ELECTRICIAN	$ 39.81	14.62

SUPR2019-002 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.21	0.91
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
LABORER: Common or General	$ 8.78	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.44	0.87
TRUCK DRIVER: Dump Truck	$ 10.21	1.09

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

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A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME

refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260037 01/02/2026

Superseded General Decision Number: PR20250037

State: Puerto Rico

Construction Type: Heavy

Counties: Aguas Buenas, Aibonito, Arecibo, Barceloneta, Barranquitas, Bayam◆n, Caguas, Camuy, Canovanas, Carolina, Catano, Cayey, Ciales, Cidra, Comerio, Corozal, Dorado, Florida, Guaynabo, Gurabo, Hatillo, Humacao, Juncos, Las Piedras, Loiza, Manati, Maunabo, Morovis, Naguabo, Naranjito, Orocovis, Quebradillas, Rio Grande, San Lorenzo, Toa Alta, Toa Baja, Trujillo Alto, Vega Alta, Vega Baja and Yabucoa Counties in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

SUPR2019-003 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.10	0.93
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
ELECTRICIAN	$ 12.00	0.55
LABORER: Common or General	$ 8.48	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.38	0.94
TRUCK DRIVER: Dump Truck	$ 10.06	1.16

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

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Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

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WAGE DETERMINATION APPEALS PROCESS

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3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative

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Administrative Review Board
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200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION
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"General Decision Number: PR20260038 01/02/2026

Superseded General Decision Number: PR20250038

State: Puerto Rico

Construction Type: Heavy

Counties: Arroyo, Guayama and Patillas Counties in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

SUPR2019-004 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.21	0.91
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
ELECTRICIAN	$ 12.00	0.55
LABORER: Common or General	$ 8.48	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.44	0.87
TRUCK DRIVER: Dump Truck	$ 10.21	1.09

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==========

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Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

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adopted.

WAGE DETERMINATION APPEALS PROCESS

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c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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"General Decision Number: PR20260039 01/02/2026

Superseded General Decision Number: PR20250039

State: Puerto Rico

Construction Type: Heavy

Counties: Ceiba, Fajardo and Luquillo Counties in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

SUPR2019-005 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.21	0.91
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
ELECTRICIAN	$ 12.00	0.55
LABORER: Common or General	$ 8.48	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.44	0.87
TRUCK DRIVER: Dump Truck	$ 10.21	1.09

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union

whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were

adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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"General Decision Number: PR20260040 01/02/2026

Superseded General Decision Number: PR20250040

State: Puerto Rico

Construction Type: Heavy

Counties: Guanica, Guayanilla, Penuelas and Yauco Counties in Puerto Rico.

HEAVY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/02/2026

ELEC0349-004 09/04/2023

	Rates	Fringes
ELECTRICIAN	$ 39.81	14.62

SUPR2019-006 05/14/2024

	Rates	Fringes
CARPENTER	$ 9.21	0.91
CEMENT MASON/CONCRETE FINISHER	$ 9.00	0.83
LABORER: Common or General	$ 8.78	0.43
LABORER: Pipelayer	$ 7.25	0.33
OPERATOR: Backhoe/Excavator/Trackhoe	$ 11.44	0.87
TRUCK DRIVER: Dump Truck	$ 10.21	1.09

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

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U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
Wage and Hour Division
WASHINGTON, D.C. 20210

MAR 17 1978

ALL AGENCY MEMORANDUM NO. 130

TO: ALL GOVERNMENT CONTRACTING AGENCIES AND THE DISTRICT OF COLUMBIA

FROM: XAVIER M. VELA
ADMINISTRATOR

SUBJECT: Application Of The Standard Of Comparison "Projects Of A Character Similar" Under The Davis-Bacon And Related Acts

The purpose of this memorandum is to set forth present policies of the Wage and Hour Division with regard to the determination of "projects of a character similar to the contract work" for wage determination purposes. The guidelines contained in the memorandum are to be used by the contracting agencies in selecting the proper schedule(s) of wage rates from the Federal Register and in instructing contractors regarding the application of multiple schedules. This memorandum supersedes A11 Agency Memorandum No. 68 (July 19, 1966).

The Davis-Bacon and related Acts require the Secretary of Labor to determine the prevailing wage rates for corresponding classes of laborers and mechanics on projects in the area which are of a "character similar" to the proposed contract work to which the determination will be applied. The Department's Wage Appeals Board in a decision specifically relating to high-rise apartment buildings (WAB Case No. stated:76-11, dated January 27, 1977) stated:

> The test of whether a project is of a character similar to another project refers to the nature of the project itself in a construction sense, not to whether union or nonunion wages are paid or whether union or nonunion workers are employed. Since the 1935 amendments to the Davis-Bacon Act, the statutory focus has always been on the character of the project itself rather than on who was employed on the project or how much he or she was being paid.

Again, in a decision relating to a water treatment plant project (WAB Case No. 77-20, dated September 30, 1977), the Board stated: "When it is clear from the nature of the project itself in a construction sense that it is to be categorized as either building, heavy, or highway construction it is not necessary to resort to an area practice survey to determine the appropriate categorization of the project."

Generally construction projects are classified as either Building, Heavy, Highway or Residential. 1/ Below are descriptions of these classifications with an illustrative listing of the kinds of projects that are generally included within the classification. Contracting agencies should utilize these descriptions and illustrations in carrying out their responsibilities, to insure a uniform and consistent administration of the Davis-Bacon and related prevailing wage statutes. The advertised and contract specifications should identify as specifically as possible the segments of work to which the schedules will apply. Note, however, that the descriptions and illustrations are guides. Contracting agencies should seek a determination from the Department of Labor on close questions or when the appropriate classification is in dispute. In making this determination where a project does not readily fall within any category, the Department of Labor may consider wages being paid on analogous projects as an indication of the proper category. As stated by the Wage Appeals Board in WAB Case No. 77-23, dated December 30, 1977: "Wages, however, are only one indication. It is also necessary to look at other characteristics of the project, including the construction techniques, the material and equipment being used on the project, the type of skills called for on the project work and other similar factors which would indicate the proper category of construction."

BUILDING CONSTRUCTION

Building construction generally is the construction of sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. It includes all construction of such structures, the installation of utilities and the installation of equipment, both above and below grade

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I/ Generally, for wage determination purposes, a project consists of all construction necessary to complete a facility regardless of the number of contracts involved so long as all contracts awarded are closely related in purpose, time and place. For example, demolition or site work preparatory to building construction is considered a part of the building project for wage determination purposes. Where a project, such as a water and sewage treatment plant, includes construction items that in themselves would be otherwise classified, a multiple classification may be justified if such construction items are a substantial part of the project. Further, however, a separate classification would not apply if such construction items are merely incidental to the total project to which they are closely related in function. For example, water or sewer line work which is a part of a building project would not generally be separately classified. Where construction is "incidental" in function, 20 percent of project cost is used as a rough guide for determining when construction is also "incidental" in amount to the overall project.

Page 3

level, as well as incidental grading, utilities and paving. Additionally, such structures need not be "habitable" to be building construction. The installation of heavy machinery and/or equipment does not generally change the project's character as a building.

Examples

Alterations and additions to buildings
Apartment buildings (5 stories and above)
Arenas (enclosed)
Auditoriums
Automobile parking garages
Banks and financial buildings
Barracks
Churches
City halls
Civic centers
Commercial buildings
Court houses
Detention facilities
Dormitories
Farm buildings
Fire stations
Hospitals
Hotels
Industrial buildings
Institutional buildings
Libraries
Mausoleums
Motels
Museums
Nursing and convalescent facilities
Office buildings
Out-patient clinics
Passenger and freight terminal buildings
Police stations
Post offices Power plants
Prefabricated buildings
Remodeling buildings
Renovating buildings
Repairing buildings
Restaurants
Schools
Service stations
Shopping centers
Stores
Subway stations
Theaters
Warehouses Water and sewage treatment plants (buildings only)

RESIDENTIAL CONSTRUCTION

Residential projects for Davis-Bacon purposes are those involving the construction, alteration, or repair of single family houses or apartment buildings of no more than four(4) stories in height. This includes all incidental items such as site work, parking areas, utilities, streets and sidewalks.

Examples

Town or row houses
Apartment buildings (4 stories or less)
Single family houses
Mobile home developments
Multi-family houses
Married student housing

HEAVY CONSTRUCTION

Heavy projects are those projects that are not properly classified as either "building", "highway", or "residential". Unlike these classifications, heavy construction is not a homogeneous classification. Because of this catch-all nature, projects within the heavy classification may sometimes be distinguished on the basis of their particular project characteristics, and separate schedules issued. For example, separate schedules may be issued for dredging projects, water and sewer line projects, dams, major bridges, and flood control projects.

Examples

Antenna towers
Bridges (major bridges designed for commercial naviqation) 2/
Breakwaters
Caissons (other than building or highway)
Canals
Channels
Channel cut-offs
Chemical complexes or facilities (other than buildings)
Cofferdams
Coke ovens
Dams
Demolition (not incidental to construction)
Dikes
Docks
Drainage projects

2/ Major bridges contain elements of both heavy and higMy construction. See WAB Case No. 772 (October 21, 1977)

Page 5

Dredging projects
Electrification projects (outdoor)
Flood control projects
Industrial incinerators (other than building)
Irrigation projects
Jetties
Kilns
Land drainage (not incidental to other construction)
Land leveling (not incidental to other construction)
Land reclamation
Levees
Locks, waterways
Oil refineries (other than buildings)
Pipe lines
Ponds
Pumping stations (prefabricated drop-in units - not buildings)
Railroad construction
Reservoirs
Revetments
Sewage collection and disposal lines
Sewers (sanitary, storm, etc)
Shoreline maintenance
Ski tows
Storage tanks
Swimming pools (outdoor)
Subways (other than buildings)
Tipples
Tunnels
Unsheltered piers and wharves
Viaducts (other than highway)
Water mains
Water-way construction
Water supply lines (not incidental to building)
Water and sewage treatment plants (other than buildings)
Wells

HIGHWAY CONSTRUCTION

Highway projects include the construction, alteration or repair of roads, streets, highways, runways, taxiways, alleys, trails, paths, parking areas, and other similar projects not incidental to building or heavy construction.

Examples

Alleys
Base courses
Bituminous treatments
Bridle paths
Concrete pavement
Curbs
Excavation and embankment (for road construction)

Page 6

Fencing (highway)
Grade crossing elimination (overpasses or underpasses)
Guard rails on highway
Highway signs
Highway bridges (overpasses; underpasses; grade separation)
Medians
Parking lots
Parkways
Resurfacing streets and highways
Roadbeds
Roadways
Runways
Shoulders
Stabilizing courses
Storm sewers incidental to road construction
Street Paving
Surface courses
Taxiways
Trails

In applying these guidelines contracting agencies are reminded that they have the authority only in the first instance to designate the appropriate wage schedule(s) from the Federal Resister, and to determine the application of multiple schedules issued by the Wage and Hour Division in project wage determinations. Any questions regarding the application of the guidelines set forth in this memorandum to a particular project or any disputes regarding the application of the wage schedules are to be referred to the Wage and Hour Division for resolution, and the instructions of the Wage and Hour Division are to be observed in all instances. Furthermore, where multiple schedules are issued by the Wage and Hour Division, they must be utilized in the contract specifications unless the agency requests and receives a change in the wage determination from the Wage and Hour Division. To ensure that appropriate schedules are issued, contracting agencies are advised to provide the Wage and Hour Division in their requests for wage determinations with a sufficiently specific description of the project to be able to determine its character.

U.S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION
Wage and Hour Division
WASHINGTON, D.C. 20210

JUL 14 1978

ALL AGENCY MEMORANDUM NO. 131

TO: ALL GOVERNMENT CONTRACTING AGENCIES AND THE DISTRICT OF COLUMBIA

FROM: XAVIER M. VELA
ADMINISTRATOR

SUBJECT: Clarification of All Agency Memorandum No. 130

The purpose of this memorandum is to clarify Memorandum No. 130, dated March 17, 1978. Although the Wage and Hour Division has received a positive reaction from most contracting agencies who work regularly with the issues raised, some questions have arisen over specific aspects of the memorandum.

Memorandum No. 130 is intended to be a guide to categories of projects in a construction sense and is to be applied uniformly by the contracting agencies in the absence of specific direction on the wage determination or advice by the Wage and Hour Division. However, the Wage and Hour Division is aware that in some circumstances the category of a project may appear to be unclear or a literal application of the guidelines may be inappropriate. For example, questions frequently arise over pumping stations, which may vary greatly in sophistication and construction techniques. Therefore, if the contracting agency has any questions regarding application of the guidelines in a specific case, or if a question is raised with the agency by interested parties, the issue of application of the wage rate schedules should be referred to the Wage and Hour Division. This referral should include a complete description of the project, any evidence available of area practice regarding wages paid on similar projects, comments by interested parties which may have been submitted to the agency, and- the agency's recommendation. Where the nature of the project in a construction sense is not clear, area practice regarding wages paid will be taken into consideration together with other factors such as construction techniques and classifications of workers required on the project. See WAB Case No. 77-23 (December 30, 1977).

Questions have also arisen regarding the circumstances in which multiple schedules of wage rates are issued for a project which includes construction items that in themselves would be

different categories of construction. Because of the complexities in application of multiple schedules, the contracting agency should consult with the Wage and Hour Division whenever it appears that more than one schedule of rates is appropriate for a project, unless the wage decision(s) as issued indicates that multiple schedules are applicable.

Generally, multiple schedules are issued if the construction items are substantial in relation to project cost -- more than approximately 20 percent. Only one schedule is issued if construction items are "incidental" in function to the over-all character of a project (e.g. paving of parking lots or an access road on a building project), and if there is not a substantial amount of construction in the second category. Note, however, that 20 percent is a rough guide. For example, when a project is very large, items of work of a different character may be sufficiently substantial to warrant a separate schedule even though these items of work do not specifically amount to 20 percent of the total project cost.

Although the example given is that of incidental paving and utilities, the same principles are applied to other categories, such as building construction on a heavy or highway project. Thus, in a recent case, the Wage and Hour Division deleted the building schedule when it learned that a small building under a contract primarily for runway construction was approximately 4 percent of project cost. Another example of general interest is the applicability of the building schedule to a building in a rest area of a highway. In this situation, applying the principles of MARTA, WAB Case No. 75-5, for extensive projects, the project for comparison purposes is the rest area itself, rather than the entire highway.

These principles regarding incidental construction are not in conflict with the Wage and Hour Division's recognition in certain circumstances (WAB Case No. 77-19) of a clearly established practice of paying different wage rates on specific portions of building projects. For example, different rates may be paid for incidental paving and utilities than are paid in the construction of buildings on building projects. These projects are building projects, and the wage rates issued by the Wage and Hour Division for incidental paving and utilities reflect wages paid on such work on building projects.

Contracting agencies are reminded of their responsibility to advise contractors on the application of multiple wage schedules issued by the Wage and Hour Division or obtained by the agency from the Federal Register. If any questions arise regarding application of the schedules to the project in accordance with these guidelines, or if it appears that a

wage schedule may have been issued in error, a ruling should be requested from the Wage and Hour Division. On these issues, as in all other matters in the administration of the Davis-Bacon and related acts, we will continue to work cooperatively with the contracting agencies. For convenience, Memorandum No. 130 is attached.

Attachment

Appendix C

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FAIR LABOR STANDARDS ACT OF 1938

[As Amended Through P.L. 117–328, Enacted December 29, 2022]

[Currency: This publication is a compilation of the text of Chapter 676 of the 75th Congress. It was last amended by the public law listed in the As Amended Through note above and below at the bottom of each page of the pdf version and reflects current law through the date of the enactment of the public law listed at https://www.govinfo.gov/app/collection/comps/]

[Note: While this publication does not represent an official version of any Federal statute, substantial efforts have been made to ensure the accuracy of its contents. The official version of Federal law is found in the United States Statutes at Large and in the United States Code. The legal effect to be given to the Statutes at Large and the United States Code is established by statute (1 U.S.C. 112, 204).]

AN ACT To provide for the establishment of fair labor standards in employments in and affecting interstate commerce, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Fair Labor Standards Act of 1938."

[29 U.S.C. 201] Enacted June 25, 1938, ch. 676, sec. 1, 52 Stat. 1060.

FINDING AND DECLARATION OF POLICY

SEC. 2. (a) The Congress hereby finds that the existence, in industries engaged in commerce or in the production of goods for commerce, of labor conditions detrimental to the maintenance of the minimum standard of living necessary for health, efficiency, and general well-being of workers (1) causes commerce and the channels and instrumentalities of commerce to be used to spread and perpetuate such labor conditions among the workers of the several States; (2) burdens commerce and the free flow of goods in commerce; (3) constitutes an unfair method of competition in commerce; (4) leads to labor disputes burdening and obstructing commerce and the free flow of goods in commerce; and (5) interferes with the orderly and fair marketing of goods in commerce. The Congress further finds that the employment of persons in domestic service in households affects commerce.

(b) It is hereby declared to be the policy of this Act, through the exercise by Congress of its power to regulate commerce among the several States and with foreign nations, to correct and as rapidly as practicable to eliminate the conditions above referred to in such industries without substantially curtailing employment or earning power.

[29 U.S.C. 202] Enacted June 25, 1938, ch. 676, sec. 2, 52 Stat. 1060; amended October 26, 1949, ch. 736, sec. 2, 63 Stat. 910; amended April 8, 1974, P.L. 93–259, sec. 7(a), 88 Stat. 62.

AUTHENTICATED U.S. GOVERNMENT INFORMATION GPO

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DEFINITIONS

SEC. 3. As used in this Act—

(a) "Person" means an individual, partnership, association, corporation, business trust, legal representative, or any organized group of persons.

(b) "Commerce" means trade, commerce, transportation, transmission, or communication among the several States or between any State and any place outside thereof.

(c) "State" means any State of the United States or the District of Columbia or any Territory or possession of the United States.

(d) "Employer" includes any person acting directly or indirectly in the interest of an employer in relation to an employee and includes a public agency, but does not include any labor organization (other than when acting as an employer) or anyone acting in the capacity of officer or agent of such labor organization.

(e)(1) Except as provided in paragraphs (2), (3), and (4), the term "employee" means any individual employed by an employer.

(2) In the case of an individual employed by a public agency, such term means—

(A) any individual employed by the Government of the United States—

(i) as a civilian in the military departments (as defined in section 102 of title 5, United States Code),

(ii) in any executive agency (as defined in section 105 of such title),

(iii) in any unit of the judicial branch of the Government which has positions in the competitive service,

(iv) in a nonappropriated fund instrumentality under the jurisdiction of the Armed Forces,

(v) in the Library of Congress, or

(vi) the Government Printing Office;

(B) any individual employed by the United States Postal Service or the Postal Rate Commission; and

(C) any individual employed by a State, political subdivision of a State, or an interstate governmental agency, other than such an individual—

(i) who is not subject to the civil service laws of the State, political subdivision, or agency which employs him; and

(ii) who—

(I) holds a public elective office of that State, political subdivision, or agency,

(II) is selected by the holder of such an office to be a member of his personal staff,

(III) is appointed by such an officeholder to serve on a policymaking level,

(IV) is an immediate adviser to such an officeholder with respect to the constitutional or legal powers of his office, or

(V) is an employee in the legislative branch or legislative body of that State, political subdivision, or agency and is not employed by the legislative library of such State, political subdivision, or agency.

(3) For purposes of subsection (u), such term does not include any individual employed by an employer engaged in agriculture if such individual is the parent, spouse, child, or other member of the employer's immediate family.

(4)(A) The term "employee" does not include any individual who volunteers to perform services for a public agency which is a State, a political subdivision of a State, or an interstate governmental agency, if—

(i) the individual receives no compensation or is paid expenses, reasonable benefits, or a nominal fee to perform the services for which the individual volunteered; and

(ii) such services are not the same type of services which the individual is employed to perform for such public agency.

(B) An employee of a public agency which is a State, political subdivision of a State, or an interstate governmental agency may volunteer to perform services for any other State, political subdivision, or interstate governmental agency, including a State, political subdivision or agency with which the employing State, political subdivision, or agency has a mutual aid agreement.

(5) The term "employee" does not include individuals who volunteer their services solely for humanitarian purposes to private non-profit food banks and who receive from the food banks groceries.

(f) "Agriculture" includes farming in all its branches and among other things includes the cultivation and tillage of the soil, dairying, the production, cultivation, growing, and harvesting of any agricultural or horticultural commodities (including commodities defined as agricultural commodities in section 15(g) of the Agricultural Marketing Act, as amended), the raising of livestock, bees, fur-bearing animals, or poultry, and any practices (including any forestry or lumbering operations) performed by a farmer or on a farm as an incident to or in conjunction with such farming operations, including preparation for market, delivery to storage or to market or to carriers for transportation to market.

(g) "Employ" includes to suffer or permit to work.

(h) "Industry" means a trade, business, industry, or other activity, or branch or group thereof, in which individuals are gainfully employed.

(i) "Goods" means goods (including ships and marine equipment), wares, products, commodities, merchandise, or articles or subjects of commerce of any character, or any part or ingredient thereof, but does not include goods after their delivery into the actual physical possession of the ultimate consumer thereof other than a producer, manufacturer, or processor thereof.

(j) "Produced" means produced, manufactured, mined, handled, or in any manner worked on in any State; and for the purposes of this Act an employee shall be deemed to have been engaged in the production of goods if such employee was employed in producing, manufacturing, mining, handling, transporting, or in any other manner working on such goods, or in any closely related process or occupation directly essential to the production thereof, in any State.

(k) "Sale" or "sell" includes any sale, exchange, contract to sell, consignment for sale, shipment for sale, or other disposition.

(l) "Oppressive child labor" means a condition of employment under which (1) any employee under the age of sixteen years is employed by an employer (other than a parent or a person standing in place of a parent employing his own child or a child in his custody under the age of sixteen years in an occupation other than manufacturing or mining or an occupation found by the Secretary of Labor to be particularly hazardous for the employment of children between the ages of sixteen and eighteen years or detrimental to their health or well-being) in any occupation, or (2) any employee between the ages of sixteen and eighteen years is employed by an employer in any occupation which the Secretary of Labor shall find and by order declare to be particularly hazardous for the employment of children between such ages or detrimental to their health or well-being; but oppressive child labor shall not be deemed to exist by virtue of the employment in any occupation of any person with respect to whom the employer shall have on file an unexpired certificate issued and held pursuant to regulations of the Secretary of Labor certifying that such person is above the oppressive child labor age. The Secretary of Labor shall provide by regulation or by order that the employment of employees between the ages of fourteen and sixteen years in occupations other than manufacturing and mining shall not be deemed to constitute oppressive child labor if and to the extent that the Secretary of Labor determines that such employment is confined to periods which will not interfere with their schooling and to conditions which will not interfere with their health and well-being.

(m)(1) "Wage" paid to any employee includes the reasonable cost, as determined by the Secretary of Labor, to the employer of furnishing such employee with board, lodging, or other facilities, if such board, lodging, or other facilities are customarily furnished by such employer to his employees: *Provided,* That the cost of board, lodging, or other facilities shall not be included as a part of the wage paid to any employee to the extent it is excluded therefrom under the terms of a bona fide collective-bargaining agreement applicable to the particular employee; *Provided further,* That the Secretary is authorized to determine the fair value of such board, lodging, or other facilities for defined classes of employees and in defined areas, based on average cost to the employer or to groups of employers similarly situated, or average value to groups of employees, or other appropriate measures of fair value. Such evaluations, where applicable and pertinent, shall be used in lieu of actual measure of cost in determining the wage paid to any employee.

(2)(A) In determining the wage an employer is required to pay a tipped employee, the amount paid such employee by the employee's employer shall be an amount equal to—

(i) the cash wage paid such employee which for purposes of such determination shall be not less than the cash wage required to be paid such an employee on the date of the enactment of this paragraph; and

(ii) an additional amount on account of the tips received by such employee which amount is equal to the difference between the wage specified in clause (i) and the wage in effect under section 6(a)(1).

The additional amount on account of tips may not exceed the value of the tips actually received by an employee. The preceding 2 sentences shall not apply with respect to any tipped employee unless such employee has been informed by the employer of the provisions of this subsection, and all tips received by such employee have been retained by the employee, except that this subsection shall not be construed to prohibit the pooling of tips among employees who customarily and regularly receive tips.

(B) An employer may not keep tips received by its employees for any purposes, including allowing managers or supervisors to keep any portion of employees' tips, regardless of whether or not the employer takes a tip credit.

(n) "Resale" shall not include the sale of goods to be used in residential or farm building construction, repair, or maintenance: *Provided,* That the sale is recognized as a bona fide retail sale in the industry.

(o) HOURS WORKED.—In determining for the purposes of sections 6 and 7 the hours for which an employee is employed, there shall be excluded any time spent in changing clothes or washing at the beginning or end of each workday which was excluded from measured working time during the week involved by the express terms of or by custom or practice under a bona fide collective-bargaining agreement applicable to the particular employee.

(p) "American vessel" includes any vessel which is documented or numbered under the laws of the United States.

(q) "Secretary" means the Secretary of Labor.

(r)(1) "Enterprise" means the related activities performed (either through unified operation or common control) by any person or persons for a common business purpose, and includes all such activities whether performed in one or more establishments or by one or more corporate or other organizational units including departments of an establishment operated through leasing arrangements, but shall not include the related activities performed for such enterprise by an independent contractor. Within the meaning of this subsection, a retail or service establishment which is under independent ownership shall not be deemed to be so operated or controlled as to be other than a separate and distinct enterprise by reason of any arrangement, which includes, but is not necessarily limited to, an agreement, (A) that it will sell, or sell only, certain goods specified by a particular manufacturer, distributor, or advertiser, or (B) that it will join with other such establishments in the same industry for the purpose of collective purchasing, or (C) that it will have the exclusive rights to sell the goods or use the brand name of a manufacturer, distributor, or advertiser within a specified area, or by reason of the fact that it occupies premises leased to it by a person who also leases premises to other retail or service establishments.

(2) For purposes of paragraph (1), the activities performed by any person or persons—

(A) in connection with the operation of a hospital, an institution primarily engaged in the care of the sick, the aged, the mentally ill or defective who reside on the premises of such institution, a school for mentally or physically handicapped or gifted children, a preschool, elementary or secondary school, or

an institution of higher education (regardless of whether or not such hospital, institution, or school is operated for profit or not for profit), or

(B) in connection with the operation of a street, suburban or interurban electric railway, or local trolley or motorbus carrier, if the rates and services of such railway or carrier are subject to regulation by a State or local agency (regardless of whether or not such railway or carrier is public or private or operated for profit or not for profit), or

(C) in connection with the activities of a public agency.

shall be deemed to be activities performed for a business purpose.

(s)(1) "Enterprise engaged in commerce or in the production of goods for commerce" means an enterprise that—

(A)(i) has employees engaged in commerce or in the production of goods for commerce, or that has employees handling, selling, or otherwise working on goods or materials that have been moved in or produced for commerce by any person; and

(ii) is an enterprise whose annual gross volume of sales made or business done is not less than $500,000 (exclusive of excise taxes at the retail level that are separately stated);

(B) is engaged in the operation of a hospital, an institution primarily engaged in the care of the sick, the aged, or the mentally ill or defective who reside on the premises of such institution, a school for mentally or physically handicapped or gifted children, a preschool, elementary or secondary school, or an institution of higher education (regardless of whether or not such hospital, institution, or school is public or private or operated for profit or not for profit); or

(C) is an activity of a public agency.

(2) Any establishment that has as its only regular employees the owner thereof or the parent, spouse, child, or other member of the immediate family of such owner shall not be considered to be an enterprise engaged in commerce or in the production of goods for commerce or a part of such an enterprise. The sales of such an establishment shall not be included for the purpose of determining the annual gross volume of sales of any enterprise for the purpose of this subsection.

(t) "Tipped employee" means any employee engaged in an occupation in which he customarily and regularly receives more than $30 a month in tips.

(u) "Man-day" means any day during which an employee performs any agricultural labor for not less than one hour.

(v) "Elementary school" means a day or residential school which provides elementary education, as determined under State law.

(w) "Secondary school" means a day or residential school which provides secondary education, as determined under State law.

(x) "Public agency" means the Government of the United States; the government of a State or political subdivision thereof; any agency of the United States (including the United States Postal Service and Postal Rate Commission), a State, or a political subdivision of a State; or any interstate governmental agency.

(y) "Employee in fire protection activities" means an employee, including a firefighter, paramedic, emergency medical technician,

rescue worker, ambulance personnel, or hazardous materials worker, who—

(1) is trained in fire suppression, has the legal authority and responsibility to engage in fire suppression, and is employed by a fire department of a municipality, county, fire district, or State; and

(2) is engaged in the prevention, control, and extinguishment of fires or response to emergency situations where life, property, or the environment is at risk.

[29 U.S.C. 203] Enacted June 25, 1938, ch. 676, sec. 3, 52 Stat. 1060; amended October 26, 1949, ch. 736, sec. 3, 63 Stat. 911; amended May 5, 1961, P.L. 87-30, sec. 2, 75 Stat. 65; amended September 23, 1966, P.L. 89-601, title I, secs. 101-103, title II, sec. 215(a), 80 Stat. 830-832, 837; amended June 23, 1972, P.L. 92-318, title IX, sec. 906(b)(2), (3), 86 Stat. 375; amended April 8, 1974, P.L. 93-259, secs. 6(a), (13(c), 88 Stat. 58, 64; amended November 1, 1977, P.L. 95-151, secs. 3(a), (b), 9(a)-(c), 91 Stat. 1249, 1251; amended November 13, 1985, P.L. 99-150, secs. 4(a), 5, 99 Stat. 790; amended November 17, 1989, P.L. 101-167, secs. 3 (a) and (d), 5, 103 Stat. 938-939, 941; amended August 20, 1996, P.L. 104-188, sec. 2105(b), 110 Stat. 1929; amended December 9, 1999, P.L. 106-151, sec. 1, 113 Stat 1731.

ADMINISTRATION

SEC. 4. (a) There is hereby created in the Department of Labor a Wage and Hour Division which shall be under the direction of an Administrator, to be known as the Administrator of the Wage and Hour Division (in this Act referred to as the "Administrator"). The Administrator shall be appointed by the President, by and with the advice and consent of the Senate, and shall receive compensation at the rate of $20,000 a year.

(b) The Secretary of Labor may, subject to the civil service laws, appoint such employees as he deems necessary to carry out his functions and duties under this Act and shall fix their compensation in accordance with the Classification Act of 1949, as amended. The Secretary may establish and utilize such regional, local, or other agencies, and utilize such voluntary and uncompensated services, as may from time to time be needed. Attorneys appointed under this section may appear for and represent the Secretary in any litigation, but all such litigation shall be subject to the direction and control of the Attorney General. In the appointment, selection, classification, and promotion of officers and employees of the Secretary, no political test or qualification shall be permitted or given consideration, but all such appointments and promotions shall be given and made on the basis of merit and efficiency.

(c) The principal office of the Secretary shall be in the District of Columbia, but he or his duly authorized representative may exercise any or all of his powers in any place.

(d)(1) The Secretary shall submit biennially in January a report to the Congress covering his activities for the preceding two years and including such information, data, and recommendations for further legislation in connection with the matters covered by this Act as he may find advisable. Such report shall contain an evaluation and appraisal by the Secretary of the minimum wages and overtime coverage established by this Act, together with his recommendations to the Congress. In making such evaluation and appraisal, the Secretary shall take into consideration any changes

which may have occurred in the cost of living and in productivity and the level of wages in manufacturing, the ability of employers to absorb wage increases, and such other factors as he may deem pertinent. Such report shall also include a summary of the special certificates issued under section 14(b).

(2) The Secretary shall conduct studies on the justification or lack thereof for each of the special exemptions set forth in section 13 of this Act, and the extent to which such exemptions apply to employees of establishments described in subsection (g) of such section and the economic effects of the application of such exemptions to such employees. The Secretary shall submit a report of his findings and recommendations to the Congress with respect to the studies conducted under this paragraph not later than January 1, 1976.

(3) The Secretary shall conduct a continuing study on means to prevent curtailment of employment opportunities for manpower groups which have had historically high incidences of unemployment (such as disadvantaged minorities, youth, elderly, and such other groups as the Secretary may designate). The first report of the results of such study shall be transmitted to the Congress not later than one year after the effective date of the Fair Labor Standards Amendments of 1974. Subsequent reports on such study shall be transmitted to the Congress at two-year intervals after such effective date. Each such report shall include suggestions respecting the Secretary's authority under section 14 of this Act.

(e) Whenever the Secretary has reason to believe that in any industry under this Act the competition of foreign producers in United States markets or in markets abroad, or both, has resulted, or is likely to result, in increased unemployment in the United States, he shall undertake an investigation to gain full information with respect to the matter. If he determines such increased unemployment has in fact resulted, or is in fact likely to result, from such competition, he shall make a full and complete report of his findings and determinations to the President and to the Congress: *Provided,* That he may also include in such report information on the increased employment resulting from additional exports in any industry under this Act as he may determine to be pertinent to such report.

(f) The Secretary is authorized to enter into an agreement with the Librarian of Congress with respect to individuals employed in the Library of Congress to provide for the carrying out of the Secretary's functions under this Act with respect to such individuals. Notwithstanding any other provision of this Act, or any other law, the Civil Service Commission is authorized to administer the provisions of this Act with respect to any individual employed by the United States (other than an individual employed in the Library of Congress, United States Postal Service, Postal Rate Commission, or the Tennessee Valley Authority). Nothing in this subsection shall be construed to affect the right of an employee to bring an action for unpaid minimum wages, or unpaid overtime compensation, and liquidated damages under section 16(b) of this Act.

[29 U.S.C. 204] Enacted June 25, 1938, ch. 676, sec. 4, 52 Stat. 1061; amended October 26, 1949, ch. 736, sec. 4, 63 Stat. 911; amended October 28, 1949, ch. 782, title XI, sec. 1106(a), 63 Stat. 972; amended August 12, 1955, ch. 867, sec. 2, 69

Stat. 711; amended May 5, 1961, P.L. 87–30, sec. 3, 75 Stat. 66; amended April 8, 1974, P.L. 93–259, secs. 6(b), 24(c), 27, 88 Stat. 60, 72, 73; amended December 21, 1995, P.L. 104–66, sec. 1102(a), 109 Stat. 722.

[SEC. 5. Repealed by section 8103(c)(1)(A) of Public Law 110–28. Paragraph (2) of section 8103(c) provides that the amendment "shall take effect 60 days after the date of enactment of this Act" (May 25, 2007).]

MINIMUM WAGES

SEC. 6. (a) Every employer shall pay to each of his employees who in any workweek is engaged in commerce or in the production of goods for commerce, or is employed in an enterprise engaged in commerce or in the production of goods for commerce, wages at the following rates:

(1)[1] except as otherwise provided in this section, not less than—

(A) $5.85 an hour, beginning on the 60th day after the date of enactment of the Fair Minimum Wage Act of 2007;

(B) $6.55 an hour, beginning 12 months after that 60th day; and

(C) $7.25 an hour, beginning 24 months after that 60th day;

(2) if such employee is a home worker in Puerto Rico or the Virgin Islands, not less than the minimum piece rate prescribed by regulation or order; or, if no such minimum piece rate is in effect, any piece rate adopted by such employer which shall yield, to the proportion or class of employees prescribed by regulation or order, not less than the applicable minimum hourly wage rate. Such minimum piece rates or employer piece rates shall be commensurate with, and shall be paid in lieu of, the minimum hourly wage rate applicable under the provisions of this section. The Secretary of Labor, or his authorized representative, shall have power to make such regulations or orders as are necessary or appropriate to carry out any of the provisions of this paragraph, including the power without limiting the generality of the foregoing, to define any operation or occupation which is performed by such home work employees in Puerto Rico or the Virgin Islands; to establish minimum piece rates for any operation or occupation so defined; to prescribe the method and procedure for ascertaining and promulgating minimum piece rates; to prescribe standards for employer piece rates, including the proportion or class of employees who shall receive not less than the minimum hourly wage rate; to define the term "home worker"; and to prescribe the conditions under which employers, agents, contractors, and subcontractors shall cause goods to be produced by home workers;

[1] Paragraph (1) of section 6(a) (shown above) was amended to read by section 8102(a) of Public Law 110–28. Subsection (b) of such section provides that the amendment "shall take effect 60 days after the date of enactment of this Act"[May 25, 2007].

(3)[2] if such employee is employed as a seaman on an American vessel, not less than the rate which will provide to the employee, for the period covered by the wage payment, wages equal to compensation at the hourly rate prescribed by paragraph (1) of this subsection for all hours during such period when he was actually on duty (including periods aboard ship when the employee was on watch or was, at the direction of a superior officer, performing work or standing by, but not including off-duty periods which are provided pursuant to the employment agreement); or

(4) if such employee is employed in agriculture, not less than the minimum wage rate in effect under paragraph (1) after December 31, 1977.

(b) Every employer shall pay to each of his employees (other than an employee to whom subsection (a)(5) applies) who in any workweek is engaged in commerce or in the production of goods for commerce, or is employed in an enterprise engaged in commerce or in the production of goods for commerce, and who in such workweek is brought within the purview of this section by the amendments made to this Act by the Fair Labor Standards Amendments of 1966, title IX of the Education Amendments of 1972, or the Fair Labor Standards Amendments of 1974, wages at the following rate: Effective after December 31, 1977, not less than the minimum wage rate in effect under subsection (a)(1).

(c) [Repealed by Public Law 104–186.]

(d)[3](1) No employer having employees subject to any provisions of this section shall discriminate, within any establishment in which such employees are employed, between employees on the basis of sex by paying wages to employees in such establishment at a rate less than the rate at which he pays wages to employees of the opposite sex in such establishment for equal work on jobs the performance of which requires equal skill, effort, and responsibility, and which are performed under similar working conditions, except where such payment is made pursuant to (i) a seniority system; (ii) a merit system; (iii) a system which measures earnings by quantity or quality or production; or (iv) a differential based on any other factor other than sex: *Provided,* That an employer who is paying a wage rate differential in violation of this subsection shall not, in order to comply with the provisions of this subsection, reduce the wage rate of any employee.

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[2] Paragraph (3) of section 6(a) was repealed and paragraphs (4) and (5) were redesignated as (3) and (4), respectively pursuant to the amendment made by section 8103(c)(1)(B) of Public Law 110–28. Paragraph (2) of section 8103(c) provides that the amendments "shall take effect 60 days after the date of enactment of this Act" [May 25, 2007].

[3] Section (d) was enacted by section 3 of the Equal Pay Act of 1963 (P.L. 88–38). Section 2 of that Act provided:

SEC. 2. (a) The Congress hereby finds that the existence in industries engaged in commerce or in the production of goods for commerce of wage differentials based on sex—

(1) depresses wages and living standards for employees necessary for their health and efficiency;

(2) prevents the maximum utilization of the available labor resources;

(3) tends to cause labor disputes, thereby burdening, affecting, and obstructing commerce;

(4) burdens commerce and the free flow of goods in commerce; and

(5) constitutes an unfair method of competition.

(b) It is hereby declared to be the policy of this Act, through exercise by Congress of its power to regulate commerce among the several States and with foreign nations, to correct the conditions above referred to in such industries.

(2) No labor organization, or its agents, representing employees of an employer having employees subject to any provisions of this section shall cause or attempt to cause such an employer to discriminate against an employee in violation of paragraph (1) of this subsection.

(3) For purposes of administration and enforcement, any amounts owing to any employees which have been withheld in violation of this subsection shall be deemed to be unpaid minimum wages or unpaid overtime-compensation under this Act.

(4) As used in this subsection, the term "labor organization" means any organization of any kind, or any agency or employee representation committee or plan, in which employees participate and which exists for the purpose, in whole or in part, of dealing with employers concerning grievances, labor disputes, wages, rates of pay, hours of employment, or conditions of work.

(e)(1) Notwithstanding the provisions of section 13 of this Act (except subsections (a)(1) and (f) thereof), every employer providing any contract services (other than linen supply services) under a contract with the United States or any subcontract thereunder shall pay to each of his employees whose rate of pay is not governed by the Service Contract Act of 1965 (41 U.S.C. 351–357) or to whom subsection (a)(1) of this section is not applicable, wages at rates not less than the rates provided for in subsection (b) of this section.

(2) Notwithstanding the provisions of section 13 of this Act (except subsections (a)(1) and (f) thereof) and the provisions of the Service Contract Act of 1965, every employer in an establishment providing linen supply services to the United States under a contract with the United States or any subcontract thereunder shall pay to each of his employees in such establishment wages at rates not less than those prescribed in subsection (b), except that if more than 50 per centum of the gross annual dollar volume of sales made or business done by such establishment is derived from providing such linen supply services under any such contracts or subcontracts, such employer shall pay to each of his employees in such establishment wages at rates not less than those prescribed in subsection (a)(1) of this section.

(f) Any employee—

(1) who in any workweek is employed in domestic service in a household shall be paid wages at a rate not less than the wage rate in effect under section 6(b) unless such employee's compensation for such service would not because of section 209(a)(6) of the Social Security Act constitute wages for the purpose of title II of such Act, or

(2) who in any workweek—

(A) is employed in domestic service in one or more households, and

(B) is so employed for more than 8 hours in the aggregate,

shall be paid wages for such employment in such workweek at a rate not less than the wage rate in effect under section 6(b).

(g)(1) In lieu of the rate prescribed by subsection (a)(1), any employer may pay any employee of such employer, during the first 90 consecutive calendar days after such employee is initially em-

ployed by such employer, a wage which is not less than $4.25 an hour.

(2) In lieu of the rate prescribed by subsection (a)(1), the Governor of Puerto Rico, subject to the approval of the Financial Oversight and Management Board established pursuant to section 101 of the Puerto Rico Oversight, Management, and Economic Stability Act, may designate a time period not to exceed four years during which employers in Puerto Rico may pay employees who are initially employed after the date of enactment of such Act a wage which is not less than the wage described in paragraph (1). Notwithstanding the time period designated, such wage shall not continue in effect after such Board terminates in accordance with section 209 of such Act.

(3) No employer may take any action to displace employees (including partial displacements such as reduction in hours, wages, or employment benefits) for purposes of hiring individuals at the wage authorized in paragraph (1) or (2).

(4) Any employer who violates this subsection shall be considered to have violated section 15(a)(3) (29 U.S.C. 215(a)(3)).

(5) This subsection shall only apply to an employee who has not attained the age of 20 years, except in the case of the wage applicable in Puerto Rico, 25 years, until such time as the Board described in paragraph (2) terminates in accordance with section 209 of the Act described in such paragraph.

[29 U.S.C. 206] Enacted June 25, 1938, ch. 676, sec. 6, 52 Stat. 1062; amended June 26, 1940, ch. 432, sec. 3 (e), (f), 54 Stat. 616; amended October 26, 1949, ch. 736, sec. 6, 63 Stat. 912; amended August 12, 1955, ch. 867, sec. 3, 69 Stat. 711; amended August 8, 1956, ch. 1035, sec. 2, 70 Stat. 1118; amended May 5, 1961, P.L. 87-30, sec. 5, 75 Stat. 67; amended June 10, 1963, P.L. 88-38, sec. 3, 77 Stat. 56; amended September 23, 1966, P.L. 89-601, title III, secs. 301-305, 80 Stat. 838, 839, 841; amended April 8, 1974, P.L. 93-259, secs. 2-4, 5(b), 7(b)(1), 88 Stat. 55, 56, 62; amended November 1, 1977, P.L. 95-151, sec. 2(a)-(d)(2), 91 Stat. 1245, 1246; amended November 17, 1989, P.L. 101-157, secs. 2, 4(b), 103 Stat. 938, 940; amended December 19, 1989, P.L. 101-239, sec. 10208(d)(2)(B)(i), 103 Stat. 2481; amended August 20, 1996, P.L. 104-188, secs. 2104(b) and 2105(c), 110 Stat. 1928 and 1929

MAXIMUM HOURS

SEC. 7. (a)(1) Except as otherwise provided in this section, no employer shall employ any of his employees who in any workweek is engaged in commerce or in the production of goods for commerce, or is employed in an enterprise engaged in commerce or in the production of goods for commerce, for a workweek longer than forty hours unless such employee receives compensation for his employment in excess of the hours above specified at a rate not less than one and one-half times the regular rate at which he is employed.

(2) No employer shall employ any of his employees who in any workweek is engaged in commerce or in the production of goods for commerce, or is employed in an enterprise engaged in commerce or in the production of goods for commerce, and who in such workweek is brought within the purview of this subsection by the amendments made to this Act by the Fair Labor Standards Amendments of 1966—

(A) for a workweek longer than forty-four hours during the first year from the effective date of the Fair Labor Standards Amendments of 1966,

(B) for a workweek longer than forty-two hours during the second year from such date, or

(C) for a workweek longer than forty hours after the expiration of the second year from such date,

unless such employee receives compensation for his employment in excess of the hours above specified at a rate not less than one and one-half times the regular rate at which he is employed.

(b) No employer shall be deemed to have violated subsection (a) by employing any employee for a workweek in excess of that specified in such subsection without paying the compensation for overtime employment prescribed therein if such employee is so employed—

(1) in pursuance of an agreement, made as a result of collective bargaining by representatives of employees certified as bona fide by the National Labor Relations Board, which provides that no employee shall be employed more than one thousand and forty hours during any period of twenty-six consecutive weeks, or

(2) in pursuance of an agreement, made as a result of collective bargaining by representatives of employees certified as bona fide by the National Labor Relations Board which provides that during a specified period of fifty-two consecutive weeks the employee shall be employed not more than two thousand two hundred and forty hours and shall be guaranteed not less than one thousand eight hundred and forty hours (or not less than forty-six weeks at the normal number of hours worked per week, but not less than thirty hours per week) and not more than two thousand and eighty hours of employment for which he shall receive compensation for all hours guaranteed or worked at rates not less than those applicable under the agreement to the work performed and for all hours in excess of the guaranty which are also in excess of the maximum workweek applicable to such employee under subsection (a) or two thousand and eighty in such period at rates not less than one and one-half times the regular rate at which he is employed; or

(3) by an independently owned and controlled local enterprise (including an enterprise with more than one bulk storage establishment) engaged in the wholesale or bulk distribution of petroleum products if—

(A) the annual gross volume of sales of such enterprise is less than $1,000,000 exclusive of excise taxes.

(B) more than 75 per centum of such enterprise's annual dollar volume of sales is made within the State in which such enterprise is located, and

(C) not more than 25 per centum of the annual dollar volume of sales of such enterprise is to customers who are engaged in the bulk distribution of such products for resale;

and if such employee receives compensation for employment in excess of twelve hours in any workday, or for employment in excess

of fifty-six hours in any workweek, as the case may be, at a rate not less than one and one-half times the regular rate at which he is employed.

[Subsections (c) and (d) repealed effective Dec. 31, 1976.]

(e) As used in this section the "regular rate" at which an employee is employed shall be deemed to include all remuneration for employment paid to, or on behalf of, the employee, but shall not be deemed to include—

(1) sums paid as gifts; payments in the nature of gifts made at Christmas time or on other special occasions, as a reward for service, the amounts of which are not measured by or dependent on hours worked, production, or efficiency;

(2) payments made for occasional periods when no work is performed due to vacation, holiday, illness, failure of the employer to provide sufficient work or other similar cause; reasonable payments for traveling expenses, or other expenses, incurred by an employee in the furtherance of his employer's interests and properly reimburseable by the employer; and other similar payments to any employee which are not made as compensation for his hours of employment;

(3) sums paid in recognition of services performed during a given period if either, (a) both the fact that payment is to be made and the amount of the payment are determined at the sole discretion of the employer at or near the end of the period and not pursuant to any prior contract, agreement, or promise causing the employee to expect such payments regularly; or (b) the payments are made pursuant to a bona fide profit-sharing plan or trust or bona fide thrift or savings plan, meeting the requirements of the Secretary of Labor set forth in appropriate regulations which he shall issue, having due regard among other relevant facts, to the extent to which the amounts paid to the employee are determined without regard to hours of work, production, or efficiency; or (c) the payments are talent fees (as such talent fees are defined and delimited by regulations of the Secretary) paid to performers, including announcers, on radio and television programs;

(4) contributions irrevocably made by an employer to a trustee or third person pursuant to a bona fide plan for providing old-age retirement, life, accident, or health insurance or similar benefits for employees;

(5) extra compensation provided by a premium rate paid for certain hours worked by the employee in any day or workweek because such hours are hours worked in excess of eight in a day or in excess of the maximum workweek applicable to such employee under subsection (a) or in excess of the employee's normal working hours or regular working hours, as the case may be;

(6) extra compensation provided by a premium rate paid for work by the employee on Saturdays, Sundays, holidays, or regular days of rest, or on the sixth or seventh day of the workweek, where such premium rate is not less than one and one-half times the rate established in good faith for like work performed in nonovertime hours on other days;

(7) extra compensation provided by a premium rate paid to the employee, in pursuance of an applicable employment contract or collective-bargaining agreement, for work outside of the hours established in good faith by the contract or agreement as the basic, normal, or regular workday (not exceeding eight hours) or workweek (not exceeding the maximum workweek applicable to such employee under subsection (a)), where such premium rate is not less than one and one-half times the rate established in good faith by the contract or agreement for like work performed during such workday or workweek; or

(8) any value or income derived from employer-provided grants or rights provided pursuant to a stock option, stock appreciation right, or bona fide employee stock purchase program which is not otherwise excludable under any of paragraphs (1) through (7) if—

(A) grants are made pursuant to a program, the terms and conditions of which are communicated to participating employees either at the beginning of the employee's participation in the program or at the time of the grant;

(B) in the case of stock options and stock appreciation rights, the grant or right cannot be exercisable for a period of at least 6 months after the time of grant (except that grants or rights may become exercisable because of an employee's death, disability, retirement, or a change in corporate ownership, or other circumstances permitted by regulation), and the exercise price is at least 85 percent of the fair market value of the stock at the time of grant;

(C) exercise of any grant or right is voluntary; and

(D) any determinations regarding the award of, and the amount of, employer-provided grants or rights that are based on performance are—

(i) made based upon meeting previously established performance criteria (which may include hours of work, efficiency, or productivity) of any business unit consisting of at least 10 employees or of a facility, except that, any determinations may be based on length of service or minimum schedule of hours or days of work; or

(ii) made based upon the past performance (which may include any criteria) of one or more employees in a given period so long as the determination is in the sole discretion of the employer and not pursuant to any prior contract.

(f) No employer shall be deemed to have violated subsection (a) by employing any employee for a workweek in excess of the maximum workweek applicable to such employee under subsection (a) if such employee is employed pursuant to a bona fide individual contract, or pursuant to an agreement made as a result of collective bargaining by representatives of employees, if the duties of such employee necessitate irregular hours of work, and the contract or agreement (1) specifies a regular rate of pay of not less than the minimum hourly rate provided in subsection (a) or (b) of section 6 (whichever may be applicable) and compensation at not less than one and one-half times such rate for all hours worked in excess of

such maximum workweek, and (2) provides a weekly guaranty of pay for not more than sixty hours based on the rates so specified.

(g) No employer shall be deemed to have violated subsection (a) by employing any employee for a workweek in excess of the maximum workweek applicable to such employee under such subsection if, pursuant to an agreement or understanding arrived at between the employer and the employee before performance of the work, the amount paid to the employee for the number of hours worked by him in such workweek in excess of the maximum workweek applicable to such employee under such subsection—

(1) in the case of an employee employed at piece rates, is computed at piece rates not less than one and one-half times the bona fide piece rates applicable to the same work when performed during nonovertime hours; or

(2) in the case of an employee performing two or more kinds of work for which different hourly or piece rates have been established, is computed at rates not less than one and one-half times such bona fide rates applicable to the same work when performed during nonovertime hours; or

(3) is computed at a rate not less than one and one-half times the rate established by such agreement or understanding as the basic rate to be used in computing overtime compensation thereunder: *Provided,* That the rate so established shall be authorized by regulation by the Secretary of Labor as being substantially equivalent to the average hourly earnings of the employee, exclusive of overtime premiums, in the particular work over a representative period of time;

and if (i) the employee's average hourly earnings for the workweek exclusive of payments described in paragraphs (1) through (7) of subsection (e) are not less than the minimum hourly rate required by applicable law, and (ii) extra overtime compensation is properly computed and paid on other forms of additional pay required to be included in computing the regular rate.

(h)(1) Except as provided in paragraph (2), sums excluded from the regular rate pursuant to subsection (e) shall not be creditable toward wages required under section 6 or overtime compensation required under this section.

(2) Extra compensation paid as described in paragraphs (5), (6), and (7) of subsection (e) shall be creditable toward overtime compensation payable pursuant to this section.

(i) No employer shall be deemed to have violated subsection (a) by employing any employee of a retail or service establishment for a workweek in excess of the applicable workweek specified therein, if (1) the regular rate of pay of such employee is in excess of one and one-half times the minimum hourly rate applicable to him under section 6, and (2) more than half his compensation for a representative period (not less than one month) represents commissions on goods or services. In determining the proportion of compensation representing commissions, all earnings resulting from the application of a bona fide commission rate shall be deemed commissions on goods or services without regard to whether the computed commissions exceed the draw or guarantee.

(j) No employer engaged in the operation of a hospital or an establishment which is an institution primarily engaged in the care

of the sick, the aged, or the mentally ill or defective who reside on the premises shall be deemed to have violated subsection (a) if, pursuant to an agreement or understanding arrived at between the employer and the employee before performance of the work, a work period of fourteen consecutive days is accepted in lieu of the workweek of seven consecutive days for purposes of overtime computation and if, for his employment in excess of eight hours in any workday and in excess of eighty hours in such fourteen-day period, the employee receives compensation at a rate of not less than one and one-half times the regular rate at which he is employed.

(k) No public agency shall be deemed to have violated subsection (a) with respect to the employment of any employee in fire protection activities or any employee in law enforcement activities (including security personnel in correctional institutions) if—

(1) in a work period of 28 consecutive days the employee receives for tours of duty which in the aggregate exceed the lesser of (A) 216 hours, or (B) the average number of hours (as determined by the Secretary pursuant to section 6(c)(3) of the Fair Labor Standards Amendments of 1974) in tours of duty of employees engaged in such activities in work periods of 28 consecutive days in calendar year 1975; or

(2) in the case of such employee to whom a work period of at least 7 but less than 28 days applies, in his work period the employee receives for tours of duty which in the aggregate exceed a number of hours which bears the same ratio to the number of consecutive days in his work period as 216 hours (or if lower, the number of hours referred to in clause (B) of paragraph (1)) bears to 28 days;

compensation at a rate not less than one and one-half times the regular rate at which he is employed.

(l) No employer shall employ any employee in domestic service in one or more households for a workweek longer than forty hours unless such employee receives compensation for such employment in accordance with subsection (a).

(m) For a period or periods of not more than fourteen workweeks in the aggregate in any calendar year, any employer may employ any employee for a workweek in excess of that specified in subsection (a) without paying the compensation for overtime employment prescribed in such subsection, if such employee—

(1) is employed by such employer—

(A) to provide services (including stripping and grading) necessary and incidental to the sale at auction of green leaf tobacco of type 11, 12, 13, 14, 21, 22, 23, 24, 31, 35, 36, or 37 (as such types are defined by the Secretary of Agriculture), or in auction sale, buying, handling, stemming, redrying, packing, and storing of such tobacco,

(B) in auction sale, buying, handling, sorting, grading, packing, or storing green leaf tobacco of type 32 (as such type is defined by the Secretary of Agriculture), or

(C) in auction sale, buying, handling, stripping, sorting, grading, sizing, packing, or stemming prior to packing, of perishable cigar leaf tobacco of type 41, 42, 43, 44, 45, 46, 51, 52, 53, 54, 55, 61, or 62 (as such types are defined by the Secretary of Agriculture); and

(2) receives for—

(A) such employment by such employer which is in excess of ten hours in any workday, and

(B) such employment by such employer which is in excess of forty-eight hours in any workweek,

compensation at a rate not less than one and one-half times the regular rate at which he is employed.

An employer who receives an exemption under this subsection shall not be eligible for any other exemption under this section.

(n) In the case of an employee of an employer engaged in the business of operating a street, suburban or interurban electric railway or local trolley or motorbus carrier (regardless of whether or not such railway or carrier is public or private or operated for profit or not for profit), in determining the hours of employment of such an employee to which the rate prescribed by subsection (a) applies there shall be excluded the hours such employee was employed in charter activities by such employer if (1) the employee's employment in such activities was pursuant to an agreement or understanding with his employer arrived at before engaging in such employment, and (2) if employment in such activities is not part of such employee's regular employment.

(o)(1) Employees of a public agency which is a State, a political subdivision of a State, or an interstate governmental agency may receive, in accordance with this subsection and in lieu of overtime compensation, compensatory time off at a rate not less than one and one-half hours for each hour of employment for which overtime compensation is required by this section.

(2) A public agency may provide compensatory time under paragraph (1) only—

(A) pursuant to—

(i) applicable provisions of a collective bargaining agreement, memorandum of understanding, or any other agreement between the public agency and representatives of such employees; or

(ii) in the case of employees not covered by subclause (i), an agreement or understanding arrived at between the employer and employee before the performance of the work; and

(B) if the employee has not accrued compensatory time in excess of the limit applicable to the employee prescribed by paragraph (3).

In the case of employees described in clause (A)(ii) hired prior to April 15, 1986, the regular practice in effect on April 15, 1986, with respect to compensatory time off for such employees in lieu of the receipt of overtime compensation, shall constitute an agreement or understanding under such clause (A)(ii). Except as provided in the previous sentence, the provision of compensatory time off to such employees for hours worked after April 14, 1986, shall be in accordance with this subsection.

(3)(A) If the work of an employee for which compensatory time may be provided included work in a public safety activity, an emergency response activity, or a seasonal activity, the employee engaged in such work may accrue not more than 480 hours of compensatory time for hours worked after April 15, 1986. If such work

was any other work, the employee engaged in such work may accrue not more than 240 hours of compensatory time for hours worked after April 15, 1986. Any such employee who, after April 15, 1986, has accrued 480 or 240 hours, as the case may be, of compensatory time off shall, for additional overtime hours of work, be paid overtime compensation.

(B) If compensation is paid to an employee for accrued compensatory time off, such compensation shall be paid at the regular rate earned by the employee at the time the employee receives such payment.

(4) An employee who has accrued compensatory time off authorized to be provided under paragraph (1) shall, upon termination of employment, be paid for the unused compensatory time at a rate of compensation not less than—

(A) the average regular rate received by such employee during the last 3 years of the employee's employment, or

(B) the final regular rate received by such employee,

whichever is higher

(5) An employee of a public agency which is a State, political subdivision of a State, or an interstate governmental agency—

(A) who has accrued compensatory time off authorized to be provided under paragraph (1), and

(B) who has requested the use of such compensatory time, shall be permitted by the employee's employer to use such time within a reasonable period after making the request if the use of the compensatory time does not unduly disrupt the operations of the public agency.

(6) The hours an employee of a public agency performs court reporting transcript preparation duties shall not be considered as hours worked for the purposes of subsection (a) if—

(A) such employee is paid at a per-page rate which is not less than—

(i) the maximum rate established by State law or local ordinance for the jurisdiction of such public agency,

(ii) the maximum rate otherwise established by a judicial or administrative officer and in effect on July 1, 1995, or

(iii) the rate freely negotiated between the employee and the party requesting the transcript, other than the judge who presided over the proceedings being transcribed, and

(B) the hours spent performing such duties are outside of the hours such employee performs other work (including hours for which the agency requires the employee's attendance) pursuant to the employment relationship with such public agency.

For purposes of this section, the amount paid such employee in accordance with subparagraph (A) for the performance of court reporting transcript preparation duties, shall not be considered in the calculation of the regular rate at which such employee is employed.

(7) For purposes of this subsection—

(A) the term "overtime compensation" means the compensation required by subsection (a), and

(B) the terms "compensatory time" and "compensatory time off" mean hours during which an employee is not work-

ing, which are not counted as hours worked during the applicable workweek or other work period for purposes of overtime compensation, and for which the employee is compensated at the employee's regular rate.

(p)(1) If an individual who is employed by a State, political subdivision of a State, or an interstate governmental agency in fire protection or law enforcement activities (including activities of security personnel in correctional institutions) and who, solely at such individual's option, agrees to be employed on a special detail by a separate or independent employer in fire protection, law enforcement, or related activities, the hours such individual was employed by such separate and independent employer shall be excluded by the public agency employing such individual in the calculation of the hours for which the employee is entitled to overtime compensation under this section if the public agency—

(A) requires that its employees engaged in fire protection, law enforcement, or security activities be hired by a separate and independent employer to perform the special detail,

(B) facilitates the employment of such employees by a separate and independent employer, or

(C) otherwise affects the condition of employment of such employees by a separate and independent employer.

(2) If an employee of a public agency which is a State, political subdivision of a State, or an interstate governmental agency undertakes, on an occasional or sporadic basis and solely at the employee's option, part-time employment for the public agency which is in a different capacity from any capacity in which the employee is regularly employed with the public agency, the hours such employee was employed in performing the different employment shall be excluded by the public agency in the calculation of the hours for which the employee is entitled to overtime compensation under this section.

(3) If an individual who is employed in any capacity by a public agency which is a State, political subdivision of a State, or an interstate governmental agency, agrees, with the approval of the public agency and solely at the option of such individual, to substitute during scheduled work hours for another individual who is employed by such agency in the same capacity, the hours such employee worked as a substitute shall be excluded by the public agency in the calculation of the hours for which the employee is entitled to overtime compensation under this section.

(q) Any employer may employ any employee for a period or periods of not more than 10 hours in the aggregate in any workweek in excess of the maximum workweek specified in subsection (a) without paying the compensation for overtime employment prescribed in such subsection, if during such period or periods the employee is receiving remedial education that is—

(1) provided to employees who lack a high school diploma or educational attainment at the eighth grade level;

(2) designed to provide reading and other basic skills at an eighth grade level or below; and

(3) does not include job specific training.

[Note: Section 108(a) of division H of Public Law 114–113 provides: [s]ection 7 of the Fair Labor Standards Act of 1938 (29 U.S.C. 207) shall be applied as if the following text is part of such section:]

[(s)[4](1) The provisions of this section shall not apply for a period of 2 years after the occurrence of a major disaster to any employee—

(A) employed to adjust or evaluate claims resulting from or relating to such major disaster, by an employer not engaged, directly or through an affiliate, in underwriting, selling, or marketing property, casualty, or liability insurance policies or contracts;

(B) who receives from such employer on average weekly compensation of not less than $591.00 per week or any minimum weekly amount established by the Secretary, whichever is greater, for the number of weeks such employee is engaged in any of the activities described in subparagraph (C); and

(C) whose duties include any of the following:

(i) interviewing insured individuals, individuals who suffered injuries or other damages or losses arising from or relating to a disaster, witnesses, or physicians;

(ii) inspecting property damage or reviewing factual information to prepare damage estimates;

(iii) evaluating and making recommendations regarding coverage or compensability of claims or determining liability or value aspects of claims;

(iv) negotiating settlements; or

(v) making recommendations regarding litigation.

(2) The exemption in this subsection shall not affect the exemption provided by section 13(a)(1).

(3) For purposes of this subsection—

(A) the term "major disaster" means any disaster or catastrophe declared or designated by any State or Federal agency or department;

(B) the term "employee employed to adjust or evaluate claims resulting from or relating to such major disaster" means an individual who timely secured or secures a license required by applicable law to engage in and perform the activities described in clauses (i) through (v) of paragraph (1)(C) relating to a major disaster, and is employed by an employer that maintains worker compensation insurance coverage or protection for its employees, if required by applicable law, and withholds applicable Federal, State, and local income and payroll taxes from the wages, salaries and any benefits of such employees; and

(C) the term "affiliate" means a company that, by reason of ownership or control of 25 percent or more of the outstanding shares of any class of voting securities of one or more companies, directly or indirectly, controls, is controlled by, or is under common control with, another company.]

[4] Section 108(a) of division H of Public Law 115–31 also provides for a shall be applied instruction and what appears to be an identical subsection (s), which is not shown here. Section 109(a) of division H of Public Law 115–141 also provides for a shall be applied instruction and what appears to be an identical subsection (s), which is not shown here.

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[29 U.S.C. 207] Enacted June 25, 1938, ch. 676, sec. 7, 52 Stat. 1063; amended October 29, 1941, ch. 461, sec. 1, 55 Stat. 756; amended July 20, 1949, ch. 352, sec. 1, 63 Stat. 446; amended October 26, 1949, ch. 736, sec. 7, 63 Stat. 912; amended May 5, 1961, P.L. 87–30, sec. 6, 75 Stat. 69; amended September 23, 1966, P.L. 89–601, title II, secs. 204(c), (d), 212(b), title IV, secs. 401–403, 80 Stat. 835, 837, 841, 842; amended April 8, 1974, P.L. 93–259, secs. 6(c)(1), 7(b)(2), 9(a), 12(b), 19, 21(a), 88 Stat. 60, 62, 64, 66, 68; amended November 13, 1985, P.L. 99–150, secs. 2(a), 3(a), (b), and (c)(1), 99 Stat. 787, 789; amended November 17, 1989, P.L. 101–157, sec. 7, 103 Stat. 944; amended September 6, 1995, P.L. 104–26, sec. 2, 109 Stat. 264; amended March 23, 2010, P.L. 111–148, sec. 4207, 124 Stat. 577.

[SEC. 8. Repealed by section 8103(c)(1)(A) of Public Law 110–28. Paragraph (2) of such section 8103(c) provides that the amendment made "shall take effect 60 days after the date of enactment of this Act" (May 25, 2007).]

ATTENDANCE OF WITNESSES

SEC. 9. For the purpose of any hearing or investigation provided for in this Act, the provisions of sections 9 and 10 (relating the attendance of witnesses and the production of books, papers, and documents) of the Federal Trade Commission Act of September 16, 1914, as amended (U.S.C. 1934 edition, title 15, secs. 40 and 50), are hereby made applicable to the jurisdiction, powers, and duties of the Secretary of Labor and the industry committees.

[29 U.S.C. 209] Enacted June 25, 1938, ch. 676, sec. 9, 52 Stat. 1065.

COURT REVIEW

SEC. 10. (a) Any person aggrieved by an order of the Secretary issued under section 8 may obtain a review of such order in the United States Court of Appeals for any circuit wherein such person resides or has his principal place of business, or in the United States Court of Appeals for the District of Columbia, by filing in such court, within 60 days after the entry of such order a written petition praying that the order of the Secretary be modified or set aside in whole or in part. A copy of such petition shall forthwith be transmitted by the clerk of the court to the Secretary, and thereupon the Secretary shall file in the court of the record of the industry committee upon which the order complained of was entered, as provided in section 2112 of title 28, United States Code. Upon the filing of such petition such court shall have exclusive jurisdiction to affirm, modify (including provision for the payment of an appropriate minimum wage rate), or set aside such order in whole or in part so far as it is applicable to the petitioner. The review by the court shall be limited to questions of law, and findings of fact by such industry committee when supported by substantial evidence shall be conclusive. No objection to the order of the Secretary shall be considered by the court unless such objective shall have been urged before such industry committee or unless there were reasonable grounds for failure so to do. If application is make to the court for leave to adduce additional evidence, and it is shown to the satifaction of the court that such additional evidence may materially affect the result of the proceeding and that there were reasonable grounds for failure to adduce such evidence in the proceedings before such industry committee, the court may order such additional evidence to be taken before an industry committee and to be adduced upon the hearing in such manner and upon such terms

and conditions as to the court may seem proper. Such industry committee may modify the initial findings by reason of the additional evidence so taken, and shall file with the court such modified or new findings which if supported by substantial evidence shall be conclusive, and shall also file its recommendation, if any, for the modification or setting aside of the original order. The judgment and decree of the court shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in section 1254 of title 28 of the United States Code.

(b) The commencement of proceedings under subsection (a) shall not, unless specifically ordered by the court, operate as a stay of the Secretary's order. The Court shall not grant any stay of the order unless the person complaining of such order shall file in court an undertaking with a surety or sureties satisfactory to the court of the payment to the employees affected by the order, in the event such order is affirmed, of the amount by which the compensation such employees are entitled to receive under the order exceeds the compensation they actually receive while such stay is in effect.

[29 U.S.C. 210] Enacted June 25, 1938, ch. 676, sec. 10, 52 Stat. 1065; amended August 12, 1955, ch. 867, sec. 5(f), 69 Stat. 712; amended August 28, 1958, P.L. 85-791, sec. 22, 72 Stat. 948; amended April 8, 1974, P.L. 93-259, sec. 5(c)(2), 88 Stat. 58.

INVESTIGATIONS, INSPECTIONS, RECORDS, AND HOMEWORK REGULATIONS

SEC. 11. (a) The Secretary of Labor or his designated representatives may investigate and gather data regarding the wages, hours, and other conditions and practices of employment in any industry subject to this Act, and may enter and inspect such places and such records (and make such transcriptions thereof), question such employees, and investigate such facts, conditions, practices, or matters as he may deem necessary or appropriate to determine whether any person has violated any provision of this Act, or which may aid in the enforcement of the provisions of this Act. Except as provided in section 12 and in subsection (b) of this section, the Secretary shall utilize the bureaus and divisions of the Department of Labor for all the investigations and inspections necessary under this section. Except as provided in section 12, the Secretary shall bring all actions under section 17 to restrain violations of this Act.

(b) With the consent and cooperation of State agencies charged with the administration of State labor laws, the Secretary of Labor may, for the purpose of carrying out his functions and duties under this Act, utilize the services of State and local agencies and their employees and, notwithstanding any other provision of law, may reimburse such State and local agencies and their employees for services rendered for such purposes.

(c) Every employer subject to any provision of this Act or of any order issued under this Act shall make, keep, and preserve such records of the persons employed by him and of the wages, hours, and other conditions and practices of employment maintained by him, and shall preserve such records for such period of time, and shall make such reports therefrom to the Secretary as he shall prescribe by regulation or order as necessary or appropriate for the enforcement of the provisions of this Act or the regulations

or orders thereunder. The employer of an employee who performs substitute work described in section 7(p)(3) may not be required under this subsection to keep a record of the hours of the substitute work.

(d) The Secretary is authorized to make such regulations and orders regulating, restricting, or prohibiting industrial homework as are necessary or appropriate to prevent the circumvention or evasion of and to safeguard the minimum wage rate prescribed in this Act, and all existing regulations or orders of the Administration relating to industrial homework are hereby continued in full force and effect.

[29 U.S.C. 211] Enacted June 25, 1938, ch. 676, sec. 11, 52 Stat. 1066; amended October 26, 1949, ch. 736, sec. 9, 63 Stat. 916; amended November 13, 1985, P.L. 99–150, sec. 3(c)(2), 99 Stat. 789.

CHILD LABOR PROVISIONS

SEC. 12. (a) No producer, manufacturer, or dealer shall ship or deliver for shipment in commerce any goods produced in an establishment situated in the United States in or about which within thirty days prior to the removal of such goods therefrom any oppressive child labor has been employed: *Provided,* That any such shipment or delivery for shipment of such goods by a purchaser who acquired them in good faith in reliance on written assurance from the producer, manufacturer, or dealer that the goods were produced in compliance with the requirements of this section, and who acquired such goods for value without notice of any such violation, shall not be deemed prohibited by this subsection: *And provided further,* That a prosecution and conviction of a defendant for the shipment or delivery for shipment of any goods under the conditions herein prohibited shall be a bar to any further prosecution against the same defendant for shipments or deliveries for shipment of any such goods before the beginning of said prosecution.

(b) The Secretary of Labor, or any of his authorized representatives, shall make all investigations and inspections under section 11(a) with respect to the employment of minors, and, subject to the direction and control of the Attorney General, shall bring all actions under section 17 to enjoin any act or practice which is unlawful by reason of the existence of oppressive child labor, and shall administer all other provisions of this Act relating to oppressive child labor.

(c) No employer shall employ any oppressive child labor in commerce or in the production of goods for commerce or in any enterprise engaged in commerce or in the production of goods for commerce.

(d) In order to carry out the objectives of this section, the Secretary may by regulation require employers to obtain from any employee proof of age.

[29 U.S.C. 212] Enacted June 25, 1938, ch. 676, sec. 12, 52 Stat. 1067; amended October 26, 1949, ch. 736, sec. 10, 63 Stat. 917; amended May 5, 1961, P.L. 87–30, sec. 8, 75 Stat. 70; amended April 8, 1974, P.L. 93–259, sec. 25(a), 88 Stat. 72.

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EXEMPTIONS

SEC. 13. (a) The provisions of sections 6 (except section 6(d) in the case of paragraph (1) of this subsection) and 7 shall not apply with respect to—

(1) any employee employed in a bona fide executive, administrative, or professional capacity (including any employee employed in the capacity of academic administrative personnel or teacher in elementary or secondary schools), or in the capacity of outside salesman (as such terms are defined and delimited from time to time by regulations of the Secretary, subject to the provisions of the Administrative Procedure Act, except that an employee of a retail or service establishment shall not be excluded from the definition of employee employed in a bona fide executive or administrative capacity because of the number of hours in his workweek which he devotes to activities not directly or closely related to the performance of executive or administrative activities, if less than 40 per centum of his hours worked in the workweek are devoted to such activities); or

[(2) Repealed effective November 17, 1989.]

(3) any employee employed by an establishment which is an amusement or recreational establishment, organized camp, or religious or non-profit educational conference center, if (A) it does not operate for more than seven months in any calendar year, or (B) during the preceding calendar year, its average receipts for any six months of such year were not more than 33⅓ per centum of its average receipts for the other six months of such year, except that the exemption from sections 6 and 7 provided by this paragraph does not apply with respect to any employee of a private entity engaged in providing services or facilities (other than, in the case of the exemption from section 6, a private entity engaged in providing services and facilities directly related to skiing) in a national park or a national forest, or on land in the National Wildlife Refuge System, under a contract with the Secretary of the Interior or the Secretary of Agriculture; or

[(4) Repealed effective November 17, 1989.]

(5) any employee employed in the catching, taking, propagating, harvesting, cultivating, or farming of any kind of fish, shellfish, crustacea, sponges, seaweeds, or other acquatic forms of animal and vegetable life, or in the first processing, canning or packing such marine products at sea as an incident to, or in conjunction with, such fishing operations, including the going to and returning from work and loading and unloading when performed by any such employee; or

(6) any employee employed in agriculture (A) if such employee is employed by an employer who did not, during any calendar quarter during the preceding calendar year, use more than five hundred man-days of agricultural labor, (B) if such employee is the parent, spouse, child, or other member of his employer's immediate family, (C) if such employee (i) is employed as a hand harvest laborer and is paid on a piece rate basis in an operation which has been, and is customarily and

generally recognized as having been, paid on a piece rate basis in the region of employment, (ii) commutes daily from his permanent residence to the farm on which he is so employed, and (iii) has been employed in agriculture less than thirteen weeks during the preceding calendar year, (D) if such employee (other than an employee described in clause (C) of this subsection) (i) is sixteen years of age or under and is employed as a hand harvest laborer, is paid on a piece rate basis in an operation which has been, and is customarily and generally recognized as having been, paid on a piece rate basis in the region of employment, (ii) is employed on the same farm as his parent or person standing in the place of his parent, and (iii) is paid at the same piece rate as employees over age sixteen are paid on the same farm, or (E) if such employee is principally engaged in the range production of livestock; or

(7) any employee to the extent that such employee is exempted by regulations, order, or certificate of the Secretary issued under section 14; or

(8) any employee employed in connection with the publication of any weekly, semiweekly, or daily newspaper with a circulation of less than four thousand the major part of which circulation is within the county where published or counties contiguous thereto; or

[(9) Repealed effective May 1, 1974.]

(10) any switchboard operator employed by an independently owned public telephone company which has not more than seven hundred and fifty stations; or

[(11) Repealed effective May 1, 1974.]

(12) any employee, employed as a seaman on a vessel other than an American vessel; or

[(13) Repealed effective May 1, 1974.]

[(14) Repealed effective May 1, 1974.]

(15) any employee employed on a casual basis in domestic service employment to provide babysitting services or any employee employed in domestic service employment to provide companionship services for individuals who (because of age or infirmity) are unable to care for themselves (as such terms are defined and delimited by regulations of the Secretary); or

(16) a criminal investigator who is paid availability pay under section 5545a of title 5, United States Code;

(17) any employee who is a computer systems analyst, computer programmer, software engineer, or other similarly skilled worker, whose primary duty is—

(A) the application of systems analysis techniques and procedures, including consulting with users, to determine hardware, software, or system functional specifications;

(B) the design, development, documentation, analysis, creation, testing, or modification of computer systems or programs, including prototypes, based on and related to user or system design specifications;

(C) the design, documentation, testing, creation, or modification of computer programs related to machine operating systems; or

(D) a combination of duties described in subparagraphs (A), (B), and (C) the performance of which requires the same level of skills, and

who, in the case of an employee who is compensated on an hourly basis, is compensated at a rate of not less than $27.63 an hour; or

(18) any employee who is a border patrol agent, as defined in section 5550(a) of title 5, United States Code; or

(19) any employee employed to play baseball who is compensated pursuant to a contract that provides for a weekly salary for services performed during the league's championship season (but not spring training or the off season) at a rate that is not less than a weekly salary equal to the minimum wage under section 6(a) for a workweek of 40 hours, irrespective of the number of hours the employee devotes to baseball related activities.

(b) The provisions of section 7 shall not apply with respect to—

(1) any employee with respect to whom the Secretary of Transportation has power to establish qualifications and maximum hours of service pursuant to the provisions of section 204 of the Motor Carrier Act, 1935; or

(2) any employee of an employer engaged in the operation of a rail carrier subject to part A of subtitle IV of title 49, United States Code; or

(3) any employee of a carrier by air subject to the provisions of title II of the Railway Labor Act; or

[(4) Repealed effective May 1, 1976.]

(5) any individual employed as an outside buyer of poultry, eggs, cream, or milk, in their raw or natural state; or

(6) any employee employed as a seaman; or

[(7) Repealed effective May 1, 1976.]

[(8) Repealed effective January 1, 1979.]

(9) any employee employed as an announcer, news editor, or chief engineer by a radio or television station the major studio of which is located (A) in a city or town of one hundred thousand population or less, according to the latest available decennial census figures as complied by the Bureau of the Census, except where such city or town is part of a standard metropolitan statistical area, as defined and designated by the Bureau of the Budget, which has a total population in excess of one hundred thousand, or (B) in a city or town or twenty-five thousand population or less, which is part of such an area but is at least 40 airline miles from the principal city in such area; or

(10) A any salesman, partsman, or mechanic primarily engaged in selling or servicing automobiles, trucks, or farm implements, if he is employed by a nonmanufacturing establishment primarily engaged in the business of selling such vehicles or implements to utlimate purchasers; or

(B) any salesman primarily engaged in selling trailers, boats, or aircraft, if he is employed by a nonmanufacturing establishment primarily engaged in the business of selling trailers, boats, or aircraft to ultimate purchasers; or

(11) any employee employed as a driver or drivers' helper making local deliveries, who is compensated for such employment on the basis of trip rates, or other delivery payment plan, if the Secretary shall find that such plan has the general purpose and effect of reducing hours worked by such employees to, or below, the maximum workweek applicable to them under section 7(a); or

(12) any employee employed in agriculture or in connection with the operation or maintenance of ditches, canals, reservoirs, or waterways, not owned or operated for profit, or operated on a sharecrop basis, and which are used exclusively for supply and storing of water, at least 90 percent of which was ultimately delivered for agricultural purposes during the preceding calendar year; or

(13) any employee with respect to his employment in agriculture by a farmer, notwithstanding other employment of such employee in connection with livestock auction operations in which such farmer is engaged as an adjunct to the raising of livestock, either on his own account or in conjunction with other farmers, if such employee (A) is primarily employed during his workweek in agriculture by such farmer, and (B) is paid for his employment in connection with such livestock auction operations at a wage rate not less than that prescribed by section 6(a)(1); or

(14) any employee employed within the area of production (as defined by the Secretary) by an establishment commonly recognized as a country elevator, including such an establishment which sells products and services used in the operation of a farm, if no more than five employees are employed in the establishment in such operations; or

(15) any employee engaged in the processing of maple sap into sugar (other than refined sugar) or syrup; or

(16) any employee engaged (A) in the transportation and preparation for transportation of fruits or vegetables, whether or not performed by the farmer, from the farm to a place of first processing or first marketing within the same State, or (B) in transportation, whether or not performed by the farmer, between the farm and any point within the same State of persons employed or to be employed in the harvesting of fruits or vegetables; or

(17) any driver employed by an employer engaged in the business of operating taxicabs; or

[(18) Repealed effective May 1, 1976.]

[(19) Repealed effective May 1, 1976.]

(20) any employee of a public agency who in any workweek is employed in fire protection activities or any employee of a public agency who in any workweek is employed in law enforcement activities (including security personnel in correctional institutions), if the public agency employs during the workweek less than 5 employees in fire protection or law enforcement activities, as the case may be; or

(21) any employee who is employed in domestic service in a household and who resides in such household; or

[(22) Repealed effective November 1, 1977.]

[(23) Repealed effective May 1, 1976.]

(24) any employee who is employed with his spouse by a nonprofit educational institution to serve as the parents of children—

(A) who are orphans or one of whose natural parents is decreased, or[5]

(B) who are enrolled in such institution and reside in residential factilities of the institution.

while such children are in residence at such institution, if such employee and his spouse reside in such facilities, receive, without cost, board and lodging from such institution, and are together compensated, on a cash basis, at an annual rate of not less than $10,000; or

[(25) Repealed effective November 1, 1977.]

[(26) Repealed effective November 1, 1977.]

(27) any employee employed by an establishment which is a motion picture theater; or

(28) any employee employed in planting or tending trees, cruising, surveying, or felling timber, or in preparing, or transporting logs or other forestry products to the mill, processing plant, railroad, or other transportation terminal, if the number of employees employed by his employer in such forestry or lumbering operations does not exceed eight;

(29) any employee of an amusement or recreational establishment located in a national park or national forest or on land in the National Wildlife Refuge System if such employee (A) is an employee of a private entity engaged in providing services or facilities in a national park or national forest, or on land in the National Wildlife Refuge System, under a contract with the Secretary of the Interior or the Secretary of Agriculture, and (B) receives compensation for employment in excess of fifty-six hours in any workweek at a rate not less than one and one-half times the regular rate at which he is employed; or

(30) a criminal investigator who is paid availability pay under section 5545a of title 5, United States Code.

(c)(1) Except as provided in paragraph (2) or (4), the provisions of section 12 relating to child labor shall not apply to any employee employed in agriculture outside of school hours for the school district where such employee is living while he is so employed, if such employee—

(A) is less than twelve years of age and (i) is employed by his parent, or by a person standing in the place of his parent, on a farm owned or operated by such parent or person, or (ii) is employed with the consent of his parent or person standing in the place of his parent, on a farm, none of the employees of which are (because of section 13(a)(6)(A)) required to be paid at the wage rate prescribed by section 6(a)(5),

(B) is twelve years or thirteen years of age and (i) such employment is with the consent of his parent or person standing in the place of his parent, or (ii) his parent or such person is employed on the same farm as such employee, or

[5]Error in law; should read "and".

(C) is fourteen years of age or older.

(2) The provisions of section 12 relating to child labor shall apply to an employee below the age of sixteen employed in agriculture in an occupation that the Secretary of Labor finds and declares to be particularly hazardous for the employment of children below the age of sixteen, except where such employee is employed by his parent or by a person standing in the place of his parent on a farm owned or operated by such parent or person.

(3) The provisions of section 12 relating to child labor shall not apply to any child employed as an actor or performer in motion pictures or theatrical productions, or in radio or television productions.

(4)(A) An employer or group of employers may apply to the Secretary for a waiver of the application of section 12 to the employment for not more than eight weeks in any calendar year of individuals who are less than twelve years of age, but not less than ten years of age, as hand harvest laborers in an agricultural operation which has been, and is customarily and generally recognized as being, paid on a piece rate basis in the region in which such individuals would be employed. The Secretary may not grant such a waiver unless he finds, based on objective data submitted by the applicant, that—

(i) the crop to be harvested is one with a particularly short harvesting season and the application of section 12 would cause severe economic disruption in the industry of the employer or group of employers applying for the wavier;

(ii) the employment of the individuals to whom the waiver would apply would not be deleterious to their health or well-being;

(iii) the level and type of pesticides and other chemicals used would not have an adverse effect on the health or well-being of the individuals to whom the waiver would apply;

(iv) individuals age twelve and above are not available for such employment; and

(v) the industry of such employer or group of employers has traditionally and substantially employed individuals under twelve years of age without displacing substantial job opportunities for individuals over sixteen years of age.

(B) Any waiver granted by the Secretary under subparagraph (A) shall require that—

(i) the individuals employed under such waiver be employed outside of school hours for the school district where they are living while so employed;

(ii) such individuals while so employed commute daily from their permanent residence to the farm on which they are so employed; and

(iii) such individuals be employed under such waiver (I) for not more than eight weeks between June 1 and October 15 of any calendar year, and (II) in accordance with such other terms and conditions as the Secretary shall prescribe for such individuals' protection.

(5)(A) In the administration and enforcement of the child labor provisions of this Act, employees who are 16 and 17 years of age

shall be permitted to load materials into, but not operate or unload materials from, scrap paper balers and paper box compactors—

(i) that are safe for 16- and 17-year-old employees loading the scrap paper balers or paper box compactors; and

(ii) that cannot be operated while being loaded.

(B) For purposes of subparagraph (A), scrap paper balers and paper box compactors shall be considered safe for 16- or 17-year-old employees to load only if—

(i)(I) the scrap paper balers and paper box compactors meet the American National Standards Institute's Standard ANSI Z245.5–1990 for scrap paper balers and Standard ANSI Z245.2–1992 for paper box compactors; or

(II) the scrap paper balers and paper box compactors meet an applicable standard that is adopted by the American National Standards Institute after the date of enactment of this paragraph and that is certified by the Secretary to be at least as protective of the safety of minors as the standard described in subclause (I);

(ii) the scrap paper balers and paper box compactors include an on-off switch incorporating a key-lock or other system and the control of the system is maintained in the custody of employees who are 18 years of age or older;

(iii) the on-off switch of the scrap paper balers and paper box compactors is maintained in an off position when the scrap paper balers and paper box compactors are not in operation; and

(iv) the employer of 16- and 17-year-old employees provides notice, and posts a notice, on the scrap paper balers and paper box compactors stating that—

(I) the scrap paper balers and paper box compactors meet the applicable standard described in clause (i);

(II) 16- and 17-year-old employees may only load the scrap paper balers and paper box compactors; and

(III) any employee under the age of 18 may not operate or unload the scrap paper balers and paper box compactors.

The Secretary shall publish in the Federal Register a standard that is adopted by the American National Standards Institute for scrap paper balers or paper box compactors and certified by the Secretary to be protective of the safety of minors under clause (i)(II).

(C)(i) Employers shall prepare and submit to the Secretary reports—

(I) on any injury to an employee under the age of 18 that requires medical treatment (other than first aid) resulting from the employee's contact with a scrap paper baler or paper box compactor during the loading, operation, or unloading of the baler or compactor; and

(II) on any fatality of an employee under the age of 18 resulting from the employee's contact with a scrap paper baler or paper box compactor during the loading, operation, or unloading of the baler or compactor.

(ii) The reports described in clause (i) shall be used by the Secretary to determine whether or not the implementation of subparagraph (A) has had any effect on the safety of children.

(iii) The reports described in clause (i) shall provide—

(I) the name, telephone number, and address of the employer and the address of the place of employment where the incident occurred;

(II) the name, telephone number, and address of the employee who suffered an injury or death as a result of the incident;

(III) the date of the incident;

(IV) a description of the injury and a narrative describing how the incident occurred; and

(V) the name of the manufacturer and the model number of the scrap paper baler or paper box compactor involved in the incident.

(iv) The reports described in clause (i) shall be submitted to the Secretary promptly, but not later than 10 days after the date on which an incident relating to an injury or death occurred.

(v) The Secretary may not rely solely on the reports described in clause (i) as the basis for making a determination that any of the employers described in clause (i) has violated a provision of section 12 relating to oppressive child labor or a regulation or order issued pursuant to section 12. The Secretary shall, prior to making such a determination, conduct an investigation and inspection in accordance with section 12(b).

(vi) The reporting requirements of this subparagraph shall expire 2 years after the date of enactment of this subparagraph.

(6) In the administration and enforcement of the child labor provisions of this Act, employees who are under 17 years of age may not drive automobiles or trucks on public roadways. Employees who are 17 years of age may drive automobiles or trucks on public roadways only if—

(A) such driving is restricted to daylight hours;

(B) the employee holds a State license valid for the type of driving involved in the job performed and has no records of any moving violation at the time of hire;

(C) the employee has successfully completed a State approved driver education course;

(D) the automobile or truck is equipped with a seat belt for the driver and any passengers and the employee's employer has instructed the employee that the seat belts must be used when driving the automobile or truck;

(E) the automobile or truck does not exceed 6,000 pounds of gross vehicle weight;

(F) such driving does not involve—

(i) the towing of vehicles;

(ii) route deliveries or route sales;

(iii) the transportation for hire of property, goods, or passengers;

(iv) urgent, time-sensitive deliveries;

(v) more than two trips away from the primary place of employment in any single day for the purpose of delivering goods of the employee's employer to a customer (other than urgent, time-sensitive deliveries);

(vi) more than two trips away from the primary place of employment in any single day for the purpose of transporting passengers (other than employees of the employer);

(vii) transporting more than three passengers (including employees of the employer); or

(viii) driving beyond a 30 mile radius from the employee's place of employment; and

(G) such driving is only occasional and incidental to the employee's employment.

For purposes of subparagraph (G), the term "occasional and incidental" is no more than one-third of an employee's worktime in any workday and no more than 20 percent of an employee's worktime in any workweek.

(7)(A)(i) Subject to subparagraph (B), in the administration and enforcement of the child labor provisions of this Act, it shall not be considered oppressive child labor for a new entrant into the workforce to be employed inside or outside places of business where machinery is used to process wood products.

(ii) In this paragraph, the term "new entrant into the workforce" means an individual who—

(I) is under the age of 18 and at least the age of 14, and

(II) by statute or judicial order is exempt from compulsory school attendance beyond the eighth grade.

(B) The employment of a new entrant into the workforce under subparagraph (A) shall be permitted—

(i) if the entrant is supervised by an adult relative of the entrant or is supervised by an adult member of the same religious sect or division as the entrant;

(ii) if the entrant does not operate or assist in the operation of power-driven woodworking machines;

(iii) if the entrant is protected from wood particles or other flying debris within the workplace by a barrier appropriate to the potential hazard of such wood particles or flying debris or by maintaining a sufficient distance from machinery in operation; and

(iv) if the entrant is required to use personal protective equipment to prevent exposure to excessive levels of noise and saw dust.

(d) The provisions of sections 6, 7, and 12 shall not apply with respect to any employee engaged in the delivery of newspapers to the consumer or to any homemaker engaged in the making of wreaths composed principally of natural holly, pine, cedar, or other evergreens (including the harvesting of the evergreens or other forest products used in making such wreaths).

(e) The provisions of section 7 shall not apply with respect to employees for whom the Secretary of Labor is authorized to establish minimum wage rates as provided in section 6(a)(3), except with respect to employees for whom such rates are in effect; and with respect to such employees the Secretary may make rules and regulations providing reasonable limitations and allowing reasonable variations, tolerances, and exemptions to and from any or all of the provisions of section 7 if he shall find, after a public hearing on the matter, and taking into account the factors set forth in section 6(a)(3), that economic conditions warrant such action.

(f) The provisions of sections 6, 7, 11, and 12 shall not apply with respect to any employees whose services during the workweek are performed in a workplace within a foreign country or within territory under the jurisdiction of the United States other than the following: a State of the United States; the District of Columbia; Puerto Rico; the Virgin Islands; Outer Continental Shelf lands defined in the Outer Continental Shelf Lands Act (ch. 345, 67 Stat. 462); American Samoa; Guam; Wake Island; Eniwetok Atoll; Kwajalein Atoll; and Johnston Island.

(g) The exemption from section 6 provided by paragraph (6) of subsection (a) of this section shall not apply with respect to any employee employed by an establishment (1) which controls, is controlled by, or is under common control with, another establishment the activities of which are not related for a common business purpose to, but materially support the activities of the establishment employing such employee; and (2) whose annual gross volume of sales made or business done, when combined with the annual gross volume of sales made or business done by each establishment which controls, is controlled by, or is under common control with, the establishment employing such employee, exceeds $10,000,000 (exclusive of excise taxes at the retail level which are separately stated).

(h) The provisions of section 7 shall not apply for a period or periods of not more than fourteen workweeks in the aggregate in any calendar year to any employee who—

(1) is employed by such employer—

(A) exclusively to provide services necessary and incidental to the ginning of cotton in an establishment primarily engaged in the ginning of cotton;

(B) exclusively to provide services necessary and incidental to the receiving, handling, and storing of raw cotton and the compressing of raw cotton when performed at a cotton warehouse or compress-warehouse facility, other than one operated in conjunction with a cotton mill, primarily engaged in storing and compressing;

(C) exclusively to provide services necessary and incidental to the receiving, handling, storing, and processing of cottonseed in an establishment primarily engaged in the receiving, handling, storing, and processing of cottonseed; or

(D) exclusively to provide services necessary and incidental to the processing of sugar cane or sugar beets in an establishment primarily engaged in the processing of sugar cane or sugar beets; and

(2) receives for—

(A) such employment by such employer which is in excess of ten hours in any workday, and

(B) such employment by such employer which is in excess of forty-eight hours in any workweek,

compensation at a rate not less than one and one-half times the regular rate at which he is employes.

Any employer who receives an exemption under this subsection shall not be eligible for any other exemption under this section or section 7.

(i) The provisions of section 7 shall not apply for a period or periods of not more than fourteen workweeks in the aggregate in any period of fifty-two consecutive weeks to any employee who—

(1) is engaged in the ginning of cotton for market in any place of employment located in a county where cotton is grown in commercial quantities; and

(2) receives for any such employment during such workweek—

(A) in excess of ten hours in any workday, and

(B) in excess of forty-eight hours in any workweek, compensation at a rate not less than one and one-half times the regular rate at which he is employed. No week included in any fifty-two week period for purposes of the preceding sentence may be included for such purposes in any other fifty-two week period.

(j) The provisions of section 7 shall not apply for a period or periods of not more than fourteen workweeks in the aggregate in any period of fifty-two consecutive weeks to any employee who—

(1) is engaged in the processing of sugar beets, sugar beet molasses, or sugar cane into sugar (other than refined sugar) or syrup; and

(2) receives for any such employment during such workweeks—

(A) in excess of ten hours in any workday, and

(B) in excess of forty-eight hours in any workweek, compensation at a rate not less than one and one-half times the regular rate at which he is employed. No week included in any fifty-two week period for purposes of the preceding sentence may be included for such purposes in any other fifty-two week period.

[29 U.S.C. 213] Enacted June 25, 1938, ch. 676, sec. 13, 52 Stat. 1067; amended August 9, 1939, ch. 605, sec. 1, 53 Stat. 1266; amended October 26, 1949, ch. 736, sec. 11, 63 Stat. 917; amended August 8, 1956, ch. 1035, sec. 3, 70 Stat. 1118; amended August 30, 1957, P.L. 85–231, sec. 1(1), 71 Stat. 514; amended July 12, 1960, P.L. 86–624, sec. 21(b), 74 Stat. 417; amended May 5, 1961, P.L. 87–30, secs. 9, 10, 75 Stat. 71, 74; amended September 23, 1966, P.L. 89–601, title II, secs. 201–204(a), (b), 205–212(a) 213–215(b), (c), 80 Stat. 833–838; amended October 15, 1966, P.L. 89–670, sec. 8(e), 80 Stat. 943; amended June 23, 1972, P.L. 92–318, title IX, sec. 906(b)(1), 86 Stat. 375; amended April 8, 1974, P.L. 93–259, secs. 6(c)(2), 7(b)(3), (4), 8, 9(b), 10, 11, 12(a), 13(a)–(c), 14–18, 20(a)–(c), 21(b), 22, 23, 25(b), 88 Stat. 61–69, 72; amended November 1, 1977, P.L. 95–151, secs. 4–8, 9(d), 11, 14, 91 Stat. 1249, 1250–1252; amended September 27, 1979, P.L. 96–70, title I, sec. 1225(a), 93 Stat. 468; amended November 17, 1989, P.L. 101–157, sec. 3(c), 103 Stat. 939; amended December 29, 1995, P.L. 104–88, sec. 340, 109 Stat. 955; amended August 6, 1996, P.L. 104–174, sec. 1, 110 Stat. 1553; amended August 20, 1996, P.L. 104–188, sec. 2105(a), 110 Stat. 1929; amended November 13, 1997, P.L. 105–78, sec. 105, 111 Stat. 1477; amended October 31, 1998, P.L. 105–334, sec. 2(a), 112 Stat. 3137.

LEARNERS, APPRENTICES, STUDENTS, AND HANDICAPPED WORKERS

SEC. 14. (a) The Secretary, to the extent necessary in order to prevent curtailment of opportunities for employment, shall by regulations or by orders provide for the employment of learners, of apprentices, and messengers employed primarily in delivering letters and messages, under special certificates issued pursuant to regulations of the Secretary, at such wages lower than the minimum wage applicable under section 6 and subject to such limitations as

to time, number, proportion, and length of service as the Secretary shall prescribe.

(b)(1)(A) The Secretary, to the extent necessary in order to prevent curtailment of opportunities for employment, shall by special certificate issued under a regulation or order provide, in accordance with subparagraph (B), for the employment, at a wage rate not less than 85 per centum of the otherwise applicable wage rate in effect under section 6 or not less than $1.60 an hour, whichever is the higher, of full-time students (regardless of age but in compliance with applicable child labor laws) in retail or service establishments.

(B) Except as provided in paragraph (4)(B), during any month in which full-time students are to be employed in any retail or service establishment under certificates issued under this subsection the proportion of student hours of employment to the total hours of employment of all employees in such establishment may not exceed—

(i) in the case of a retail or service establishment whose employees (other than employees engaged in commerce or in the production of goods for commerce) were covered by this Act before the effective date of the Fair Labor Standards Amendments of 1974—

(I) the proportion of student hours of employment to the total hours of employment of all employees in such establishment for the corresponding month of the immediately preceding twelve-month period,

(II) the maximum proportion for any corresponding month of student hours of employment to the total hours of employment of all employees in such establishment applicable to the issuance of certificates under this section at any time before the effective date of the Fair Labor Standards Amendments of 1974 for the employment of students by such employer, or

(III) a proportion equal to one-tenth of the total hours of employment of all employees in such establishment,

whichever is greater;

(ii) in the case of retail or service establishment whose employees (other than employees engaged in commerce or in the production of goods for commerce) are covered for the first time on or after the effective date of the Fair Labor Standards Amendments of 1974—

(I) the proportion of hours of employment of students in such establishment to the total hours of employment of all employees in such establishment for the corresponding month of the twelve-month period immediately prior to the effective date of such Amendments,

(II) the proportion of student hours of employment to the total hours of employment of all employees in such establishment for the corresponding month of immediately preceding twelve-month period, or

(III) a proportion equal to one-tenth of the total hours of employment of all employees in such establishment,

whichever is greater; or

(iii) in the case of a retail or service establishment for which records of student hours worked are not available, the

proportion of students hours of employment to the total hours of employment of all employees based on the practice during the immediately preceding twelve-month period in (I) similar establishments of the same employer in the same general metropolitan area in which such establishment is located, (II) similar establishments of the same or nearby communities if such establishment is not in a metropolitan area, or (III) other establishments of the same general character operating in the community or the nearest comparable community.

For purpose of clauses (i), (ii), and (iii) of this subparagraph, the term "student hours of employment" means hours during which students are employed in a retail or service establishment under certificates issued under this subsection.

(2) The Secretary, to the extent necessary in order to prevent curtailment of opportunities for employment, shall by special certificate issued under a regulation or order provide for the employment, at a wage rate not less than 85 per centum of the wage rate in effect under section 6(a)(5) or not less than $1.30 an hour, whichever is the higher, of full-time students (regardless of age but in compliance with applicable child labor laws) in any occupation in agriculture.

(3) The Secretary, to the extent necessary in order to prevent curtailment of opportunities for employment, shall by special certificate issued under a regulation or order provide for the employment by an institution of higher education, at a wage rate not less than 85 per centum of the otherwise applicable wage rate in effect under section 6 or not less than $1.60 an hour, whichever is the higher, of full-time students (regardless of age but in compliance with applicable child labor laws) who are enrolled in such institution. The Secretary shall by regulation prescribe standards and requirements to insure that this paragraph will not create a substantial probability of reducing the full-time employment opportunities of persons other than those to whom the minimum wage rate authorized by this paragraph is applicable.

(4)(A) A special certificate issued under paragraph (1), (2), or (3) shall provide that the student or students for whom it is issued shall, except during vacation periods, be employed on a part-time basis and not in excess of twenty hours in any workweek.

(B) If the issuance of a special certificate under paragraph (1) or (2) for an employer will cause the number of students employed by such employer under special certificates issued under this subsection to exceed six, the Secretary may not issue such a special certificate for the employment of a student by such employer unless the Secretary finds employment of such student will not a create a substantial probability of reducing the full-time employment opportunities of persons other than those employed under special certificates issued under this subsection. If the issuance of a special certificate under paragraph (1) or (2) for an employer will not cause the number of students employed by such employer under special certificates issued under this subsection to exceed six—

(i) the Secretary may issue a special certificate under paragraph (1) or (2) for the employment of a student by such employer if such employer certifies to the Secretary that the employment of such student will not reduce the full-time employ-

ment opportunities of persons other than those employed under special certificates issued under this subsection, and

(ii) in the case of an employer which is a retail or service establishment, subparagraph (B) of paragraph (1) shall not apply with respect to the issuance of special certificates for such employer under such paragraph.

The requirement of this subparagraph shall not apply in the case of the issuance of special certificates under paragraph (3) for the employment of full-time students by institutions of higher education; except that if the Secretary determines that an institution of higher education is employing students under certificates issued under paragraph (3) but in violation of the requirements of that paragraph or of regulations issued thereunder, the requirements of this subparagraph shall apply with respect to the issuance of special certificates under paragraph (3) for the employment of students by such institution.

(C) No special certificate may be issued under this subsection unless the employer for whom the certificate is to be issued provides evidence satisfactory to the Secretary of the student status of the employees to be employed under such special certificate.

(D) To minimize paperwork for, and to encourage, small businesses to employ students under special certificates issued under paragraphs (1) and (2), the Secretary shall, by regulation or order, prescribe a simplified application form to be used by employers in applying for such a certificate for the employment of not more than six full-time students. Such an application shall require only—

(i) a listing of the name, address, and business of the applicant employer,

(ii) a listing of the date the applicant began business, and

(iii) the certification that the employment of such full-time students will not reduce the full-time employment opportunities of persons other than persons employed under special certificates.

(c)(1) The Secretary, to the extent necessary to prevent curtailment of opportunities for employment, shall by regulation or order provide for the employment, under special certificates, of individuals (including individuals employed in agriculture) whose earning or productive capacity is impaired by age, physical or mental deficiency, or injury, at wages which are—

(A) lower than the minimum wage applicable under section 6,

(B) commensurate with those paid to nonhandicapped workers, employed in the vicinity in which the individuals under the certificates are employed, for essentially the same type, quality, and quantity of work, and

(C) related to the individual's productivity.

(2) The Secretary shall not issue a certificate under paragraph (1) unless the employer provides written assurances to the Secretary that—

(A) in the case of individuals paid on an hourly rate basis, wages paid in accordance with paragraph (1) will be reviewed by the employer at periodic intervals at least once every 6 months, and

(B) wages paid in accordance with paragraph (1) will be adjusted by the employer at periodic intervals, at least once each year, to reflect changes in the prevailing wage paid to experienced nonhandicapped individuals employed in the locality for essentially the same type of work.

(3) Notwithstanding paragraph (1), no employer shall be permitted to reduce the hourly wage rate prescribed by certificate under this subsection in effect on June 1, 1986, of any handicapped individual for a period of two years from such date without prior authorization of the Secretary.

(4) Nothing in this subsection shall be construed to prohibit an employer from maintaining or establishing work activities centers to provide therapeutic activities for handicapped clients.

(5)(A) Notwithstanding any other provision of this subsection, any employee receiving a special minimum wage at a rate specified pursuant to this subsection or the parent or guardian of such an employee may petition the Secretary to obtain a review of such special minimum wage rate. An employee or the employee's parent or guardian may file such a petition for and in behalf of the employee or in behalf of the employee and other employees similarly situated. No employee may be a party to any such action unless the employee or the employee's parent or guardian gives consent in writing to become such a party and such consent is filed with the Secretary.

(B) Upon receipt of a petition filed in accordance with subparagraph (A), the Secretary within 10 days shall assign the petition to an administrative law judge appointed pursuant to section 3105 of title 5, United States Code. The administrative law judge shall conduct a hearing on the record in accordance with section 554 of title 5, United States Code, with respect to such petition within 30 days after assignment.

(C) In any such proceeding, the employer shall have the burden of demonstrating that the special minimum wage rate is justified as necessary in order to prevent curtailment of opportunities for employment.

(D) In determining whether any special minimum wage rate is justified pursuant to subparagraph (C), the administrative law judge shall consider—

(i) the productivity of the employee or employees identified in the petition and the conditions under which such productivity was measured; and

(ii) the productivity of other employees performing work of essentially the same type and quality for other employers in the same vicinity.

(E) The administrative law judge shall issue a decision within 30 days after the hearing provided for in subparagraph (B). Such action shall be deemed to be a final agency action unless within 30 days the Secretary grants a request to review the decision of the administrative law judge. Either the petitioner or the employer may request review by the Secretary within 15 days of the date of issuance of the decision by the administrative law judge.

(F) The Secretary, within 30 days after receiving a request for review, shall review the record and either adopt the decision of the administrative law judge or issue exceptions. The decision of the

administrative law judge, together with any exceptions, shall be deemed to be a final agency action.

(G) A final agency action shall be subject to judicial review pursuant to chapter 7 of title 5, United States Code. An action seeking such review shall be brought within 30 days of a final agency action described in subparagraph (F).

(d) The Secretary may by regulation or order provide that sections 6 and 7 shall not apply with respect to the employment by any elementary or secondary school of its students if such employment constitutes as determined under regulations prescribed by the Secretary, an integral part of the regular education program provided by such school and such employment is in accordance with applicable child labor laws.

[29 U.S.C. 214] Enacted June 25, 1938, ch. 676, sec. 14, 52 Stat. 1068; amended October 26, 1949, ch. 736, sec. 12, 63 Stat. 916; amended May 5, 1961, P.L. 87–30, sec. 11, 75 Stat. 74; amended September 23, 1966, P.L. 89–601, title V, sec. 501, 80 Stat. 842; amended April 8, 1974, P.L. 93–259, sec. 24 (a), (b), 88 Stat. 69, 72; amended November 1, 1977, P.L. 95–151, secs. 12, 13, 91 Stat. 1252; amended October 16, 1986, P.L. 99–486, sec. 1, 100 Stat. 1229; amended November 17, 1989, P.L. 101–157, sec. 4(d), 103 Stat. 941.

PROHIBITED ACTS

SEC. 15. (a) After the expiration of one hundred and twenty days from the date of enactment of this Act, it shall be unlawful for any person—

(1) to transport, offer for transportation, ship, deliver, or sell in commerce, or to ship, deliver, or sell with knowledge that shipment or delivery or sale thereof in commerce is intended, any goods in the production of which any employee was employed in violation of section 6 or section 7, or in violation of any regulation or order of the Secretary of Labor issued under section 14; except that no provision of this Act shall impose any liability upon any common carrier for the transportation in commerce in the regular course of its business of any goods not produced by such common carrier, and no provision of this Act shall excuse any common carrier from its obligation to accept any goods for transportation; and except that any such transportation, offer, shipment, delivery, or sale of such goods by a purchaser who acquired them in good faith in reliance on written assurance from the producer that the goods were produced in compliance with the requirements of the Act, and who acquired such goods for value without notice of any such violation, shall not be deemed unlawful;

(2) to violate any of the provisions of section 6 or section 7, or any of the provisions of any regulation or order of the Secretary issued under section 14;

(3) to discharge or in any other manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act, or has testified or is about to testify in any such proceeding, or has served or is about to serve on an industry committee;

(4) to violate any of the provisions of section 12;

(5) to violate any of the provisions of section 11(c) or any regulation or order made or continued in effect under the provisions of section 11(d), or to make any statement, report, or record filed or kept pursuant to the provisions of such section or of any regulation or order thereunder, knowing such statement, report, or record to be false in a material respect; and

(6) to violate any of the provisions of section 18D.

(b) For the purposes of subsection (a)(1) proof that any employee was employed in any place of employment where goods shipped or sold in commerce were produced, within ninety days prior to the removal of the goods from such place of employment, shall be prima facie evidence that such employee was engaged in the production of such goods.

[29 U.S.C. 215] Enacted June 25, 1938, ch. 676, sec. 15, 52 Stat. 1068; amended October 26, 1949, ch. 736, sec. 13, 63 Stat. 919.

PENALTIES

SEC. 16. (a) Any person who willfully violates any of the provisions of section 15 shall upon conviction thereof be subject to a fine of not more than $10,000, or to imprisonment for not more than six months, or both. No person shall be imprisoned under this subsection except for an offense committed after the conviction of such person for a prior offense under this subsection.

(b) Any employer who violates the provisions of section 6 or section 7 of this Act shall be liable to the employee or employees affected in the amount of their unpaid minimum wages, or the unpaid overtime compensation, as the case may be, and in an additional equal amount as liquidated damages. Any employer who violates the provisions of section 15(a)(3) or 18D of this Act shall be liable for such legal or equitable relief as may be appropriate to effectuate the purposes of section 15(a)(3) or 18D, including without limitation employment, reinstatement, promotion, and the payment of wages lost and an additional equal amount as liquidated damages. Any employer who violates section 3(m)(2)(B) shall be liable to the employee or employees affected in the amount of the sum of any tip credit taken by the employer and all such tips unlawfully kept by the employer, and in an additional equal amount as liquidated damages. An action to recover the liability prescribed in the preceding sentences may be maintained against any employer (including a public agency) in any Federal or State court of competent jurisdiction by any one or more employees for and in behalf of himself or themselves and other employees similarly situated. No employees shall be a party plaintiff to any such action unless he gives his consent in writing to become such a party and such consent is filed in the court in which such action is brought. The court in such action shall, in addition to any judgment awarded to the plaintiff or plaintiffs, allow a reasonable attorney's fee to be paid by the defendant, and costs of the action. The right provided by this subsection to bring an action by or on behalf of any employee, and the right of any employee to become a party plaintiff to any such action, shall terminate upon the filing of a complaint by the Secretary of Labor in an action under section 17 in which (1) restraint is sought of any further delay in the payment of un-

paid minimum wages, or the amount of unpaid overtime compensation, as the case may be, owing to such employee under section 6 or section 7 of this act by an employer liable therefor under the provisions of this subsection or (2) legal or equitable relief is sought as a result of alleged violations of section 15(a)(3) or 18D.

(c) The Secretary is authorized to supervise the payment of the unpaid minimum wages or the unpaid overtime compensation owing to any employee or employees under section 6 or 7 of this Act, and the agreement of any employee to accept such payment shall upon payment in full constitute a waiver by such employee of any right he may have under subsection (b) of this section to such unpaid minimum wages or unpaid overtime compensation and an additional equal amount as liquidated damages. The Secretary may bring an action in any court of competent jurisdiction to recover the amount of the unpaid minimum wages or overtime compensation and an equal amount as liquidated damages. The right provided by subsection (b) to bring an action by or on behalf of any employee to recover the liability specified in the first sentence of such subsection and of any employee to become a party plaintiff to any such action shall terminate upon the filing of a complaint by the Secretary in an action under this subsection in which a recovery is sought of unpaid minimum wages or unpaid overtime compensation under sections 6 and 7 or liquidated or other damages provided by this subsection owing to such employee by an employer liable under the provisions of subsection (b), unless such action is dismissed without prejudice on motion of the Secretary. Any sums thus recovered by the Secretary on behalf of an employee pursuant to this subsection shall be held in a special deposit account and shall be paid, on order of the Secretary, directly to the employee or employees affected. Any such sums not paid to an employee because of inability to do so within a period of three years shall be covered into the Treasury of the United States as miscellaneous receipts. In determining when an action is commenced by the Secretary under this subsection for the purposes of the statutes of limitations provided in section 6(a) of the Portal-to-Portal Act of 1947, it shall be considered to be commenced in the case of any individual claimant on the date when the complaint is filed if he is specifically named as a party plaintiff in the complaint, or if his name did not so appear, on the subsequent date on which his name is added as a party plantiff in such action. The authority and requirements described in this subsection shall apply with respect to a violation of section 3(m)(2)(B), as appropriate, and the employer shall be liable for the amount of the sum of any tip credit taken by the employer and all such tips unlawfully kept by the employer, and an additional equal amount as liquidated damages.

(d) In any action or proceeding commenced prior to, on, or after the date of enactment of this subsection, no employer shall be subject to any liability or punishment under this Act or the Portal-to-Portal Act of 1947 on account of his failure to comply with any provision or provisions of such Acts (1) with respect to work heretofore or hereafter performed in a workplace to which the exemption in section 13(f) is applicable, (2) with respect to work performed in Guam, the Canal Zone, or Wake Island before the effective date of this amendment of subsection (d), or (3) with respect to work per-

formed in a possession named in section 6(a)(3) at any time prior to the establishment by the Secretary, as provided therein, of a minimum wage rate applicable to such work.

(e)(1)(A) Any person who violates the provisions of sections 12 or 13(c), relating to child labor, or any regulation issued pursuant to such sections, shall be subject to a civil penalty not to exceed—

(i)[6] $11,000 for each employee who was the subject of such a violation; or

(ii)[6] $50,000 with regard to each such violation that causes the death or serious injury of any employee under the age of 18 years, which penalty may be doubled where the violation is a repeated or willful violation.

(B) For purposes of subparagraph (A), the term "serious injury" means—

(i) permanent loss or substantial impairment of one of the senses (sight, hearing, taste, smell, tactile sensation);

(ii) permanent loss or substantial impairment of the function of a bodily member, organ, or mental faculty, including the loss of all or part of an arm, leg, foot, hand or other body part; or

(iii) permanent paralysis or substantial impairment that causes loss of movement or mobility of an arm, leg, foot, hand or other body part.

(2) Any person who repeatedly or willfully violates section 6 or 7, relating to wages, shall be subject to a civil penalty not to exceed $1,100 for each such violation. Any person who violates section 3(m)(2)(B) shall be subject to a civil penalty not to exceed $1,100 for each such violation, as the Secretary determines appropriate, in addition to being liable to the employee or employees affected for all tips unlawfully kept, and an additional equal amount as liquidated damages, as described in subsection (b).

(3) In determining the amount of any penalty under this subsection, the appropriateness of such penalty to the size of the business of the person charged and the gravity of the violation shall be considered. The amount of any penalty under this subsection, when finally determined, may be—

(A) deducted from any sums owing by the United States to the person charged;

(B) recovered in a civil action brought by the Secretary in any court of competent jurisdiction, in which litigation the Secretary shall be represented by the Solicitor of Labor; or

(C) ordered by the court, in an action brought for a violation of section 15(a)(4) or a repeated or willful violation of section 15(a)(2), to be paid to the Secretary.

(4) Any administrative determination by the Secretary of the amount of any penalty under this subsection shall be final, unless within 15 days after receipt of notice thereof by certified mail the person charged with the violation takes exception to the determination that the violations for which the penalty is imposed occurred, in which event final determination of the penalty shall be made in an administrative proceeding after opportunity for hearing in ac-

[6] Margins for clauses (i) and (ii) of subsection (e)(1)(A) so in law.

cordance with section 554 of title 5, United States Code, and regulations to be promulgated by the Secretary.

(5) Except for civil penalties collected for violations of section 12, sums collected as penalties pursuant to this section shall be applied toward reimbursement of the costs of determining the violations and assessing and collecting such penalties, in accordance with the provision of section 2 of the Act entitled "An Act to authorize the Department of Labor to make special statistical studies upon payment of the cost thereof and for other purposes" (29 U.S.C. 9a). Civil penalties collected for violations of section 12 shall be deposited in the general fund of the Treasury.

[29 U.S.C. 216] Enacted June 25, 1938, ch. 676, sec. 16, 52 Stat. 1069; amended May 14, 1947, ch. 52, sec. 5(a), 61 Stat. 87; amended October 26, 1949, ch. 736, sec. 14, 63 Stat. 919; amended August 8, 1956, ch. 1035, sec. 4, 70 Stat. 1118; amended August 30, 1957, P.L. 85-231, sec. 1(2), 71 Stat. 514; amended May 5, 1961, P.L. 87-30, sec. 12(a), 75 Stat. 74; amended September 23, 1966, P.L. 89-601, title VI, sec. 601(a), 80 Stat. 844; amended April 8, 1974, P.L. 93-259, secs. 6(d)(1), 25(c), 26, 88 Stat. 61, 72, 73; amended November 1, 1977, P.L. 95-151, sec. 10, 91 Stat.1252; amended November 17, 1989, P.L. 101-157, sec. 9, 103 Stat. 945; amended November 5, 1990, P.L. 101-508, sec. 3103, 104 Stat. 1388-29; amended August 6, 1996, P.L. 104-174, sec. 2, 110 Stat. 1554; amended May 21, 2008, P.L. 110-233, sec. 302(a), 122 Stat. 920.

INJUNCTION PROCEEDINGS

SEC. 17. The district courts, together with the United States District Court for the District of the Canal Zone, the District Court of the Virgin Islands, and the District Court of Guam shall have jurisdiction, for cause shown, to restrain violations of section 15, including in the case of violations of section 15(a)(2) the restraint of any withholding of payment of minimum wages or overtime compensation found by the court to be due to employees under this Act (except sums which employees are barred from recovering, at the time of the commencement of the action to restrain the violations, by virtue of the provisions of section 6 of the Portal-to-Portal Act of 1947).

[29 U.S.C. 217] Enacted June 25, 1938, ch. 676, sec. 17, 52 Stat. 1069; amended October 26, 1949, ch. 736, sec. 15, 63 Stat. 919; amended August 30, 1957, P.L. 85-231, sec. 1(3), 71 Stat. 514; amended July 12, 1960, P.L. 86-624, sec. 21(c), 74 Stat. 417; amended May 5, 1961, P.L. 87-30, sec. 12(b), 75 Stat. 74.

RELATION TO OTHER LAWS

SEC. 18. (a) No provision of this Act or of any order thereunder shall excuse noncompliance with any Federal or State law or municipal ordinance establishing a minimum wage higher than the minimum wage established under this Act or a maximum workweek lower than the maximum workweek established under this Act, and no provision of this Act relating to the employment of child labor shall justify noncompliance with any Federal or State law or municipal ordinance establishing a higher standard than the standard established under this Act. No provision of this Act shall justify any employer in reducing a wage paid by him which is in excess of the applicable minimum wage under this Act, or justify any employer in increasing hours of employment maintained by him which are shorter than the maximum hours applicable under this Act.

(b) Notwithstanding any other provision of this Act (other than section 13(f)) or any other law—

(1) any Federal employee in the Canal Zone engaged in employment of the kind described in section 5102(c)(7) of title 5, United States Code, and

(2) any employee employed in a nonappropriated fund instrumentality under the jurisdiction of the Armed Forces,

shall have his basic compensation fixed or adjusted at a wage rate that is not less than the appropriate wage rate provided for in section 6(a)(1) of this Act (except that the wage rate provided for in section 6(b) shall apply to any employee who performed services during the workweek in a work place within the Canal Zone), and shall have his overtime compensation set at an hourly rate not less than the overtime rate provided for in section 7(a)(1) of this Act.

[29 U.S.C. 218] Enacted June 25, 1938, ch. 676, sec. 18, 52 Stat. 1069; amended September 23, 1966, P.L. 89-601, title III, sec. 306, 80 Stat. 841; amended September 11, 1967, P.L. 90-83, sec. 8, 81 Stat. 222.

SEC. 18B. NOTICE TO EMPLOYEES.

(a) IN GENERAL.—In accordance with regulations promulgated by the Secretary, an employer to which this Act applies, shall provide to each employee at the time of hiring (or with respect to current employees, not later than March 1, 2013), written notice—

(1) informing the employee of the existence of an Exchange, including a description of the services provided by such Exchange, and the manner in which the employee may contact the Exchange to request assistance;

(2) if the employer plan's share of the total allowed costs of benefits provided under the plan is less than 60 percent of such costs, that the employee may be eligible for a premium tax credit under section 36B of the Internal Revenue Code of 1986 and a cost sharing reduction under section 1402 of the Patient Protection and Affordable Care Act if the employee purchases a qualified health plan through the Exchange; and

(3) if the employee purchases a qualified health plan through the Exchange, the employee may lose the employer contribution (if any) to any health benefits plan offered by the employer and that all or a portion of such contribution may be excludable from income for Federal income tax purposes.

(b) EFFECTIVE DATE.—Subsection (a) shall take effect with respect to employers in a State beginning on March 1, 2013.

[29 U.S.C. 218b] Enacted March 23, 2010, P.L. 111-148, sec. 1512, 124 Stat. 252; amended April 15, 2011, P.L. 112-10 [div. B], sec. 1858(c), 125 Stat. 169.

SEC. 18C. PROTECTIONS FOR EMPLOYEES.

(a) PROHIBITION.—No employer shall discharge or in any manner discriminate against any employee with respect to his or her compensation, terms, conditions, or other privileges of employment because the employee (or an individual acting at the request of the employee) has—

(1) received a credit under section 36B of the Internal Revenue Code of 1986 or a subsidy under section 1402 of this Act;

(2) provided, caused to be provided, or is about to provide or cause to be provided to the employer, the Federal Government, or the attorney general of a State information relating

to any violation of, or any act or omission the employee reasonably believes to be a violation of, any provision of this title (or an amendment made by this title);

(3) testified or is about to testify in a proceeding concerning such violation;

(4) assisted or participated, or is about to assist or participate, in such a proceeding; or

(5) objected to, or refused to participate in, any activity, policy, practice, or assigned task that the employee (or other such person) reasonably believed to be in violation of any provision of this title (or amendment), or any order, rule, regulation, standard, or ban under this title (or amendment).

(b) COMPLAINT PROCEDURE.—

(1) IN GENERAL.—An employee who believes that he or she has been discharged or otherwise discriminated against by any employer in violation of this section may seek relief in accordance with the procedures, notifications, burdens of proof, remedies, and statutes of limitation set forth in section 2087(b) of title 15, United States Code.

(2) NO LIMITATION ON RIGHTS.—Nothing in this section shall be deemed to diminish the rights, privileges, or remedies of any employee under any Federal or State law or under any collective bargaining agreement. The rights and remedies in this section may not be waived by any agreement, policy, form, or condition of employment.

[29 U.S.C. 218c] Enacted March 23, 2010, P.L. 111–148, sec. 1558, 124 Stat. 261.

SEC. 18D. BREASTFEEDING ACCOMMODATIONS IN THE WORKPLACE.

(a) IN GENERAL.—An employer shall provide—

(1) a reasonable break time for an employee to express breast milk for such employee's nursing child for 1 year after the child's birth each time such employee has need to express the milk; and

(2) a place, other than a bathroom, that is shielded from view and free from intrusion from coworkers and the public, which may be used by an employee to express breast milk.

(b) COMPENSATION.—

(1) IN GENERAL.—Subject to paragraph (2), an employer shall not be required to compensate an employee receiving reasonable break time under subsection (a)(1) for any time spent during the workday for such purpose unless otherwise required by Federal or State law or municipal ordinance.

(2) RELIEF FROM DUTIES.—Break time provided under subsection (a)(1) shall be considered hours worked if the employee is not completely relieved from duty during the entirety of such break.

(c) EXEMPTION FOR SMALL EMPLOYERS.—An employer that employs less than 50 employees shall not be subject to the requirements of this section, if such requirements would impose an undue hardship by causing the employer significant difficulty or expense when considered in relation to the size, financial resources, nature, or structure of the employer's business.

(d) EXEMPTION FOR CREWMEMBERS OF AIR CARRIERS.—

(1) IN GENERAL.—An employer that is an air carrier shall not be subject to the requirements of this section with respect to an employee of such air carrier who is a crewmember

(2) DEFINITIONS.—In this subsection:

(A) AIR CARRIER.—The term "air carrier" has the meaning given such term in section 40102 of title 49, United States Code.

(B) CREWMEMBER.—The term "crewmember" has the meaning given such term in section 1.1 of title 14, Code of Federal Regulations (or successor regulations).

(e) APPLICABILITY TO RAIL CARRIERS.—

(1) IN GENERAL.—Except as provided in paragraph (2), an employer that is a rail carrier shall be subject to the requirements of this section.

(2) CERTAIN EMPLOYEES.—An employer that is a rail carrier shall be subject to the requirements of this section with respect to an employee of such rail carrier who is a member of a train crew involved in the movement of a locomotive or rolling stock or who is an employee who maintains the right of way, provided that compliance with the requirements of this section does not—

(A) require the employer to incur significant expense, such as through the addition of such a member of a train crew in response to providing a break described in subsection (a)(1) to another such member of a train crew, removal or retrofitting of seats, or the modification or retrofitting of a locomotive or rolling stock; or

(B) result in unsafe conditions for an individual who is an employee who maintains the right of way.

(3) SIGNIFICANT EXPENSE.—For purposes of paragraph (2)(A), it shall not be considered a significant expense to modify or retrofit a locomotive or rolling stock by installing a curtain or other screening protection.

(4) DEFINITIONS.—In this subsection:

(A) EMPLOYEE WHO MAINTAINS THE RIGHT OF WAY.—The term "employee who maintains the right of way" means an employee who is a safety-related railroad employee described in section 20102(4)(C) of title 49, United States Code.

(B) RAIL CARRIER.—The term "rail carrier" means an employer described in section 13(b)(2).

(C) TRAIN CREW.—The term "train crew" has the meaning given such term as used in chapter II of subtitle B of title 49, Code of Federal Regulations (or successor regulations).

(f) APPLICABILITY TO MOTORCOACH SERVICES OPERATORS.—

(1) IN GENERAL.—Except as provided in paragraph (2), an employer that is a motorcoach services operator shall be subject to the requirements of this section.

(2) EMPLOYEES WHO ARE INVOLVED IN THE MOVEMENT OF A MOTORCOACH.—An employer that is a motorcoach services operator shall be subject to the requirements of this section with respect to an employee of such motorcoach services operator who is involved in the movement of a motorcoach provided

that compliance with the requirements of this section does not—

(A) require the employer to incur significant expense, such as through the removal or retrofitting of seats, the modification or retrofitting of a motorcoach, or unscheduled stops; or

(B) result in unsafe conditions for an employee of a motorcoach services operator or a passenger of a motorcoach.

(3) SIGNIFICANT EXPENSE.—For purposes of paragraph (2)(A), it shall not be considered a significant expense—

(A) to modify or retrofit a motorcoach by installing a curtain or other screening protection if an employee requests such a curtain or other screening protection; or

(B) for an employee to use scheduled stop time to express breast milk.

(4) DEFINITIONS.—In this subsection:

(A) MOTORCOACH; MOTORCOACH SERVICES.—The terms "motorcoach" and "motorcoach services" have the meanings given the terms in section 32702 of the Motorcoach Enhanced Safety Act of 2012 (49 U.S.C. 31136 note).

(B) MOTORCOACH SERVICES OPERATOR.—The term "motorcoach services operator" means an entity that offers motorcoach services.

(g) NOTIFICATION PRIOR TO COMMENCEMENT OF ACTION.—

(1) IN GENERAL.—Except as provided in paragraph (2), before commencing an action under section 16(b) for a violation of subsection (a)(2), an employee shall—

(A) notify the employer of such employee of the failure to provide the place described in such subsection; and

(B) provide the employer with 10 days after such notification to come into compliance with such subsection with respect to the employee.

(2) EXCEPTIONS.—Paragraph (1) shall not apply in a case in which—

(A) the employee has been discharged because the employee—

(i) has made a request for the break time or place described in subsection (a); or

(ii) has opposed any employer conduct related to this section; or

(B) the employer has indicated that the employer has no intention of providing the place described in subsection (a)(2).

(h) INTERACTION WITH STATE AND FEDERAL LAW.—

(1) LAWS PROVIDING GREATER PROTECTION.—Nothing in this section shall preempt a State law or municipal ordinance that provides greater protections to employees than the protections provided for under this section.

(2) NO EFFECT ON TITLE 49 PREEMPTION.—This section shall have no effect on the preemption of a State law or municipal ordinance that is preempted under subtitle IV, V, or VII of title 49, United States Code.

[29 U.S.C. 218d] Enacted December 29, 2022, division KK of P.L. 117–328, sec. 102(a)(2), 136 Stat. 6093.

SEPARABILITY OF PROVISIONS

SEC. 19. If any provision of this Act or the application of such provision to any person or circumstances is held invalid, the remainder of the Act, and the application of such provision to other persons or circumstances shall not be affected thereby.

[29 U.S.C. 219] Enacted June 25, 1938, ch. 676, sec. 19, 52 State. 1069.

ARTICLE 5. ADDITIONAL INFORMATION TO BIDDERS

Section 5.01 Changes in the Standard Forms

The following forms or documents reflect changes to the Standard Forms as presented in the Section B.1 Standard Instructions to Bidders, Article 8. Standard Forms:

1. Payment Bond
2. Performance Bond

1. PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____as principal, ____ and __ as sureties, are hereby held and firmly bound unto the Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico, in the sum of _____($_____ _____) Dollars, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _day of _____, 20____.

The condition of this obligation is such that:

Whereas, the said principal did on the _____day of _____, 20_____ enter into a contract with the Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico for furnishing materials and performing labor required for the construction of:

Project: _____

(Project Description)

_____ _____ _____

(CIP NUMBER) (Federal Funding Agency: EPA, FEMA, RD, PWS or N/A) (Funding Agency Number)

located at _____

_____, _____, Puerto Rico,

(Ward) (City)

as stated in his PROPOSAL, which said contract is made a part of this, the bond, the same as though set forth herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Principal and all Subcontractors to whom any portion of the Work provided for in said contract is sublet, shall pay all lawful claims of Subcontractors and material men for labor performed and materials furnished in the carrying forward, performing or completing of said contract, (we agreeing and assenting that this undertaking shall be for the benefit of any material man having a just claim, as well as for the obligee herein), and shall promptly make payment to all persons who perform labor or render services in the prosecution of the Work provided for in said contract then this obligation shall be void; otherwise to remain in full force and effect.

All persons who have performed labor or rendered services as foresaid shall have a direct right of action against the Principal and Surety, on this Bond, which right of action shall be asserted in proceedings instituted in Puerto Rico. Insofar as permitted by the laws of Puerto Rico, such right of action shall be asserted in a proceeding instituted in the name of the obligate to the use and benefit of the persons instituting such action and of all other persons having claims hereunder shall have the right to be made a party to such proceeding (but not later than twelve months after the complete performance of said Contract and final settlement thereof) and to have such claim adjudicated in such action and judgment rendered thereon.

Moreover, all controversies, claims, counter-claims, action for subrogation by the Surety, disputes and any other matter in question between PRASA and the Surety arising out of the Payment Bond or pursuant to the Commonwealth Statutory Law and/or related to the interpretation of the Contract Documents or its breach in case that the Contractor or Design-Builder Contractor failed to pay any subcontractor, supplier or labor and that is not resolved in a mediation proceeding per section(s) 16.3 of the General Conditions; and which have not been waived in accordance with it; then the Surety ***expressly agree*** to submit themselves to the courts of the Commonwealth of Puerto Rico, San Juan, Part. The

obligation of the Surety to expressly submit to the Court of the Commonwealth is not subject to the expiration term of this bond. Furthermore, the Surety's obligation to expressly submit to the Court of the Commonwealth, as indicated hereto, will not lapse is the Surety brings any action against PRASA after the term of this bond has ended. In the same fashion, the Surety hereby waive its right, if any, to file a lawsuit or claim against PRASA in the United State Federal Court System.

The Surety shall not be liable hereunder for any damages or compensation recoverable under any workmen's compensation or employer's liability statute.

In no event shall the Surety be liable for a greater sum than that specified in this bond, or subject to any suit, action or proceeding therein that is instituted later than twelve months after the complete performance of said Contract and final settlement thereof.

As used herein the term person refers to any person engaged in the prosecution of the Work provided for in said Contract or in any amendment or extension of or addition to said Contract, who is an agent, servant or employee of the Principal, or of any Subcontractor, or of any assignee of said Principal or of any subcontract or, and also anyone so engaged who performs the work of a laborer or of a mechanic regardless of any contractual relationship between the Principal, or any assignee of said Subcontractor, and such laborer or mechanic, but shall not include office employees not regularly stationed at the side of the Work.

This bond will remain in full force and effect for an additional year after the date of acceptance of the Work and liquidation of the contract.

SIGNED, SEALED AND DELIVERED This _____day

of _____, _____.

PRINCIPAL:

Firm Name:_____

By (Typed Name): _____

Authorized Representative

Address:_____

_____

Signature: _____

Date: _____

Seal

SURETY:

Firm Name:_____

By (Typed Name): _____

Authorized Representative

Address: _____

_____

Signature: _____

Date: _____

Seal

SURETY:

Firm Name:_____

By (Typed Name):_____

Title_____

Address: _____

_____

Signature: _____

Date: _____

Seal

Note: Date of BOND must not be prior to date of Contract. If Contractor is partnership, all partners should execute BOND.
IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current List (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

2. PERFORMANCE BOND

KNOW ALL MEN BYTHESE PRESENTS, that we, the undersigned _____ _____as principal, _____and _____sureties, are hereby held and firmly bound unto the Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico, in the sum of _____ _____($ _____) Dollars, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _____day of _____, _____.

The condition of this obligation is such that:

Whereas, the said principal did on the _____day of _____, _____ enter into a contract with the Puerto Rico Aqueduct and Sewer Authority, San Juan, Puerto Rico for furnishing materials, equipment and performing labor required for the Construction of:

Project: _____
(Project Description)

_____ _____ _____
(CIP NUMBER) (Federal Funding Agency: EPA, FEMA, RD, PWS or N/A) (Funding Agency Number)

located at _____

_____, _____, Puerto Rico,
(Ward) (City)

as stated in his PROPOSAL, which said contract is made a part of this, the bond, the same as though set forth herein.

Now, if the said principal shall well and faithfully do and perform said contract, then this obligation shall be void; otherwise the same shall remain in full force and effect it being expressly understood and agreed that the liability of surety for any and all claims hereunder shall in no event exceed the amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modification, omissions or addition in or to the terms of the said contract or in or to the Construction Drawings or specifications therefore shall in anywise affect the obligation of said surety on its bond.

In addition, the surety hereby stipulates that all controversies, claims, counter-claims, disputes and any other matter in question between PRASA and the Surety arising out of the Performance Bond and related to the interpretation of the Contract Documents or its breach in case that the Contractor or Design-Builder Contractor is declared in Default and not resolved in either a mediation proceeding per section(s) 16.3 of the General Conditions; and which have not been waived in accordance with it; then the surety expressly agree to submit themselves to the courts of the Commonwealth of Puerto Rico, San Juan, Part. The obligation of the surety to expressly submit to the Court of the Commonwealth is not subject to the expiration term of this bond. Furthermore, the surety's obligation to expressly submit to the Court of the Commonwealth, as indicated hereto, will not lapse is the Surety brings any action against PRASA after the term of this bond has ended. In same fashion, the Surety hereby waive if rights, if any, to file a claim or lawsuit in the United State Federal Court System.

This bond will remain in full force and effect for an additional year after the date of acceptance of the Work and liquidation of the contract.

SIGNED, SEALED AND DELIVERED This _____day of

_____, _____.

PRINCIPAL:	SURETY:
Firm Name:_____	Firm Name:_____
By (Typed Name): _____	By (Typed Name): _____
Authorized Representative	Authorized Representative
Address:_____	Address: _____
_____	_____

Signature: _____ Signature: _____

Date: _____ Date: _____

Seal Seal

SURETY:

Firm Name:_____

By (Typed Name):_____

Title_____

Address: _____

_____

Signature: _____

Date: _____

Seal

Note: Date of BOND must not be prior to date of Contract. If Contractor is partnership, all partners should execute BOND.
IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current List (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

ARTICLE 6. – CLARIFICATION TO BIDDERS

1. Contractor shall use the Davis Bacon guidelines, as well as the establish form for payroll, HUD 4710 (09/2024), during execution of the work.

2. SECTION B.4, ARTICLE 1 ON PAGE B.4 16 OF 64 IS HEREBY AMENDED TO READ AS FOLLOWS:

III. Proposal Guarantee - Unless otherwise stated in the Bid Documents, proposals must be accompanied by a Proposal Guarantee in an amount equal to five (5%) percent of the proposal and complying with the requirements for bonds in Section IV and Section VII. If the proposal guarantee is a bid bond, an original and four (4) copies of the bid bond must be submitted, duly complete and signed, using the forms provided by PRASA in the Bid Documents. The bid bond shall remain effective for at least **ninety (90) days** after the bid opening date or for a longer period of time, if so, is specified in the Bid Documents.

If the Proposal Guarantee is a certified check, it will be retained to pay for any damage or loss to PRASA in case the successful Bidder neglects or refuses to enter into a contract in accordance with the proposal.

The bid bond must be accompanied by the

A. "Power of Attorney",

B. Acknowledgement of Surety,

C. Copy of license issued by the Office of the Insurance Commissioner of Puerto Rico, and the bond shall be duly classified as in Section J.

3. SECTION B.4, ARTICLE 2 ON PAGE B.4 52-53 OF 64 IS HEREBY AMENDED TO READ AS FOLLOWS:

3. Proposal Guarantee - Unless otherwise stated in the Bid Documents, proposals must be accompanied by a Proposal Guarantee in an amount equal to five (5%) percent of the proposal and complying with the requirements for bonds in Section 4 and Section 7.

If the proposal guarantee is a bid bond, an original and four (4) copies of the bid bond must be submitted, duly completed, and signed, using the forms provided by PRASA in the Bid Documents. The bid bond shall remain effective for at least **ninety (90) days** after the bid opening date or for a longer period of time, if so, is specified in the Bid Documents.

If the Proposal Guarantee is a certified check, it will be retained to pay for any damage or loss to PRASA in case the successful Bidder neglects or refuses to enter into a contract in accordance with the proposal.

The bid bond must be accompanied by the
a) "Power of Attorney",
b) Acknowledgement of Surety,

c) Copy of license issued by the Office of the Insurance Commissioner of Puerto Rico, and the bond shall be duly classified as in Section J.

4. COR3 Memo entitled "*Rótulos en Proyectos de Construcción*" and Project Sign Template are herein attached.



OFICINA CENTRAL DE RECUPERACIÓN, RECONSTRUCCIÓN Y RESILIENCIA

COR3

GOBIERNO DE PUERTO RICO

21 de octubre de 2025

A: Todos los Subrecipientes

RE: Rótulos en Proyectos de Construcción

La Oficina Central para la Recuperación, Reconstrucción y Resiliencia de Puerto Rico (COR3) emite la presente notificación a todos los Subrecipientes:

De conformidad con lo establecido en las Órdenes Ejecutivas OE-2017-065, OE-2017-069, OE-2018-011 y OE-2020-014, el Gobierno de Puerto Rico ha delegado en COR3 la responsabilidad de identificar, procurar, administrar y canalizar todos los recursos estatales, federales y/o privados disponibles para la recuperación y reconstrucción de Puerto Rico. Asimismo, se ha designado al Director Ejecutivo de COR3 como el Representante Autorizado del Gobernador ante la Agencia Federal para el Manejo de Emergencias (FEMA), con la responsabilidad de administrar los programas federales de asistencia por desastres y garantizar el cumplimiento de los acuerdos establecidos con dicha agencia, conforme a lo dispuesto en el 44 C.F.R. § 206.44.

En el ejercicio de dichas funciones, COR3 no solo administra fondos, sino que también actúa como entidad intermediaria (*pass-through entity*) responsable de asegurar el cumplimiento de las condiciones que rigen el uso de los fondos federales. Conforme a lo dispuesto en los 2 C.F.R. §§ 200.208 y 200.332, COR3 está facultado para establecer condiciones específicas o adicionales cuando estas sean necesarias para promover la transparencia, fortalecer los mecanismos de supervisión y garantizar el uso adecuado de los recursos públicos asignados bajo subvención federal.

En virtud de lo anterior, y como medida dirigida a promover la visibilidad y el reconocimiento del esfuerzo conjunto entre el Gobierno de Puerto Rico y el Gobierno de los Estados Unidos, se instruye a todos los subrecipientes a instalar y mantener un rótulo informativo en cada proyecto de construcción que esté siendo financiado, en todo o en parte, con fondos de los Programas de Asistencia Pública o de Subvención para la Mitigación de Riesgos de FEMA canalizados a través de COR3. Dicho rótulo deberá incluir el logo oficial de COR3, junto con el texto que identifique claramente que el proyecto es financiado con fondos federales de los Programas de Asistencia Pública o de Subvención para la Mitigación de Riesgos de FEMA administrados por COR3.

Esta acción se fundamenta en los principios de transparencia, divulgación y rendición de cuentas establecidos en el 2 C.F.R. § 200.113, y refuerza el compromiso del Gobierno de Puerto Rico con la administración responsable de los fondos destinados a la recuperación y reconstrucción. Su cumplimiento contribuye a fortalecer la confianza pública en los procesos de recuperación y a visibilizar el impacto positivo de los esfuerzos conjuntos entre los gobiernos estatal y federal.

50 PR-165 SECTOR. BUCHANAN PARQUE INDUSTRIAL GPR. MEDIA, SUITE 2, GUAYNABO, P.R. 00968
PO BOX 42001 SAN JUAN, PR. 00940-2001 • 787-474-7050 • INFO@COR3.PR.GOV

A.7 SUPPLEMENTARY TECHNICAL SPECIFICATIONS

REHABILITATION OF THE RIO PRIETO RAW WATER INTAKE
YAUCO, PUERTO RICO
CIP NUMBER: 4-79-7005
BID NUMBER: 27-SP-021

SUPPLEMENTARY TECHNICAL SPECIFICATIONS INDEX

No.	DESCRIPTION	TOTAL PAGES
01010	SUMMARY OF WORK	6
01143	COORDINATION WITH OWNER'S OPERATIONS	6
01450	QUALITY CONTROL	6
01500	CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS	11
01600	MATERIALS AND EQUIPMENT	8
01810	EQUIPMENT TESTING	8
02223	TRENCH SAFETY SYSTEM	3
02227	WASTE MATERIAL DISPOSAL	2
02230	STONES AND CHANNEL PROTECTION	3
02310	NONWOVEN GEOTEXTILES	4
02920	DIVERSION AND DEWATERING	5
02930	VERTICAL HIGH DENSITY CROSS-LINKED POLYETHYLENE STORAGE TANK	8
03000	CONCRETE REHABILITATION	5
03100	CONCRETE FORMWORK	6
03213	PORTLAND CEMENT CONCRETE PAVING	39
03251	EXPANSION, CONSTRUCTION AND CONTROL JOINTS	10
03300A	RAW WATER INTAKE STRUCTURE CAST-IN-PLACE CONCRETE	17
03370	CONCRETE CURING	5
03456	PRECAST STRUCTURES	3
03500	MASS CONCRETE	14
03600	GROUT	4
05050	WELDING	5
05500	METAL FABRICATIONS AND CASTINGS	12
05510	METAL STAIRS, LADDERS AND WALKWAYS	9
07526	MODIFIED BITUMINOUS MEMBRANE ROOFING	8
07800	EPOXY FLOOR FINISH	7
07841	PENETRATION FIRESTOPPING	7

SECTION No.	DESCRIPTION	TOTAL PAGES
08113	HOLLOW METAL DOORS AND FRAMES	12
08345	SECURITY DOORS AND FRAMES	12
08710	DOOR HARDWARE	10
08900	LOUVERS AND VENTS	6
11212	VERTICAL TURBINE PUMPS	11
11306	LUBRICATION PUMPS	5
13300	I&C – GENERAL PROVISIONS	23
13302	I&C – GENERAL TESTING	15
13303	I&C – GENERAL TRAINING	9
13305	I&C – CONTROL DESCRIPTIONS	25
13306	I&C – GENERAL APPLICATIONS ENGINEERING SERVICES	18
13311	I&C – PLC HARDWARE AND SOFTWARE	13
13315	I&C – HMI SYSTEM SOFTWARE	4
13320	I&C – CONTROL AND DATA NETWORK EQUIPMENT	13
13325	I&C – ANTENNA SUPPORT STRUCTURES AND LIGHTNING PROTECTION	9
13330	I&C – CONTROL PANELS AND PANEL-MOUNTED EQUIPMENT	18
13332	I&C – SURGE SUPPRESSORS	7
13335	I&C – UNINTERRUPTIBLE POWER SUPPLY (SINGLE-PHASE AND DC-DC)	9
13340	I&C – INSTRUMENTS	10
13341	I&C – FLOW DEVICES	7
13342	I&C – LEVEL DEVICES	10
13343	I&C – PRESSURE DEVICES	8
13344	I&C – TEMPERATURE DEVICES	5
13350	I&C – VENDOR PACKAGE SYSTEM CONTROLS INTEGRATION	2
15002	TESTING OF PIPING SYSTEMS	5
15031	DUCTILE IRON PIPE AND FITTINGS	9
15042	EQUIPMENT INSTALLATION	4
15100	VALVES AND OPERATORS	4

SECTION No.	DESCRIPTION	TOTAL PAGES
15101	MISCELLANEOUS VALVES	9
15145	PIPING SUPPORT SYSTEMS	13
15300	STAINLESS STEEL SLUICE GATES & SLIDE GATES	7
15980	“COANDA EFFECT” WEDGE WIRE SCREEN	2
16050	BASIC ELECTRICAL MATERIALS AND METHODS	16
16485	ADJUSTABLE FREQUENCY DRIVE SYSTEMS	14
16621	STEEL FUEL-OIL STORAGE TANK	3
260500	COMMON WORK RESULTS FOR ELECTRICAL SYSTEM	12
260519	LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND	6
260526	CABLES GROUNDING AND BONDING FOR ELECTRICAL	6
260529	SYSTEMS HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	6
260533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS	8
260543	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS	13
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS	6
26712	INTRUDER ALARM AND SECURITY CAMERA SYSTEM	9
260850	ELECTRICAL TESTING	7
262416	PANELBOARDS	18
262726	WIRING DEVICES	9
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	6
265119	LED INTERIOR LIGHTING	7
265619	LED EXTERIOR LIGHTING	10

REHABILITATION OF THE RIO PRIETO
RAW WATER INTAKE
YAUCO, PUERTO RICO
CIP NUMBER: 4-79-7005
BID NUMBER: 27-SP-021

PRASA STANDARD TECHNICAL SPECIFICATIONS INDEX

The following Standard Technical Specifications are applicable to this project. Refer to Volume B, Section B.3 - Standard Technical Specifications.

SECTION No.	DESCRIPTION	TOTAL PAGES
010900	ABBREVIATIONS	6
013340	SHOP DRAWINGS, PRODUCT DATA AND SAMPLES	4
014480	TESTING LABORATORY SERVICES	3
014500	VALUE ENGINEERING INCENTIVE – VALUE ENGINEERING CHANGE PROPOSALS	3
015100	PRASA'S FIELD OFFICE	4
015800	PROJECT SIGN	8
016400	MANUFACTURERS' SERVICES	6
016500	FACILITY START-UP	8
017200	SURVEY AND STAKE OUT	3
017400	CLEANING DURING EXECUTION OF WORK	2
017800	OPERATION AND MAINTENANCE MANUAL	9
017805	HAZARD IDENTIFICATION	3
02A015	ROCK EXCAVATION	3
02A050	EXCAVATION, FILL/EMBANKMENT AND BACKFILL	11
02A092	TRENCH EXCAVATION FOR PIPE	9
02C025	DEMOLITION AND REPLACEMENT OF PAVEMENT, SIDEWALK, CURB AND GUTTER	9
02C040	BITUMINOUS PAVEMENT FOR ACCESS ROAD AND PAVED AREAS	1
02D005	DEMOLITION (GENERAL)	4

SECTION No.	DESCRIPTION	TOTAL PAGES
02D011	SITE CLEARING AND GRUBBING	3
02D020	LANDSCAPING & PLANTING	7
02D040	MOBILIZATION AND SITE PREPARATION	1
02D115	CUTTING AND REMOVING EXISTING CONCRETE, MASONRY AND MISCELLANEOUS WORK	2
02D130	DISPOSAL OF UNSUITABLE MATERIAL	1
02D205	CONCRETE MANHOLES	6
02D252	CAST IRON FRAMES AND COVERS	1
02D300	CHAIN LINK FENCE	2
030540	LEAN CONCRETE	1
032100	CONCRETE REINFORCEMENT	4
033100	CAST-IN-PLACE CONCRETE	5
040850	MASONRY ACCESSORIES	3
042212	CONCRETE BLOCKS	7
050900	ANCHOR BOLTS, EXPANSION ANCHORS AND CONCRETE INSERTS	3
051240	ALUMINUM FRAMES AND COVERS	2
055155	LADDER & SAFETY CAGE	2
055210	PIPE RAILING	2
055510	SAFETY TREADS FOR CONCRETE STAIRS	1
071010	WATERPROOFING OF CONCRETE STRUCTURES BELOW GRADE	1
071220	EPOXY COATING FOR PIPES AND STRUCTURES	4
079212	JOINT SEALERS	4
092210	CEMENT PLASTERING	2
092215	CEMENT FINISHES	3
099100	PAINTING	11
104010	AAA SEAL AND LETTERING	2
104520	DETECTABLE MARKING TAPE (TO BE USED ABOVE ALL WATER AND SANITARY PIPE)	3
144010	LIFTING DEVICE	4
15A020	WALL VENTILATOR	2
15C010	COPPER PIPE	2
15C031	DUCTILE IRON PIPE AND FITTINGS (FORCE MAINS)	9

SECTION No.	DESCRIPTION	TOTAL PAGES
15C040	DUCTILE IRON PIPE (GRAVITY SYSTEM)	5
15C100	POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE AND FITTINGS	4
15C115	PVC WATER (GRAVITY AND PRESSURE) AND SEWER FORCE MAIN PIPE AND FITTINGS	6
15D090	GALVANIZED STEEL TRAPS	1
15D160	FLANGED COUPLING ADAPTER	1
15E050	CONNECTION TO EXISTING MANHOLES	1
15E070	CONNECTION TO EXISTING WATER MAIN	1
160100	MATTING FOR FLOOR INSULATION	2
160200	LIGHTNING PROTECTION	4
160310	ELECTRICAL CONTROLS AND MISCELLANEOUS ELECTRICAL EQUIPMENT	4
160500	GENERAL ELECTRICAL WORK	29
160810	ELECTRIC FIELD ACCEPTANCE TESTS	3
161210	ELECTRIC WIRES AND CABLES	4
161310	ELECTRICAL RACEWAYS SYSTEMS	9
161312	CONDUIT	6
161315	FLEXIBLE CONDUITS	2
161317	UNDERGROUND DUCT BANKS	3
161320	OUTLET BOXES	2
161330	PULL AND JUNCTION BOXES	2
161410	WIRING DEVICES	4
161420	RECEPTACLES	2
162220	DIESEL-ENGINE GENERATING SET AND APPURTENANCES	14
162320	AUTOMATIC LOAD TRANSFER CONTROL	3
162710	GENERAL PURPOSE DRY-TYPE TRANSFORMERS	3
164310	DISCONNECT SWITCHES	2
164410	PANELBOARDS	3

SECTION 01010
SUMMARY OF WORK

PART 1 – GENERAL

1.1 PROJECT SUMMARY

A. Project name: Rehabilitation of the Río Prieto Raw Water Intake CIP # 4-79-7005

B. Location: Near State Road PR-372 and PR-3074, in La Montaña Sector of the Río Prieto Ward, in Yauco**.** Coordinates: 18° 08' 38.3" N, 66° 49' 31.4" W.

C. Purpose: Improve and eliminate infrastructure deficiencies that affect the safe access for operation and maintenance of the Río Prieto raw water intake and pump station facilities, in addition to bringing the facilities to compliance with current codes and industry standards. The project includes improvements to the existing raw water intake (RWI), construction of new pump station (PS), river weir improvements, installation of new raw water pressure pipeline, perimeter fences and improvements to access road.

1.2 PROJECT SCOPE

A. Furnish all labor, materials, equipment, tools, services, permits, testing, temporary works, and incidentals necessary to complete the Project in accordance with the Contract Documents.

B. The Work includes temporary river diversion and dewatering, construction of new raw water intake, pump station, control room, emergency generator and diesel tank, electrical upgrades (offsite electrical connection, substation, MCC, panels, I&C), access road and site improvements, and river bank stabilization, plus testing, commissioning, restoration, and closeout.

1.3 PROJECT BACKGROUND

The existing Río Prieto raw water facilities consist of a concrete gravity weir on the Prieto River, a lateral intake, two parallel gravity pipelines that convey flow from the intake to the existing pump station structure (which will be abandoned), a raw water pressure pipeline, an Emergency Generator Unit (EGU), a pole-mounted electrical substation, electrical and control panels, perimeter fencing, and an access road.

The current intake location is geomorphologically unfavorable, as it is situated on the inner side of a river bend where significant sediment deposition occurs. Due to site access constraints, improvements to the intake must remain in the same general location. The access road leading to the existing pump station is steep and narrow, complicating entry for

maintenance vehicles. For this reason, PRASA has determined that the pump station must be relocated to a more accessible area adjacent to the intake, which will be upgraded to reduce clogging and minimize sediment diversion.

1.4 MAJOR WORK ELEMENTS

A. Furnish all labor, materials, equipment, tools, conveyances, testing, temporary works, and incidentals necessary to complete the Work shown and specified.

B. Major components include, but are not limited to:

1. Temporary Works & Water Management.

    a. Install and maintain temporary raw water intake, river diversion (earth dike) and work-zone dewatering to isolate construction areas; protect all discharges against erosion.

    b. Provide and later remove/decommission all temporary diversion and dewatering works; refill the temporary channel and restore grades to pre-construction or plan grades.

2. Civil / Structural.

    a. Raw Water Intake: Excavation, intake structure, screens, valves/sluices, intake piping to the pump station, backfill/compaction.

    b. Pump Station: Foundations/slabs/wet well, pumps, suction/discharge headers, appurtenances, coatings, leak tests, and backfill.

    c. Control Room: Foundations, slab and building.

    d. Access Road & Site Improvements: Subgrade, base, final surfacing, swales/ditches/culverts with outlet protection, fences, gates, guardrails, and surface restoration (sodding).

    e. Raw Water Pipeline:

    Install the new raw water pressure pipeline from the pump station to a connection point along the existing raw water pipeline, including trenching, bedding, pipe installation, fittings, thrust restraints, hydrostatic testing, flushing, backfilling, compaction, and surface restoration.

3. Mechanical / Electrical / I&C.

    a. Electrical Improvements: New offsite connection, new substation, MCC, power and control panels, conduit/cable, grounding and bonding.

    b. Generator & Fuel System: Emergency generator, diesel storage tank, piping, and containment.

c. Instrumentation & Controls: Level/pressure/flow instruments; terminations; point-to-point checks; integration with plant systems.

4. Surface Stabilization & Restoration.

a. Sod all disturbed areas; water to establish; remove temporary erosion and sedimentation control measures after stable cover.

5. Testing, Startup & Commissioning.

a. Dry and wet testing of intake, pumps, electrical systems, and I&C; generator load testing; alarms/interlocks verification; operator training.

b. Submit as-built survey (intake, pump station, platform/electrical yard, bank protection limits/grades) and full QC closeout package.

1.5 CONTRACTOR RESPONSIBILITIES

A. Means and Methods: Any diversion/dewatering shown in the documents is suggested/conceptual. The Contractor is solely responsible for preparing and designing project-specific plans and sequences that meet project goals and specifications.

B. Plans for Approval (Pre-Work):

1. Diversion & Dewatering Plan (per 02920), including discharge locations, methods/equipment, sequencing, and seasonal contingencies; PRASA approval required prior to in/near-channel work.

2. Quality Control Plan (QCP/ITP) (per 01450), including definable features of work, Hold/Witness points, testing frequencies, daily CQC reports, and survey control.

C. Permits/Compliance: Comply with all permits, PRASA conditions, and environmental requirements.

D. Survey: Establish and maintain control; provide interim checks and final as-builts.

E. Access & Protection: Maintain access, protect existing improvements, and provide traffic/pedestrian control as required.

F. Water Management: Maintain continuous river flow, prevent offsite sediment discharge, and protect all dewatering discharge points against erosion.

G. Maintain the temporary raw water intake and existing pump station in continuous operation for the duration of the work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

A. This section presents a suggested construction sequence for planning purposes. The Contractor shall develop and submit its own detailed construction plan (means, methods, sequencing, contingencies) for Engineer/Owner approval before field work; approval of this sequence does not shift responsibility for performance.

1. Pre-Construction / Submittals
    a. Submit and obtain written acceptance of: Construction Plan, Dewatering & Diversion Plan (per 02920), and Quality Control Plan (QCP/ITP) (per 01450).
    b. Establish survey control; set staff gauges/reference marks for river stage/groundwater; take pre-construction photos.
    c. Confirm utility coordination, outages, and cut-over windows.
2. Mobilization, Access & Site Prep
    a. Install temporary access/staging and perimeter erosion/sediment controls.
    b. Construct/upgrade access road segments needed for construction traffic and heavy deliveries.
    c. Stake limits for intake, pump station, elevated platform, electrical yard, and bank protection.
3. Temporary Raw Water Intake, River Diversion & Work-Zone Isolation
    a. Construct the temporary raw water intake, temporary earth dike to separate river flow from the project work area; confirm freeboard/stability; open and maintain the diversion as shown/approved.
4. Dewatering
    a. Install sumps/pumps (well points if needed) within isolated areas; route discharge to approved points with erosion protection.
    b. Start dewatering; maintain workable subgrade moisture.
5. Raw Water Intake
    a. Excavate to design elevations; construct intake structure, screens, piping/sluice/valves as detailed.
    b. Install and connect intake piping toward the pump station.
    c. Backfill and compact.
6. Pump Station
    a. Excavate and construct pump station foundations/slab/wet well.

b. Install pumps, suction/discharge headers, isolation/check valves, fittings, and appurtenances; complete internal coatings and leak testing.

c. Install electrical and instrumentation connections, as well as specified instruments.

d. Backfill/compact, place slabs/curbs, and provide housekeeping pads.

7. Control Room, Generator & Diesel Tank

a. Construct foundations and concrete slabs.

b. Construct control room, install MCC, electrical panels, and instrumentation & controls cabinets.

c. Install emergency generator and diesel storage tank.

d. Pull power/control conduits and cables between substation, MCC, intake, pumps, instruments, and generator.

8. Electrical Improvements / Commissioning Prep

a. Construct the new offsite electrical connection, including conduit, cabling, utility coordination, and terminations as specified.

b. Complete new substation equipment, grounding, and protective relays as specified.

c. Install/terminate MCC, VFDs/starters, panels, and I&C devices (level/pressure/flow).

d. Perform point-to-point checks; cold commissioning (no flow) as feasible.

9. Raw Water Pipeline

a. Excavate trench, install raw water pressure pipeline, fittings, and appurtenances; perform thrust restraint construction, hydrostatic pressure tests, flushing, and backfilling with compaction per specifications.

b. Restore surfaces, including municipal road sections affected by the installation of the pipeline and offsite electrical work.

10. Decommission Temporary Diversion

a. Remove the temporary earth dike in stages while maintaining stable flow.

b. Restore flow paths as designed; monitor and patch any localized erosion.

11. Site Improvements

a. Construct access road at intake area (subgrade, base, final surfacing).

b. Install fences, gates, and guardrails.

c. Sod all disturbed areas (stake/peg on slopes ≥3H:1V and at ditches/outfalls); water to establish.

d. Remove temporary erosion controls after stable vegetative cover is achieved.

12. Startup, Testing & Commissioning

a. Energize substation/MCC; perform dry and wet testing of pumps, intake, instruments, and controls.

b. Conduct interlocks/alarms verification, generator load test, and operator training.

c. Resolve punch list items.

13. QC Closeout & As-Builts

a. Submit as-built survey (intake, pump station, platform/electrical yard, bank protection limits/grades).

b. Deliver QC package: daily CQC reports, test results (density, Proctors, electrical testing), certifications, and photos.

B. Contractor remains solely responsible for means/methods and for preparing/designing the project-specific Diversion & Dewatering Plan (02920) and Quality Control Plan (01450).

C. Maintain river flow and protect dewatering discharges from erosion at all times; coordinate outages and cut-overs to minimize service interruptions.

D. Hold/Witness points per the accepted QCP apply to layout, diversion acceptance, dewatering startup, subgrade checks, bank protection geometry, electrical energization, and final acceptance.

END OF SECTION

SECTION 01143
COORDINATION WITH OWNER'S OPERATIONS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:

1. This Section specifies requirements for coordinating with OWNER's operations during the Work and provides requirements for tie-ins and shutdowns necessary to complete the Work without impact on OWNER's operations other than as allowed herein.

2. CONTRACTOR shall provide labor, materials, tools, equipment and incidentals shown, specified and required to coordinate with OWNER's operations during the Work.

B. Coordination:

1. Review installation procedures under other Specification sections and coordinate activities that must be performed with or before Work specified herein.

C. Related Sections:

1. Section 01010 – Summary of Work

D. Except for approved shutdowns, the Work shall be performed such that the OWNER's plant or facility remains in continuous satisfactory operation during the Project. Work shall be scheduled and conducted by CONTRACTOR such that it does not impede the OWNER's production or processes, create potential hazards to operating equipment and personnel, create overflows, or cause other nuisances.

E. Work not specifically covered herein and in the referenced Specification sections may, in general, be completed at any time during normal work hours, subject to operating requirements described herein.

F. CONTRACTOR has the option of providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to the OWNER, provided it does not present hazards to personnel, structures, and/or equipment, that it does not adversely affect the OWNER's ability to comply with permits and operating requirements (both functional and regulatory), that it does not generate other nuisances, and that requirements of the Contract Documents are fulfilled.

G. Coordinate shutdowns with OWNER's Representative. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on OWNER'S operations and processes.

H. Do not shut off or disconnect the existing operating systems unless approved by the OWNER's Representative in writing. Operation of existing equipment will be by OWNER unless specified otherwise. Where necessary for the Work and in coordination with the Owner, CONTRACTOR shall seal or bulkhead OWNER-operated gates and valves to prevent leakage that may affect the Work or OWNER's operations. Provide temporary watertight plugs, bulkheads, and/or line stops as required. After the Work is complete, CONTRACTOR shall remove the seals, plugs, bulkhead, and/or line stops to the satisfaction of OWNER's Representative.

1.2 SUBMITTALS

A. Substitute Sequence Submittal: When deviation from the suggested sequence is proposed, provide a submittal to OWNER's Representative explaining in detail the proposed sequence change and its effects, including evidence that OWNER's operations will not be adversely affected by the proposed change. List benefits of the proposed sequence change, including benefits to the Progress Schedule.

B. Shutdown Submittals:

1. Shutdown Planning Submittal: For each shutdown, CONTRACTOR shall prepare an inventory of labor and materials required to perform the shutdown and Work tasks, an estimate of the time required for the shutdown including time for OWNER to take down and start up existing equipment, systems, or conduits, and a written description of steps required to complete the Work associated with the shutdown. Submit the inventory, time estimate, schedule of activities during the shutdown period, written procedures, and proposed date(s) of the shutdown to the OWNER's Representative for review at least twenty one (21) calendar days prior to the proposed shutdown start date. Fines and/or imprisonment to CONTRACTOR's representatives may apply for any violation to DNER, USACE and EPA's ordered provisions or stipulations agreed among PRASA and EPA. CONTRACTOR will bear at its own cost any fines or legal costs imposed to the OWNER. Do not start shutdown until the OWNER's Representative accepts the shutdown submittal.

2. Shutdown Notification: After acceptance of shutdown planning submittal and prior to the shutdown, provide written notification to OWNER's Representative of the date and time each shutdown is to start. Provide notification at least l4 days in advance of each shutdown.

C. Startup Submittals

1. Administrative Submittals:
   a. Functional and performance test schedules and plan for equipment, units, and systems at least 14 days prior to start of related testing. Include test plan, procedures, and log format.

b. Schedule and plan of facility startup activities at least 21 days prior to commencement.

2. Quality Control Submittals:
   a. Manufacturer's Certificate of Proper Installation as required.
   b. Test Reports: Functional and performance testing, in format acceptable to OWNER’s Representative and certification of functional and performance test for each piece of equipment or system specified.
   c. Certifications of Calibration: Testing equipment.

1.3 GENERAL CONSTRAINTS

A. Specified below are the sequence and shutdown durations, where applicable, for OWNER'S equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New systems may be used after the specified testing is completed and the units are accepted by OWNER’s Representative in writing.

B. These constraints apply to coordination with OWNER's operations:

1. CONTRACTOR shall request prior approval of the OWNER’s Representative any required system shutdown.

2. Dead End Valves or Pipe: CONTRACTOR shall provide blind flanges, watertight bulkheads, or valve at the temporary or permanent terminus of a pipe or conduit. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required or as directed by ENGINEER. Temporary valves shall be suitable for the service. Where a valve is provided at a permanent terminus of a pipe, also provide on the downstream side of the valve with a blind flange with a drain/flushing connection.

3. CONTRACTOR shall maintain a clean dry and ventilated work area by pumping and properly disposing of fluid and solids that accumulates in work areas and by supplying adequate ventilation to the work area. Ventilation shall comply with applicable health and safety regulations.

1.4 TIE-INS

A. CONTRACTOR shall perform all tie-ins required to complete the Work. CONTRACTOR shall obtain requirements for tie-ins from ENGINEER.

1.5 SHUTDOWNS

A. General:

1. A shutdown is defined as when a portion of the normal operation of OWNER's facility, whether equipment, systems, or conduit, has to be temporarily suspended or taken out of service to perform the Work.

2. Work that may interrupt normal operations shall be accomplished at times convenient to OWNER, including night and dawn hours at no additional cost to OWNER.

3. Provide at the Site in close proximity to the shutdown and tie-in work areas tools, Equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Prefabrication of piping and other assemblies shall be completed to the degree possible prior to their associated shutdown. Demonstrate to OWNER's Representative satisfaction that CONTRACTOR has complied with these requirements before starting the shutdown.

4. If CONTRACTOR's operations cause an unscheduled interruption of OWNER'S operations, CONTRACTOR shall immediately re-establish satisfactory operation for OWNER.

5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of OWNER's facilities that result in fines or penalties by authorities having jurisdiction shall be the responsibility of CONTRACTOR if, in the OWNER's Representative opinion, CONTRACTOR was negligent in the Work or did not exercise proper precautions in conducting the Work.

B. Shutdowns of Electrical Systems: Comply with the National Electric Code. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall check cables and wires to verify that they are de-energized to ground potential before Work is started. Upon completion of Work associated with the shutdown, CONTRACTOR shall remove the locks and tags and notify OWNER's Representative that the facilities are available for use.

1.6 CONTRACTOR FACILITY STARTUP RESPONSIBILITIES

A. General:

1. Perform Work for tests specified except for items furnished by OWNER.

2. Provide the OWNER-furnished equipment contractor access to the Work area and assist as necessary in functional and performance testing.

3. Demonstrate proper installation, adjustment, function, performance, and operation of equipment, systems, control devices, and required interfaces individually and in conjunction with process instrumentation and control system.

1.7 OWNER'S REPRESENTATIVE FACILITY STARTUP RESPONSIBILITIES

A. General:

1. Review CONTRACTOR's test plan and schedule.

2. Witness each functional or performance test.

3. Coordinate other plant operations, if necessary, to facilitate CONTRACTOR's tests.

B. Startup Test Period:

1. Furnish manufacturer's representative(s) for assistance during testing on OWNER-furnished equipment.

2. Make available spare parts and special tools and operation and maintenance information for OWNER-furnished equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

A. Work shall conform, among others, to the requirements of Section 01010 – Summary of Work.

3.2 DETAILED SHUTDOWN REQUIREMENTS

A. Detailed shutdown requirements are indicated in Table 01143-A.

1.3 SCHEDULES

A. The schedules listed below, following the "End of Section" designation, are a part of this Specification Section.

3. Table 01143-A, Suggested Schedule of Shutdowns.

4. The Suggested Schedule of Shutdowns table indicates the major equipment shutdowns and the major tie- in work expectations. The Contractor is responsible for completing all tie-ins and minor shutdowns without affecting OWNER's operation.

TABLE 01143-A SUGGESTED SCHEDULE OF SHUTDOWNS					
Shutdown No.	**Description**	**Precedent condition to activity**	**Shutdown Type**	**Notes / Comments**	**Maximum Duration**
A	Connection of temporary intake	Onsite temporary intake, pipe and fittings.	Full		8 hrs
B	Connection to existing 6” pipe to Río Prieto WTP	Mechanical work completed pipe and fitting on site.	Full		8 hrs

END OF SECTION

SECTION 01450
QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Requirements for the Contractor's Quality Control (CQC) program covering:

1. Excavation and subgrade preparation.
2. Backfill and embankment.
3. River diversion and flow isolation.
4. Dewatering.
5. Rock vanes (river training structures).
6. Bank protection using rock/riprap and associated filter systems.

B. Related Sections: 013340 Shop Drawings, Product Data and Samples; 02A050 Excavation, Fill/Embankment and Backfill; 02920 Diversion and Dewatering; 02230 Stones and Channel Protection.

1.2 DEFINITIONS

A. CQC Manager (CQCM): Contractor's designated person with authority to stop work and to enforce QC.
B. Definable Feature of Work (DFW): A task that requires separate quality controls (e.g., geotextile placement, rock vane footer stones).
C. Three-Phase Control: Preparatory, Initial, and Follow-Up inspections conducted for each DFW.
D. Hold Point (H): Work pause until Engineer inspects/accepts.
E. Witness Point (W): Engineer may observe; work proceeds unless directed otherwise.
F. Acceptance Criteria: Minimum requirements for acceptance (tolerances, test values, conformance to drawings/specs).

1.3 SUBMITTALS

A. CQC Plan: Submit within 21 calendar days of Notice to Proceed and ≥14 days before field work. Include:
1. Organization chart; duties and qualifications of CQCM, alternates, surveyor, testing lab.
2. Inspection & Test Plan (ITP) listing DFWs, tests/methods, frequencies, acceptance criteria, and (H/W) points.

3. Daily CQC Report template; NCR (nonconformance) and Corrective Action forms.
4. Calibration certificates for test equipment (nuclear gauges, scales, GNSS/levels, turbidity meters if used).
5. Survey Control Plan (benchmarks, QA checks, as-built methods).
6. Dewatering & River Diversion Plan (sequence, capacities, standby/contingencies).

B. Materials/Products (with QC data):
1. Rock (vanes/bank protection): source, petrography, specific gravity, soundness/durability and abrasion loss.
2. Geotextiles/filters: product data (class/strength, AOS, permittivity, survivability), sewing details if applicable.
3. Backfill soils: classification (ASTM D2487), Proctor (ASTM D698 unless noted), deleterious content limits.
4. Diversion/Dewatering equipment: pump curves, intake screens, bypass sizing summary, discharge layout.

1.4 CONTRACTOR QUALITY CONTROL (CQC) PROGRAM

A. CQC Manager: On site during critical operations (channel excavation near water, diversion switch-overs, geotextile placement, vane stone placement).
B. Three-Phase Control (for each DFW):
1. Preparatory Meeting (before starting the DFW): review specs, approved submittals, drawings, equipment, test methods, safety, tolerances, and (H/W) points. Record minutes.
2. Initial Inspection: verify first work performed meets requirements (e.g., first vane foundation, first geotextile panel). Adjust methods as needed.
3. Follow-Up Inspections: continuous checks to maintain compliance; document results in Daily CQC Reports.

C. Meetings:
1. Pre-Construction QC Meeting (with Engineer) to review CQC Plan and ITP.
2. Daily QC Huddle to coordinate sequencing, weather/flow forecasts, and control measures.

1.5 QUALITY RECORDS

1. Maintain on site: approved submittals, ITP, Daily CQC Reports, test results, checklists, calibration records, survey notes, NCRs and corrective-action closeouts.
2. Submit Daily CQC Reports summarizing work performed, inspections/tests, results, deficiencies, weather/flows, and photos.

1.6 QUALIFICATIONS & TESTING

1. Testing laboratory: accredited for methods specified, with current certifications.
2. Field technicians: certified for nuclear gauge (if used) and density testing; survey personnel with demonstrable experience for waterway works.

1.7 TOLERANCES (MINIMUM)

1. Subgrade elevation: ±30 mm.
2. Finished backfill/embankment: ±0.30 mm.
3. Channel alignment: ±150 mm horizontally unless otherwise shown.
4. Rock vanes:
   a) Vane angle to approach flow: as specified on drawings, ±5°.
   b) Crest elevation / bank tie-in: ±30 mm; toe elevation: ±45 mm.
   c) Vane stone size: ±150 mm of specified stone size measured at the intermediate axis.
   d) Rock bench stone size: ±150 mm of specified stone size measured at the intermediate axis.
5. Geotextile overlaps: ≥450 mm; upslope shingle lap; no wrinkles bridging voids.

1.8 NONCONFORMANCE & CORRECTIVE ACTION

1. Issue NCR for any work or material outside acceptance criteria. Propose corrective action (repair, replacement, or engineering evaluation).
2. Re-inspect and re-test until accepted; record closure in CQC files.

PART 2 — (NOT USED)

PART 3 — EXECUTION (QC PROCEDURES)

3.1 SURVEY CONTROL (H)

1. Establish and protect benchmarks/control points; verify at start of each shift affecting alignment or grade.
2. Provide layout for channel centerline, bank limits, geotextile panels, and vane geometry (crest, toe, apex, bank tie-in).
3. Hold Point: Do not start excavation or stone placement until layout is verified and offered for Engineer review.

3.2 EXCAVATION QC

1. Verify limits, side slopes, benches, and access.
2. Shape subgrade to plan grade; identify and treat soft/unsuitable zones (undercut/replace as directed).

3. Record subgrade elevations at 50-ft stations and at breaks in grade; include in CQC Reports.

3.3 BACKFILL/EMBANKMENT QC (H/W)

1. Place in max 8–12 in loose lifts; moisture-condition as needed; compact with appropriate equipment.

   Testing (minimum):

   - Proctor (per soil type/source) before placement.
   - Density/Moisture: 1 test per 300 CY placed, and at least 1 per lift per 30 m of embankment in critical zones.

   Acceptance:

   - Structural/critical zones: ≥95% of ASTM D698 MDD; moisture ±2% of optimum.
   - General fill: ≥90% of D698; moisture ±3%.

3.4 RIVER DIVERSION QC (H)

1. Install diversion works (cofferdams, bypass pipe/ditch) per approved plan; verify freeboard, stability, and isolation of work zone.
2. Provide standby pumps/power as indicated; confirm no short-circuiting/erosion at transitions.
3. Hold Point: Offer diversion for inspection before excavation within isolated area.

3.5 DEWATERING QC

1. Intakes screened to prevent debris; pump rates matched to discharge capacity.
2. Maintain foundation moisture consistent with compaction/placement requirements.
3. Record pump start/stop times, estimated flow, and field observations (e.g., clarity at discharge, local scour).

3.6 GEOTEXTILE / FILTER QC (H)

1. Subgrade smooth, free of protrusions; remove standing water that would float fabric.
2. Place geotextile without wrinkles; overlaps per manufacturer requirements; temporarily anchor before rock placement.
3. Repair tears with ≥3-ft patches; sew if specified.

4. Hold Point: Inspect subgrade and geotextile prior to rock placement.

3.7 ROCK VANES — PLACEMENT QC (H)

1. Place footer stones first, embedded to depth and well-seated.
2. Set key stones (apex/crest) to elevations and vane angle; maintain downward gradient toward thalweg if shown.
3. Interlock stones to act as a mass; avoid rocking pieces or planar slips.
4. Survey checks: apex, crest, toe, bank tie-in, and offsets at 5 m spacing.
5. Acceptance: Tolerances §1.07; gradation and embedment verified.

3.8 BANK PROTECTION ROCK — QC (W)

1. Place filter/geotextile, then rock to plan thickness/limits, working upslope; avoid equipment directly on fabric without cover.
2. Finish surface reasonably even; no voids or thin spots; thickness not less than plan minimums.

3.9 AS-BUILTS & CLOSEOUT

1. Provide as-built survey of channel alignment/profile; vane locations and elevations (apex/crest/toe/tie-in); bank protection limits and thickness spot checks.
2. Submit compiled QC package: Daily reports, tests, certifications, photo log (pre/during/post).

APPENDIX A — ITP SNAPSHOT

DFW / Activity	QC Check / Test	Method	Frequency	Acceptance	Point
Survey control	Verify benchmarks/control	Field check	Daily start	≤6 mm horiz/vert (or per plans)	H
Subgrade	Elevations; proof-roll/probe	Level/visual	Each area	±30 mm; stable	W
Backfill	Density & moisture	ASTM D6938	As §3.03	≥95% (critical) / ≥90% (general)	W
Geotextile	Class; overlaps; damage	Visual/tape	Each panel	Class as submittal; ≥18 in overlap	H

Rock vanes	Geometry survey	Level/GNSS	Each vane	§1.07 tolerances	H
Diversion	Install check	Visual/measure	At completion	Per approved plan	H
Dewatering	Startup check	Visual/record	Startup & changes	Capacity per plan; stable	W

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 REFERENCES NOT USED

1.2 SUBMITTALS

A. Administrative Submittals: Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.

B. Shop Drawings:

1. Temporary Construction Submittals:
   a. Access Roads: Routes, cross-sections, and drainage facilities.
   b. Parking area plans.
   c. CONTRACTOR's field office, storage yard, and storage building plans, including gravel surfaced area.
   d. Fencing and protective barrier locations and details.
   e. Staging area location plan.
   f. Traffic Control and Routing Plans: As specified herein, and proposed revisions thereto.
   g. Plan for maintenance of existing pump station operations.

2. Temporary Control Submittals:
   a. Noise control plan.

C. Computer Hardware and Software

1. Submit for approval prior to purchase all software and hardware to be provided as requested in this specification.

1.3 MOBILIZATION

A. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving CONTRACTOR's field office and equipment required for first month operations onto site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite communication facilities, including telephones.

5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
6. Arranging for and erection of CONTRACTOR's work and storage yard as applicable.
7. Posting OSHA required notices and establishing safety programs and procedures.
8. Having the CONTRACTOR's superintendent at the site full time.

B. Use area designated for CONTRACTOR's temporary facilities as coordinated with OWNER and Engineer. No area is available at the site on OWNER's property for CONTRACTOR's temporary facilities, provide lands and access thereto that will be required for such use by CONTRACTOR.

1.4 CONTRACTOR'S USE OF PREMISES

A. Lands furnished by OWNER upon which CONTRACTOR shall perform the Work as described by Engineer.
B. Rights-of-way and easements for access to such lands furnished by OWNER as described by Engineer.

1.5 PERMITS

A. Permits, Licenses, or Approvals: Obtain in accordance with the General Conditions and as otherwise may be provided in the Supplementary Conditions and retain onsite.

1.6 PROTECTION OF WORK AND PROPERTY

A. Comply with OWNER'S safety rules while on OWNER'S property.
B. Keep OWNER informed of serious accidents on the site and related claims.
C. Use of Explosives: No blasting or use of explosives will be allowed on the site.

PART 2

2.1 PRASA FIELD OFFICE

A. Refer to PRASA field office Detail on Specification Section 015100, PRASA'S FIELD OFFICE.

2.2 PROJECT SIGN

A. Refer to Project Sign Detail on Specification Section 015800, PROJECT SIGN.

PART 3 EXECUTION

3.1 ENGINEER'S FIELD OFFICE

A. Refer to PRASA field office Detail on Specification Section 015100 PRASA'S FIELD OFFICE.

3.3 TEMPORARY UTILITIES

A. Power:

1. If no electric power is available at the site, make arrangements to obtain and pay for electrical power used until office removal, unless otherwise recommended by OWNER's Representative at Substantial Completion.
2. Electric power may be available near the site. Determine the type and amount available and make arrangements for obtaining temporary electric power service, metering equipment, and pay all costs for the electric power used during the contract period, except for portions of the Work designated in writing by the ENGINEER as substantially complete.
3. Cost of electric power used in performance and acceptance testing will be borne by the OWNER.

B. Lighting: Provide temporary lighting at least to meet all applicable safety requirements to allow erection, application or installation of materials and equipment, and observation or inspection of the Work.

C. Heating, Cooling, and Ventilating:

1. Provide as required to maintain adequate environmental conditions to progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials, equipment, and finishes from damage due to temperature or humidity.
2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
3. Pay all costs of installation, maintenance, operation, removal, and fuel consumed.

D. Water:

1. If no construction or potable water is available at the site, make

arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during the Project construction.

E. Sanitary and Personnel Facilities:

1. Provide and maintain facilities for CONTRACTOR's employees, Subcontractors, and all other onsite employer's employees. Service, clean, and maintain facilities and enclosures.

F. Fire Protection: Furnish and maintain on the site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).

3.4 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within rights-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a non-reasonable period of time unless special arrangements have been made.
3. Maintain in continuous service all existing underground power lines, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along the line of work, unless other arrangements satisfactory to owners of said utilities have been made.
4. Where completion of Work requires temporary or permanent removal and/or relocation of an existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
6. Always keep fire hydrants and water control valves free from obstruction and available for use.
7. In areas where the CONTRACTOR's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer, or irrigation system and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by the CONTRACTOR.
8. Notify property owners and utility offices which may be affected by the construction operation at least 14 days in advance.

9. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the CONTRACTOR's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
10. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
11. Maintain original site drainage wherever possible.

B. Site Security:

1. Erect a temporary security fence as needed. Maintain the fence throughout the construction period. Obtain the OWNER's Representative' written permission before removal of temporary security fencing.
2. Provide and maintain additional temporary security fences as necessary to protect the Work and CONTRACTOR-furnished products not yet installed.
3. Excavation during pipeline installation shall be filled at the end of each working day to prevent accidents. The contractor is fully responsible for providing all security measures all time.
4. Contractor shall provide security plan to prevent access of unauthorized personnel to equipment and material used during construction. OWNER's Representative shall approve the plan prior to execution.

C. Barricades and Lights:

1. Provide as required by the Vehicle Code and in sufficient quantity to safeguard public and Work.
2. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of CONTRACTOR's employees, other employer's employees, and others who may be affected by the Work.
3. Provide to protect existing facilities and adjacent properties from potential damage.
4. Locate to enable access by facility operators and property owners.
5. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.
6. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section as needed.

D. Signs and Equipment:

1. Conform to requirements of the manual published by the Puerto Rico Department of Transportation (DTOP).
2. Portable TOW-AWAY-NO STOPPING Signs: Place where approved by police department.
3. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movements.
4. High-Level Warning Flag Units: Provide in advance of traffic approaching the Work, each displaying three flags mounted at a height of 9 feet.
5. CONSTRUCTION AHEAD, and HEAVY EQUIPMENT IN MOTION Signs: Provide size 48 inches by 48 inches. Place in conspicuous locations, approximately 200 feet in advance of the Work, and facing approaching traffic as needed.
6. DETOUR Signs: Provide right arrow or left arrow, placed as approved by ENGINEER as needed.
7. RIGHT or LEFT LANE CLOSED AHEAD Signs: Provide place in advance of lane to be closed.
8. Provide obstructions, such as material piles and equipment.
9. Illuminate barricades and obstructions with warning lights from sunset to sunrise.
10. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

E. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside the limits of the Work and within the limits of the Work which are designated on the Drawings to remain undisturbed.
    a. Where practical, tunnel beneath trees when on or near the line of trench.
    b. Employ hand excavation as necessary to prevent tree injury.
    c. Do not stockpile materials or permit traffic within drip lines of trees.
    d. Provide and maintain temporary barricades around trees.
    e. Water vegetation as necessary to maintain health.
    f. Cover temporarily exposed roots with wet burlap and keep the burlap moist until soil is replaced around the roots.
    g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of the OWNER's Representative.
    h. Dispose of removed trees in a legal manner off the site.
2. The balling and burlapping of trees indicated for replacement shall conform to the recommended specifications set forth in the American

Standards for Nursery Stock, published by American Association of Nurserymen. All balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by the ball and not by the top.

3. In the event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
4. Replace each plant that dies as a result of construction activities.

F. Water ways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris unless otherwise specified in drawings.

G. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain the foundations and parts of the Work free from water.

H. Endangered Species:

1. Take precautions necessary and prudent to protect native endangered flora and fauna.
2. Notify OWNER's Representative of construction activities that might threaten endangered species or their habitats.
3. OWNER Representative will mark areas known as habitats of endangered species prior to commencement of onsite activities.
4. Additional areas will be marked by OWNER's Representative, as other habitats of endangered species become known during construction.

3.5 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris is prohibited.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood,

insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as the need no longer exists.

B. Noise Control:

1. Provide mitigation measures so noise emissions from tools or equipment will not exceed legal noise levels.
2. Noise Control Ordinance: Noise Control Plans: Proposed plan to mitigate construction noise impacts and to comply with noise control ordinances including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

1. Divert sanitary sewage and non storm waste flow interfering with construction and requiring diversion to sanitary sewers if available on site. Do not cause or permit action to occur which would cause an overflow to an existing waterway.
2. Prior to commencing excavation and construction, obtain OWNER's Representative's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," CES Plan dispositions, and all requirements set forth in the Regulatory Agencies" permits.
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of waste into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control:

1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect Work and existing facilities from flooding during construction period.

3.6 STORAGE YARDS AND BUILDINGS

A. Coordinate requirements with Section 01600, MATERlALS AND

EQUIPMENT.

B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

C. Temporary Storage Facilities:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.

3. Store combustible materials (paints, solvents, fuels, etc.) in a well-ventilated and remote building meeting safety standards.
4. Storage facilities shall be located out of areas that may be subject to flooding. Refer to the local flood zone maps. (U.S.G.S., Planning Board, etc.)

3.7 ACCESS ROADS AND DETOURS

A. Provide gravel, crushed rock, or other stabilization material where appropriate to permit access by all motor vehicles at all times.

B. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.

C. Coordinate with OWNER Representative detours and other operations affecting traffic and access. Provide at least 72 hours' notice to OWNER's Representative of operations that will alter access to the site

D. Upon completion of construction, restore ground surface disturbed by access road construction to original grade, leave access roads in condition suitable for future use by OWNER, and replace damaged or broken culverts with new culvert pipe of the same diameter and material.

3.8 PARKING AREAS

A. Provide adequate and sufficient parking facilities or facilitate for personnel working on the Project. Where parking facilities are not feasible, provide workers with appropriate transportation to and from the site.

3.9 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting the use

of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

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

C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along the route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.

E. Maintenance of traffic is not required if CONTRACTOR obtains written permission from OWNER and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

F. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen the shoulder on the opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary or provide temporary detours as required by Agencies Regulations.

G. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.

H. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices as required by the corresponding agencies.

I. Notify the fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from the fire department. Conduct

operations with the least interference to fire equipment access, and at no time prevent such access. Furnish CONTRACTOR's night emergency telephone numbers to the police department.

J. Move mailboxes as coordinated with the corresponding postal service office to temporary locations accessible to postal service, and on completion of Work in each area replace them in their original location and in a condition equal to or better than original. Coordination is the contractor's responsibility.

3.10 CLEANING DURING CONSTRUCTION

A. The site is to be kept clean at all times to ensure a safe productive environment.

B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep all floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up all debris and dispose.

C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.

D. At least weekly, brush sweep the entry drive and roadways, and all other streets and walkways affected by Work and where adjacent to Work.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SCOPE

A. This section covers general design requirements, procedural requirements for shipment, receiving and unloading, and storage and maintenance of products prior to installation, and requirements for substitute or “or approved equal” items/methods.

1.2 DEFINITIONS

A. Products:

1. New items for incorporation in the Work, whether purchased by CONTRACTOR or OWNER for the Project, or taken from previously purchased stock and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change the meaning of such other terms used in the Contract Documents as those terms are self-explanatory and have well recognized meanings in the construction industry.
3. Items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.3 DESIGN REQUIREMENTS

A. Provide systems, equipment, and components, including supports and anchorages, in accordance with the provisions of the latest edition of Uniform Building Code (UBC).

1.4 SUBMITTALS

A. Administrative Submittals:

1. List of all proposed substitute or "or approved equal" items/methods.
2. Schedule of factory tests required by Contract Documents. Identify tests for which ENGINEER's presence has been specified.

B. Quality Control Submittals:

1. Factory Tests: As specified in the individual Specifications.
   a. Procedures: Submit such that approval may be granted prior to start of factory testing.
   b. Test Documentation: Results of successful testing, including certification of procedures and results.

1.5 PREPARATION FOR SHIPMENT

A. When practical, factory assemble products. Matchmark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and CONTRACTOR, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Spare Parts, Special Tools, Test Equipment, Expendables, and Maintenance Materials:

1. Furnish as required by the Specifications prior to (i) starting functional testing as set forth in Section 016500, FACILITY STARTUP, or (ii) operation of the equipment by the OWNER, or (iii) 75 percent Project completion, whichever occurs first.
2. Properly package to avoid damage, in original cartons insofar as possible. Replace parts damaged or otherwise inoperable.
3. Firmly fix to, and prominently display on, each package.
   a. Minimum 3-inch by 6-inch manila shipping tag with the following information printed clearly:
      1) Manufacturer's part description and number.
      2) Applicable equipment description.
      3) Quantity of parts in package.
      4) Equipment manufacturer.
      5) Applicable Specification section.
      6) Name of CONTRACTOR.
      7) Project name.
4. Deliver materials to jobsite.
5. Notify OWNER's Representative upon arrival.

D. Protect equipment from exposure to the elements and keep thoroughly dry and dust free at all times. Protect painted surfaces against impact, abrasion, discoloration, or other damage. Grease or oil for all bearings and similar items.

E. Request a minimum 7-day advance notice of shipment from manufacturers. Upon receipt of manufacturer's advance notice of shipment, promptly notify OWNER's Representative of anticipated date and place of equipment arrival.

F. Factory Test Results: Reviewed and accepted by OWNER's Representative before product shipment as required in individual Specification sections.

1.6 DELIVERY AND INSPECTION

A. Deliver products in accordance with the accepted current progress schedule and coordinate to avoid conflict with Work and conditions at the site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label date of manufacture and shelf life, where applicable. Include UL labels on products so specified.

C. Unload products in accordance with manufacturer's instructions for unloading, or as specified. Record the receipt of products at the site. Inspect for completeness and evidence of damage during shipment.

D. Remove damaged products from the site and expedite delivery of identical new undamaged products and remedy incomplete or lost products to provide that specified, so as not to delay the progress of the Work.

1.7 HANDLING, STORAGE, AND PROTECTION

A. Handle products in accordance with the manufacturer's written instructions, and in a manner to prevent damage. Store products, upon delivery, in accordance with manufacturer's instructions, with labels intact and legible, in approved storage yards or sheds provided in accordance with Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by OWNER.

B. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the Work.

C. Store electrical, instrumentation, and control products, and equipment with bearings in weathertight lockable structures maintained above 60 degrees F. Protect electrical, instrumentation, and control products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.

D. Store fabricated products aboveground, on blocking or skids, and prevent soiling or staining. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

E. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.

F. Hazardous Materials: Prevent contamination of personnel, the storage building, and the site. Meet the requirements of the product specifications, codes, and manufacturer's instructions.

1.8 SUBSTITUTE AND "OR APPROVED EQUAL" PRODUCTS

A. Meet the requirements of the General Conditions, the Specification sections, and as set forth herein.

B. Listing of proposed substitutes or "or approved equal" items or methods.

1. With consideration of the additional evaluation time necessary for OWNER's Representative review of such items, indicate for each item the review status (either substitute or "or approved equal") and estimated submission date.
2. CONTRACTOR, in indicating the review status of the proposed item, acknowledges that the time shown for OWNER's Representative review on the current accepted schedule is sufficient only to allow OWNER's Representative to accomplish review for the status indicated and not sufficient to perform both a review for "or approved equal" status and a subsequent review for substitute status on the same product.
3. OWNER's Representative may return unreviewed those submissions (i) not shown on the current accepted schedule, (ii) for which the review status differs from that indicated on the accepted list unless previously approved in writing by OWNER Representative, (iii) not in accordance with Article 6 of the General Conditions and as specified herein, (iv) which are incomplete, or (v) which are uncertified, in which case CONTRACTOR shall provide the specified product.

4. Submit the proposed substitute or “or approved equal” item/method through the Owner’s a Project Management Information System, a cloud-based platform designated by the Owner for construction documentation and communication. The submittal must include all supporting data to allow OWNER's Representative review.
5. Disposition of “or approved equal” Item: In accordance with Article 6.5 of the OWNER's General Conditions and Specifications 013340, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard materials suitable for service conditions unless otherwise specified in the individual Specifications.

B. Where product specifications include a named manufacturer, with or without model number, and include performance requirements, named manufacturer's products must meet the performance specifications.

C. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, and manufacturer's services and implement same or similar process instrumentation and control functions in same or similar manner.

D. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

E. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.

F. Equipment, Components, Systems, Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.

G. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.

H. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.

I. Provide materials and equipment listed by UL wherever standards have been established by that agency.

J. Equipment Finish: Provide manufacturer's standard finish and color, except where specific color is indicated.

K. Special Tools and Accessories: Furnish to OWNER, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, hand wheels, chain operators, special tools, and other spare parts as required for maintenance.

L. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by OWNER.

2.2 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
3. Design structural members for anticipated shock and vibratory loads.
4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
5. Modify standard products as necessary to meet performance Specifications.

B. Lubrication System:

1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible. Oil drains with bronze or stainless steel valves and fill plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

2.3 SOURCE QUALITY CONTROL

A. Where Specifications call for factory testing to be witnessed by ENGINEER,

notify ENGINEER not less than 14 days prior to scheduled test date, unless otherwise specified.

B. Calibration Instruments: Bear the seal of a reputable laboratory certifying that instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).

C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the site and expedite delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage which necessitates procurement of new products will be considered delays within CONTRACTOR's control.

3.2 INSTALLATION

A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. No shimming between machined surfaces is allowed.

C. Install Work in accordance with NECA Standard of Installation, unless otherwise specified.

D. Repaint painted surfaces that are damaged prior to equipment acceptance.

E. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions and as may be specified. Retain a copy of manufacturers' instruction at site, available for review at all times.

F. For material and equipment specifically indicated or specified to be reused in the Work:

G. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.

H. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work in the Contract Price.

3.3 FIELD FINISH

A. In accordance with Section 099100, PAINTING and individual Specifications sections.

3.4 ADJUSTMENT AND CLEANING

A. Perform required adjustments, tests, operation checks, and other startup activities.

3.5 LUBRICANTS

A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by OWNER.

END OF SECTION

SECTION 01810
EQUIPMENT TESTING

PART 1 GENERAL

1.1 DEFINITIONS

A. Functional Test: Test or tests in presence of Engineer and Owner to demonstrate that installed equipment meets installation, calibration, and adjustment requirements and other requirements as specified.

B. Performance Test: Test or tests performed after any required functional test in presence of Engineer and Owner to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.

C. Unit Process: As used in this section, a unit process is a portion of the facility that performs a specific process function.

D. Equipment Performance Demonstration:

1. A demonstration, conducted by Manufacturer together with installation Contractor, with assistance of Owner, to demonstrate and document the performance of the entire operating equipment, both manually and automatically (if required), based on criteria developed in conjunction with Owner and as accepted by Engineer.

2. Such demonstration is for the purposes of (i) verifying to Owner entire equipment performs as a whole, and (ii) documenting performance characteristics of completed equipment for Owner's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire equipment the responsibility of Manufacturer, unless such performance is otherwise specified.

1.2 SUBMITTALS

A. Informational Submittals:

1. Facility Startup and Performance Demonstration Plan.

2. Functional and performance test results.

3. Completed Unit Process Startup Form for each unit process.

4. Completed Facility Performance Demonstration/Certification Form.

1.3 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

A. Develop a written plan, in conjunction with Owner's operations personnel; to include the following:

1. Step-by-step instructions for startup of each unit process and the complete facility.

2. Unit Process Startup Form (sample attached), to minimally include the following:
   a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
   b. Detailed procedure for startup of the unit process.
   c. Startup requirements for each unit process, including water, power, chemicals, etc.
   d. Space for evaluation comments.

3. Facility Performance Demonstration/Certification Form (sample attached), to minimally include the following:

   a. Description of unit processes included in the facility startup.
   b. Sequence of unit process startup to achieve facility startup.
   c. Description of computerized operations, if any, included in the facility.
   d. Manufacturer's certification facility is capable of performing its intended function(s), including fully automatic operation.
   e. Signature spaces for Manufacturer and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.2 GENERAL

A. Facility Startup Meetings: Schedule Project Meetings, to discuss test schedule, test methods, materials, chemicals and liquids required, facilities operations interface, and Owner involvement.

B. Manufacturer's Testing and Startup Representative:

4. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.

5. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.

3.3 EQUIPMENT TESTING

A. Preparation:

1. Ensure installation before testing.

2. Furnish representatives.

3. Submit Manufacturer's Certificate of Proper Installation Form, in accordance with Section 016400, Manufacturer's Services, when required by individual Specification sections.

4. Equipment Test Report Form: Provide written test report for each item of equipment to be tested, to include the minimum information:
   a. Owner/Project Name.
   b. Equipment or item tested.
   c. Date and time of test.
   d. Type of test performed (Functional or Performance).
   e. Test method.
   f. Test conditions.
   g. Test results.
   h. Signature spaces for Manufacturer and Engineer as witness.

5. Cleaning and Checking: Prior to beginning functional testing:
   a. Calibrate testing equipment.
   b. Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
   c. Lubricate equipment.
   d. Turn rotating equipment by hand when possible to confirm that equipment is not bound.
   e. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
   f. Check power supply to electric-powered equipment for correct voltage.
   g. Adjust clearances and torque.
   h. Test piping for leaks.

6. Ready-to-test determination will be by Engineer based at least on the following:
   a. Acceptable Operation and Maintenance Data.
   b. Notification by Contractor of equipment readiness for testing.
   c. Receipt of Manufacturer's Certificate of Proper Installation.
   d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested.
   e. Manufacturer's representative, to assist in testing of respective equipment.

f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
g. Equipment and electrical tagging complete.
h. Delivery of all spare parts and special tools.

B. Functional Testing:

1. Conduct as specified in individual Specification sections.

2. Notify Owner and Engineer in writing at least 10 days prior to scheduled date of testing.

3. Prepare Equipment Test Report summarizing test method and results.

4. When, in Engineer's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual Specification sections. Such acceptance will be evidenced by Engineer/Owner's signature as witness on Equipment Test Report.

C. Performance Testing:

1. Conduct as specified in individual Specification sections.

2. Notify Engineer and Owner in writing at least 10 days prior to scheduled date of test.

3. Performance testing shall not commence until equipment has been accepted by Engineer as having satisfied functional test requirements specified.

4. Type of fluid, gas, or solid for testing shall be as specified.

5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.

6. Prepare Equipment Test Report summarizing test method and results.

7. When, in Engineer's opinion, equipment meets performance requirements specified, such equipment will be accepted as to conforming to Contract requirements. Such acceptance will be evidenced by Engineer's signature on Equipment Test Report.

3.2 STARTUP OF UNIT PROCESSES

A. Prior to unit process startup, equipment within unit process shall be accepted by Engineer as having met functional and performance testing requirements specified.

B. Startup sequencing of unit processes shall be as chosen by Installation Contractor to meet schedule requirements.

C. Make adjustments, repairs, and corrections necessary to complete unit process startup.

D. Startup shall be considered complete when, as approved by Engineer, unit process has operated in manner intended for 14 continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.

E. Significant Interruption: May include any of the following events:

1. Failure of Manufacturer to provide and maintain qualified onsite startup personnel as scheduled.
2. Failure to meet specified functional operation for more than 2 consecutive hours.
3. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.
4. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
5. As determined by Engineer.

F. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from beginning again.

3.3 FACILITY PERFORMANCE DEMONSTRATION

A. When, as approved by Engineer, startup of all unit processes has been achieved, sequence each unit process to the point that facility is operational.

B. Demonstrate proper operation of required interfaces within and between individual unit processes.

C. After facility is operating, complete performance testing of equipment and systems not previously tested.

D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility.

E. Certify, on the Facility Performance Demonstration/Certification Form, that facility is capable of performing its intended function(s).

F. Provide a test and analysis log for all equipment test.

3.4 SUPPLEMENTS

A. Supplements listed below, following "End of Section," are a part of this Specification:

1. Unit Process Startup Form.
2. Equipment Performance Demonstration/Certification Form.

END OF SECTION

UNIT PROCESS STARTUP FORM

OWNER:_____ PROJECT:_____

Unit Process Description: (Include description and equipment number of all equipment and devices):

_____

_____

_____

_____

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

_____

_____

_____

_____

_____

Startup Requirements (Water, power, chemicals, etc.). _____

_____

_____

Evaluation Comments: _____

_____

_____

EQUIPMENT PERFORMANCE DEMONSTRATION/CERTIFICATION FORM

OWNER:_____ PROJECT:_____

Unit Processes Description (List unit processes involved in facility startup):

_____

_____

_____

_____

Unit Processes Startup Sequence (Describe sequence for startup, including computerized operations, if any):

_____

_____

_____

_____

_____

Contractor Certification that Equipment is capable of performing its intended function(s), including fully automatic operation:

Contractor:_____ Date:_____, 20____

Engineer:_____ Date: _____, 20___

Owner:_____ Date: _____, 20___

(Authorized Signature)

SECTION 02223

TRENCH SAFETY SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

Work in this section shall consist of furnishing all equipment, materials and labor for a trench safety system meeting appropriate requirements established in the Occupational Safety and Health Administration (OSHA) Safety and Health Regulations, Part 1926, Subpart **P** - Excavations, Trenching and Shoring, Commonwealth of Puerto Rico, and other applicable regulations.

1.2 RELATED WORK

A. Section 02A092, TRENCH EXCAVATION FOR PIPE.

1.3 TRENCH EXCAVATION PLAN

A. CONTRACTOR shall prepare and maintain a trench safety plan prepared by a Professional Engineer registered in the Commonwealth of Puerto Rico. Design, furnish and install trench safety system to protect the adjoining existing structures that are shown on the Drawings. CONTRACTOR will be solely responsible for the design and construction of Trench Safety System.

B. A signed, dated and sealed copy of the trench safety plan shall be maintained at the project site for the CONTRACTOR's use during construction. In addition, a signed, dated and sealed copy of the trench safety plan shall be maintained at the project site in the CONTRACTOR's records. The CONTRACTOR shall not deviate from the trench safety plan without written authorization from the CONTRACTOR 's professional who prepared the trench safety plan. This written authorization shall be signed, dated and sealed by the Engineer. Any changes in the trench safety plan after initiation of construction will not be cause for extension of time or change order. CONTRACTOR accepts sole responsibility for compliance with all applicable safety requirements. The trench safety plan does not relieve CONTRACTOR from responsibility for any or all construction means, methods, techniques and procedures. Furthermore, the CONTRACTOR shall indemnify the Owner Owner's Representative, and Engineer from any and all claims due to any property damage or bodily injury (including death) that arises.

1.4 DEFINITION

For the purposes of this project, a trench excavation is any excavation whose bottom width is less than the total depth of the excavation.

PART 2 EXECUTION

2.1 GENERAL

Trench safety system shall be constructed, installed, and maintained in accordance with the details shown in the design prepared by the CONTRACTOR's registered Professional Engineer to prevent death or injury to personnel or damage to structures in or near these trench excavations. Materials excavated from trench shall be stored no closer to the edge of trench than one half the depth of the trench.

2.2 SUPERVISION

A. CONTRACTOR shall provide competent supervisory personnel at each trench while work is in progress to ensure CONTRACTOR trench safety methods, procedures, equipment and materials meet the requirements of OSHA standards and the trench excavation plan.
B. Supervisory personnel shall be knowledgeable in soil mechanics and have attended a trench safety program.

2.3 MAINTAINANCE OF SAFETY SYSTEM

The safety system shall be maintained in the condition as specified by the CONTRACTOR's Trench Safety Engineer. The CONTRACTOR shall take all necessary precautions to ensure the safety systems are not damaged during their use. If at any time during its use a safety system is damaged, personnel shall be immediately removed from the trench or excavation area and the safety system repaired. The CONTRACTOR shall take all necessary Precautions to ensure no loads, except those included in the safety system design, are imposed upon the excavation.

2.4 INSPECTION

CONTRACTOR shall make daily inspection of trench safety system to ensure that the system meets OSHA requirements and the requirements of the trench safety plan. Daily inspection is to be made by qualified personnel. Ifevidence of possible cave-ins or slides is apparent, all work in the trench shall cease until necessary precautions have been taken to safeguard Personnel entering trench. Contractors shall maintain a permanent record of daily inspections. The Contractor's Trench Safety Engineer shall make periodic (at least once per week) site visits. Within two (2) days after each visit, the Contractor's Trench Safety Engineer shall make a written report to the Company's Representative certifying that the trench excavation plan and safety construction practices are being followed. The Contractor's Trench Safety Engineer shall immediately report any unsafe construction practices to the Owner's Representative and Contractor.

2.5 REMOVAL

Bed and backfill pipe to a point at least one foot above top of pipe prior to removal of any portion of trench safety system. Bedding and backfill to be in accordance with other applicable specifications items. Backfilling and removal of trench supports shall progress together from bottom of trench upward. Remove no braces or trench supports until all personnel have evacuated the trench. Backfill trench to within 1.5 m (5') of natural ground prior to removal of entire trench safety system.

END OF SECTION

SECTION 02227

WASTE MATERIAL DISPOSAL

PART 1 GENERAL

1.1 DESCRIPTION

Off-Site Waste Material Disposal: Waste material disposal consists of trees, stumps, logs, brush, roots, grass, vegetation, humus, rubbish, reinforced concrete debris, demolished equipment not retained by Owner and other objectionable matter from operations such as clearing and grubbing, demolition, excavation and grading. Unless otherwise specified, the CONTRACTOR is responsible for removal and disposal of waste material in accordance with applicable regulations.

1.2 RELATED WORK

A. Section 02A050, EXCAVATION, FILL/EMBANKMENT AND BACKFILL.

B. Section 02A092, TRENCH EXCAVATION FOR PIPE.

C. Section 02D011, SITE CLEARING AND GRUBBING.

D. Section 02D040, MOBILIZATION AND SITE PREPARATION.

PART 2 PRODUCTS

2.1 Specific products are not required. Use equipment and materials necessary to properly complete disposal of waste materials.

PART 3 EXECUTION

3.1 OFF-SITE DISPOSAL AREA

Waste material which must be removed from the work site shall be disposed of in accordance with applicable regulations and in a manner as not to damage the Owner, Engineer, or other persons. The contractor shall follow all applicable regulations to waste disposal operations and shall submit to the resident engineer the corresponding permits as well as a written permit from the disposal site (entity or owner) accepting the waste from the project. All related fees will be at the CONTRACTOR's expense.

3.2 ON-SITE TEMPORARY STOCKPILE AREA

Material may be temporarily stockpiled at a designated area approved by Owner's Representative. Grade and slope stockpile for drainage with a maximum 4:1 slope (horizontal to vertical). Waste Material stockpiles shall not increase the flood danger in the area and shall be placed in areas where it cannot be carried away by runoff. Stockpiles shall be protected using appropriate erosion and dust control measures. Stockpiles of waste within the area designated for the reservoir will not be allowed. On-Site waste stockpiling will be temporary and shall be cleaned (full disposal of waste to Off-Site) on monthly basis.

3.3 EQUIPMENT FLUIDS

CONTRACTOR'S equipment fluids shall be collected during service and removed from the site and disposed off-site and in accordance with environmental regulations. Flammable or toxic waste shall be contained and not allowed to be spilled on the ground. Used filters, batteries, machine parts, tires and other waste material shall also be removed from the site and disposed off-site in accordance with environmental regulations. Contaminated soils shall be removed from the site and disposed accordingly.

END OF SECTION

SECTION 02230
STONES AND CHANNEL PROTECTION

PART 1 GENERAL

1.1 SUMMARY

The work covered by this section consists of furnishing all plant, labor, equipment and materials, and performing all operations in connection with the stone placement in accordance with the contract drawings and specifications. This section covers river bank slope protection stones.

1.2 REFERENCES

A. ASTM C 88 - (1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

B. ASTM C 127 - (2001) Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

C. ASTM C 131 - (2001) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

D. ASTM C 295 - (1998) Petrographic Examination of Aggregates for Concrete

E. ASTM D 75 - (1997) Sampling Aggregates

F. ASTM D 5313 - (1992; R 1997) Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions

G. EM 1110-2-1906 - (1986) Laboratory Soils Testing

1.3 SUBMITTALS

A. The following shall be submitted in accordance with Section 013340 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES:

1. Specific gravity (ASTMS C 127) results.

2. Abrasion Test (ASTM C 535) results.

PART 2 PRODUCTS

2.1 STONE

A. The stones size shall be as specified on Drawings, and shall be hard, close grained, free of cracks, seams or other imperfections which might adversely

affect its durability when exposed to weathering. All stones shall be roughly angular in shape, with the least dimension of any stone no less than one-third of its greater dimension. Flat stones will not be accepted. All stones shall have a specific gravity of not less than 2.6 and abrasion loss lower than 35%, per ASTM C 127 and C 3535 respectively.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

A. The subgrade surfaces on which the stones are to be placed shall be cut or filled and graded to the lines and grades shown on the Drawings. When fill is required to achieve subgrade lines, it shall consist of approved materials and shall conform to the requirements of the specified class of fill and compaction.

3.2 PLACEMENT

A. Stones shall be placed in a manner to produce a reasonably well graded mass with a minimum practicable percent of voids and shall be constructed to the lines and grades shown on the design drawings. Stone shall be placed in a careful, controlled manner in such a way as to avoid damaging the underlying material.

B. Stones shall be roughly dressed to properly bed them and make them fit together so they shall rest on their longest face.

C. Stones shall be keyed and set by relocating or placing with a crane or approved equipment. The rocks shall have a 3-point bearing on the under-laying rocks. Placing of stones by dumping will not be permitted.

D. Misplaced Materials: Materials deposited above the maximum indicated tolerances or outside of the construction limits will require the degrading or removal of such material at the Contractor's expense.

3.3 TESTING

A. Engineer may perform such tests as he deems necessary to verify that the Stones and Riprap materials and the completed Work meet the requirements of the construction documents. These tests are not intended to provide the CONTRACTOR with the information he needs to assure that the materials and workmanship meet the requirements of this Specification, and their performance will not relieve the CONTRACTOR

of the responsibility of performing his own tests for that purpose.

3.4 DEBRIS REMOVAL

A. The Contractor shall remove all debris and cleared vegetation, as needed, from within the construction limits prior to placement of stone. Debris may consist of wooden piles, concrete, rebar, broken sheet piles, and other manmade trash. All debris removed from the work area shall be properly disposed by the Contractor in an approved disposal area at no additional cost to the Owner.

END OF SECTION

SECTION 02310

NONWOVEN GEOTEXTILES

PART l- GENERAL

1.1 SCOPE

This specification covers the technical requirements for the Manufacturing and Installation of the nonwoven geotextile. All materials meet or exceed the requirements of this specification, and all work will be performed in accordance with the procedures provided in these project specifications.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
2. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
3. ASTM D 4533, Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles
4. ASTM D 4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
5. ASTM D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity
6. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
7. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing
8. ASTM D 4759, Standard Practice for Determining the Specifications Conformance of Geosynthetics

1.3 SUBMITTALS

A. Prior to material delivery to project site, the contractor shall provide the engineer with a written certification or manufacturers quality control data which displays that the geotextile meets or exceeds minimum average roll values (MARV) specified herein.

B. The contractor shall submit, if required by the engineer, manufacturer's quality control manual for the geotextile to be delivered to the site.

PART 2- PRODUCT

2.1 GEOTEXTILE

A. The nonwoven needle punched geotextile specified herein shall be made from staple fiber.

B. The geotextile shall be manufactured from prime quality virgin polymer.

C. The geotextile shall be able to withstand direct exposure to ultraviolet radiation from Sun for up to 30 days without any noticeable effect on index or performance properties.

D. Geotextile shall meet or exceed all material properties listed in Table 1.

Table 1: Geotextile Properties

Property	Test Method	Unit	Value
Grab Tensile Strength	ASTM D4632	lbs (N)	380 (1691)
Grab Tensile	ASTM D4632	%	50
Trapezoid Tear Strength	ASTM D4533	lbs (N)	140 (623)
CBR Puncture	ASTM D6241	lbs (N)	1025 (4561)
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	100 (0.15)
Permittivity	ASTM D4491	Sec-1	0.7
Flow Rate	ASTM D4491	gal/min/ft2 (l/min/m2)	50 (2037)
UV Resistance (at 500 hours)	ASTM D4355	% strene:th retained	70

2.2 MANUFACTURE

All rolls of the geotextile shall be identified with permanent marking on the roll or packaging, with the manufacturers name, product identification, roll number and roll dimensions.

2.3 TRANSPORT

A. Transportation of the geotextile shall be the responsibility of the contractor.

B. During shipment, the geotextile shall be protected from ultraviolet light exposure, precipitation, mud, dirt, dust, puncture, or other damaging or deleterious conditions.

C. Upon delivery at the job site, the contractor shall ensure that the geotextile rolls are handled and stored in accordance with the manufacturer's instructions as to prevent damage.

PART 3- EXECUTION

3.1 QUALITY ASSURANCE

A. The Engineer shall examine the geotextile rolls upon delivery to the site and report any deviations from project specifications to the contractor.

B. The Engineer may decide to arrange conformance testing of the rolls delivered to the job site. For this purpose, the engineer shall take a sample three feet (along roll length) by roll width according to ASTM Practice D 4354. The sample shall be properly marked, wrapped and sent to an independent laboratory for conformance testing.

C. The pass or fail of the conformance test results shall be determined according to ASTM Practice D 4759.

3.2 INSTALLATION

A. The geotextile shall be handled in such a manner as to ensure that it is not damaged in any way. Should the contractor damage the geotextile to the extent that it is no longer usable as determined by these specifications or by the engineer, the contractor shall replace the geotextile at his own cost.

B. The geotextile shall be installed to the lines and grades as shown on the contract drawings and as described herein.

C. The geotextile shall be rolled down the slope in such a manner as to continuously keep the geotextile in tension by self weight. The geotextile shall be securely anchored in an anchor trench where applicable, or by other approved or specified methods.

D. Inthe presence of wind, all geotextiles shall be weighted by sandbags or approved equivalent. Such anchors shall be installed during placement and shall remain in place until replaced with cover material.

E. The contractor shall take necessary precautions to prevent damage to adjacent or underlying materials during placement of the geotextile. Should damage to such material occur due to the fault of the contractor, the latter shall repair the damaged materials at his own cost and to the satisfaction of the engineer.

F. During placement of the geotextile, care shall be taken not to entrap soil, stones or excessive moisture that could hamper subsequent seaming of the geotextile as judged by the engineer.

G. The geotextile shall not be exposed to precipitation prior to being installed and shall not be exposed to direct Sun light for more than 15 days after installation.

H. The geotextile shall be seamed using heat seaming or stitching methods as recommended by the manufacturer and approved by the engineer. Sewn seams shall be made using polymeric thread with chemical resistance equal to or exceeding that of the geotextile. All sewn seams shall be continuous. Seams shall be oriented down slopes perpendicular to grading contours unless otherwise specified. For heat seaming, fusion welding techniques recommended by the manufacturer shall be used.

I. The contractor shall not use heavy equipment to traffic above the geotextile without approved protection.

J. The geotextile shall be covered as soon as possible after installation and approval. Installed geotextile shall not be left exposed for more than 15 days.

K. Material overlying the geotextile shall be carefully placed to avoid wrinkling or damage to the geotextile.

END OF SECTION

SECTION 02920

DIVERSION AND DEWATERING

PART 1 – GENERAL

1.1 SUMMARY

A. The Work of this Section consists of all labor, materials, equipment, and performance of all Work necessary for diversion of surface water; lowering and continuously controlling piezometric levels of groundwater; and dewatering of excavations for concrete structures, river-bank slope protection, and rock vanes. Removal of all such temporary works after they have served their purposes is also included in this Scope of Work.

B. Diversion and dewatering systems will be required during construction of concrete structures within the river waterway and in other parts of the construction site.

C. CONTRACTOR's attention is drawn to the fact that Work will be undertaken within the river and adjacent areas where groundwater levels are high beneath the project footprint.

D. The CONTRACTOR shall be responsible for dewatering the construction work area in a manner which maintains a continuous flow, and shall make every reasonable effort to ensure the design and construction are such that their function is not impaired by floods. To dewater the work area the CONTRACTOR may use temporary cofferdams, sand bags, or other approved means.

1.2 DEFINITIONS

A. Diversion: Performance of all Work to divert on-site streams and tributaries during placement of fill materials and construction of appurtenant concrete structures.

B. Dewatering: Ditches, sumps, pumps, dewatering wells, well points, monitoring devices, and all associated equipment for the removal of surface water, groundwater, and river water as needed to perform the required construction in accordance with the Specifications.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater to permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified Professional Engineer, using the performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control; stability of excavations and constructed slopes; prevention of flooding; and protection of subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

A. Section 013340, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES: Requirements for submittals.

B. The CONTRACTOR shall furnish the Engineer, in writing seven (7) days prior to beginning excavation work, a plan for diverting surface water and controlling groundwater. This plan shall be acceptable to the Engineer and approved by him. Include, but not be limited to, details of all channels, cofferdams, sumps, deep wells, well-point systems, sedimentation ponds, pumps, and pump lines. Acceptance of this plan will not relieve the CONTRACTOR of responsibility for completing the Work as specified. Success of the plan shall be the sole responsibility of the CONTRACTOR. Failure of the plan will require a resubmittal, acknowledgment, and implementation at no extra charge to the Owner. The suggested plan and sequence of diversion shown on the Drawings are provided to assist the CONTRACTOR to develop the CONTRACTOR's own plan and sequence which shall be the CONTRACTOR's sole responsibility.

C. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
   1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
   2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

D. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified Professional Engineer responsible for their preparation.

E. Qualification Data: For qualified Installer, land surveyor, and Professional

Engineer.

F. Field quality-control reports.

G. Other Informational Submittals:

1. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

1.5 DEWATERING PLAN REQUIREMENTS

A. Contractor Submittal & Approval. Before any in-channel or near-channel work begins (including new river channel excavation, bank stabilization structures, rock vanes, and fill placement in the existing channel), the CONTRACTOR shall prepare a project-specific Dewatering Plan for review and approval by PRASA. Work shall not start until written PRASA approval is received.

B. Discharge Locations. The Dewatering Plan shall identify all proposed dewatering discharge locations for each work area listed above and show them on a site sketch with stationing/coordinates. All discharge points shall be protected against erosion.

C. Methods, Sequencing, and Equipment. The Plan shall briefly describe the dewatering method(s) to be used, expected ranges of pumping rates/volumes, equipment to be deployed (e.g., pumps/hoses/manifolds), and the sequence for isolating and dewatering each work area.

D. Seasonal Provisions. The Plan shall address both dry-season and wet-season conditions, including contingencies for rainfall/high flows and a proposed work window aimed at low-flow conditions where practicable.

PART 2 - PRODUCTS

A. Diversion and dewatering system shall consist of cofferdams, channels, flumes, sumps, floats, ditches, pumps, deep wells or well-point systems, pipes, and all other equipment and Work necessary to achieve required results.

PART 3 - EXECUTION

3.1 DIVERTING SURFACE WATER

A. General: The CONTRACTOR shall build, maintain, and operate all cofferdams, channels, flumes, sumps, and other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction site and away from the construction work while construction is in progress. Unless otherwise specified, this diversion must discharge in the same natural state and into the same natural

drainageway in which its headworks are located. The diversion plan shall manage runoff without creating flooding to adjacent properties.

B. Earth Material: The earth material used in constructing any necessary earth-fill cofferdams shall be obtained from the excavation of structures or other approved sources.

C. Cofferdam Foundation Preparation: The base area of any cofferdam sections shall be stripped of unsuitable material and scarified and compacted prior to placing fill.

D. Cofferdam Fill Placement: Fill material shall contain no rock particles greater than 0.150 m (six (6) inches) in diameter, sod, brush, or other objectionable material.

E. The earth materials used to construct any necessary cofferdams and other temporary berms shall be placed in lifts no thicker than 0.150 m (six (6) inches) and compacted by routing the hauling and spreading equipment over the fills in such a manner that the entire surface of the fills will be traversed by not less than one tread track of the loaded equipment.

F. When an excess of earth material results from excavations it shall, if suitable, be used as fill or be temporarily deposited adjacent to the Work at locations approved by the Engineer.

G. The CONTRACTOR shall protect adjacent properties from flooding at all times.

3.2 DEWATERING THE CONSTRUCTION SITE

A. Foundations of Concrete Structures: Where the foundation of concrete structures is below the water table, groundwater shall be lowered prior to excavating below the measured water level and shall be lowered and maintained at least 1 m (three (3) feet) below the excavation bottom until structural concrete is placed. Observation wells shall be installed prior to excavation to verify that the water level has been lowered sufficiently.

B. Foundations, cut-off trenches, and other parts of the construction site shall be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction Work. The CONTRACTOR shall furnish, install, operate, and maintain all drains, sumps, pumps, casings, deep wells, well points, and other equipment needed to perform the dewatering as specified. Dewatering methods that cause a loss of fines from foundation areas will not be permitted.

C. To effectively dewater all excavations it may be necessary to construct sumps strategically placed at low points so that the foundation excavations drain to the sumps. If particularly high inflow occurs into the excavations at local areas, it may be necessary to install well points or interception trenches to intercept and remove the groundwater flow before it reaches the excavation.

D. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on a continuous basis if any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

E. Disposal of Water: Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of Work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction. Protect all discharge points against erosion.

F. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 REMOVAL OF TEMPORARY WORKS

A. After the temporary works have served their purposes, the CONTRACTOR shall completely remove them or level and grade them to a pre-construction condition to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

B. Except as otherwise specified, pipes and casings shall be removed from temporary dewatering wells and the wells shall be plugged or filled with sand, or cut off and capped a minimum of 36 inches below overlying construction.

END OF SECTION

SECTION 02930
VERTICAL HIGH DENSITY CROSS-LINKED POLYETHYLENE STORAGE TANKS

PART 1-GENERAL

1.01 Requirements

1. The CONTRACTOR shall provide a vertical, high density cross-linked polyethylene tanks and accessories per section 2.05, complete and in place, in accordance with the Contract Documents.
2. Unit Responsibility: The CONTRACTOR shall be responsible for furnishing the vertical tank(s) and its accessories for the chemical storage as noted.

1.02 REFERENCES, CODES AND STANDARDS

A. American Society of Testing Materials (ASTM).

1. D638 Tensile Properties of Plastics
2. D883 Standard Definitions of Terms Relating to Plastics
3. D1505 Density of Plastics by the Density-Gradient Technique
4. D1693 ESCR Specification Thickness 0.125" F50-10% Igepal
5. F412 Standard Terminology Relating to Plastic Piping Systems

B. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings

C. Building Code: International Building Code, IBC 2018 / 2021

D. ARM: Low Temperature Impact Resistance (Falling Dart Test Procedure).

E. NSF/ANSI Standard 61, AWWA – Drinking Water System Components

F. ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

1.03 SUBMITTALS

A. Shop Drawings: Shop drawings shall be approved by the engineer or contractor prior to the manufacturing of the vertical tank(s). Submit the following as a single complete initial submittal.

Sufficient data shall be included to show that the product conforms to Specification requirements. Provide the following additional information:

1. Vertical tank and Fitting Material

a. Resin Manufacturer Data Sheet
b. Fitting Material
c. Gasket style and material
d. Bolt material

2. Dimensioned Tank Drawings

a. Location and orientation of openings, fittings, accessories, restraints and supports.
b. Details of manways, flexible connections, and vents.

3. Calculations shall be stamped and signed by a registered, third party engineer in the State of installation.

a. Tank restraint system. Show seismic and wind criteria.

B. Manufacturer's warranty

C. Manufacturer's unloading procedure

D. Manufacturer's installation instructions

E. Supporting information of Quality Management System.

F. Supporting documentation of Manufacturer's certification to NSF/ANSI Standard 61 – Drinking Water System Components for water treatment chemicals.

G. Manufacturer's Qualifications: Submit to engineer a list of 5 installations in the same service as proof of manufacturer's qualifications.

H. Factory Test Report

1. Wall thickness verification.
2. Fitting placement verification.
3. Visual inspection
4. Impact test
5. Gel test
6. Hydrostatic test

1.04 QUALITY ASSURANCE

A. The CONTRACTOR shall provide a vertical tank of high density cross-linked polyethylene. Tanks furnished under this Section shall be supplied by Poly Processing Company or approved equal who has been regularly engaged in the design and manufacture of chemical storage tanks for over 10 years.

B. Tanks shall be manufactured from virgin materials.

C. Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage and submit form from NSF supporting chemical certification.

1.05 WARRANTY

A. The warranty shall be provided upon request for the specific service application. The warranty shall offer a limited 5 year full replacement.

PART 2 – PRODUCTS

2.01 General

Tanks shall be rotationally-molded, vertical, high density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section and vertical with flat bottoms. Tanks shall be adequately vented as prescribed in Poly Processing Company's Technical Bulletin, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

2.02 MANUFACTURER

A. Tanks shall be manufactured by Poly Processing Company or approved equal.

2.03 POLYETHYLENE STORAGE TANKS

A. Service: Chemical storage tanks shall be suited for the following operating conditions:

B. High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ or approved equal and shall contain ultraviolet stabilizer as recommended by resin manufacturer. Where black tanks are indicated, the resin shall have a carbon black compounded into it. The tank material shall be rotationally molded and be a resin that is commercially available at the time of tank manufacture.

C. **Wall thickness** for a given hoop stress is to be calculated in accordance with ASTM D 1998. In NO case shall the tank thickness be less than design requirements per ASTM D 1998.

1. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation:

$$T = P \times OD/2SD \text{ or } 0.433 \times SG \times H \times OD/2SD$$

Where:

T	=	wall thickness, in
P	=	pressure, psi
SG	=	specific gravity, gm/cc
H	=	fluid head, ft
OD	=	outside diameter, ft
SD	=	hydrostatic design stress

a. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.

2. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.

3. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	**Min Knuckle Radius, in**
less than or equal to 6	1
greater than 6	1-1/2

4. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty.
   a. Unless otherwise indicated by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device to prevent over-pressurization.
   b. Unless otherwise indicated by Contract drawings, for outdoor pneumatic fill, manways shall be 24-in diameter combined manway and vent to prevent over pressurization of tank.
   c. Unless otherwise indicated, tanks less than 2000 gallons in non-pneumatic applications shall have a manway cover 17-in or smaller of Polyethylene material with a coarse thread.

NOTE: Tanks must be vented to allow for performance at atmospheric pressure, in accordance with the following matrix:

Venting Requirements For Polyethylene Tanks

Mechanical Pump Fill	**Pneumatic Fill**								
IF ≤ 1000 gallons	**IF** - Vent length ≤ 3 feet			**IF** - Vent length > 3' and ≤ 30'			**IF** - Scrubber Application		
Vent size should equal size of largest fill or discharge fitting	**AND - Vent** screen mesh size ≥ 1/4" or no screen used			**AND** - 3 or less 90° elbows with no other restrictions or reduction in pipe size			**Vent pipe size throughout scrubber system CANNOT be reduced!** Centerline of dispersion pipe not to be submersed > 6 inches		
IF > 1000 gallons	**Emergency Pressure Relief Cover Required**			**Emergency Pressure Relief Cover Required**			Perforated dispersion pipe must be same diameter or larger, as vent. Sum of perforations ≥ cross sectional area of pipe		
Vent size should exceed the largest fill or discharge fitting by 1 inch	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size	Tanker Discharge	Inlet/Fitting Size	Minimum Vent Size
	2"	2"	4"	2"	2"	6"	2"	2"	6"
	3"	2"	6"	3"	2"	6"	3"	2"	8"
	3"	3"	6"	3"	3"	8"	3"	3"	10"

(2) 2 inch vents **DO NOT EQUAL** 4 inch venting capacity rev. Nov 2006

For detailed venting guidelines, please visit our Technical Resources at www.polyprocessing.com

E. Tank colors shall be natural (unpigmented), black (compounded), or as specified by the ENGINEER with written agreement by the tank manufacturer.

2.04 TANK ACCESSORIES

A. Restraint System:

1. Metal components to be stainless steel, edge softeners, and tension ring with stainless steel cables and clamps.

2. Tank restraint system shall be supplied and the design of same certified by a Structural Engineer registered in the State of tank installation. Design shall conform to the most recent edition of the IBC code for seismic and wind load. Anchor bolts as required by the calculations shall be supplied by the tank manufacturer

2.05 TANKS:

A. Tank Schedule per the following specifications

Note 1: Approximate overall height is measured along the straight cylindrical portion of the tank and includes the dome top.

B. Fittings

1. Tank fittings shall be according to the fitting schedule in 2.05B above. Threaded fittings shall use American Standard Pipe Threads. If tanks are insulated, fittings shall be installed at the factory prior to application of the insulation.

2. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

3. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 2-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.

4. U-Vents: Each tank must be vented for the material and flow and withdrawal rates expected. Vents should comply with OSHA 1910.106(F)(iii)(2)(IV)(9). U-vents shall sized by the tank manufacturer and be furnished complete with insect screen if required (Insect screen lessens the vent capacity by 1/3) in accordance with the venting schedule listed above.
5. All fittings on the 1/3 lower sidewall of tanks with capacities $\geq$ 1000 gallons shall have 100% virgin PTFE Flexijoint® expansion joint. Expansion joint to have a minimum of 3 convolutions, stainless steel limit cables and FRP composite flanges. Galvanized parts will not be accepted.

   Expansion joint to meet the following minimum performance requirements:

Axial Compression	$\geq$	0.67”
Axial Extension	$\geq$	0.67”
Lateral Deflection	$\geq$	0.51”
Angular Deflection	$\geq$	14º
Torsional Rotation	$\geq$	4º

2.06 LEVEL INDICATION

A. Float Indication: The level indicator shall be assembled to the tank and shall consist of PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube, and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.

B. Ultrasonic Level Indicator: The ultrasonic level indicator shall be a Flowline ultrasonic level transmitter, level controller with one 4-20 mA or 0-10 VDC continuous level input and NEMA 4X box to be supplied by tank manufacturer.

2.07 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.

2. Degree of Crosslinking. Use Method C of ASTM D 1998- Section11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.

2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.

3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. The tank shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. AVOID sharp objects on trailers.

B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the contractor.

C. Upon arrival at the destination, inspect the tank(s) and accessories for damage in transit. If damage has occurred, manufacturer shall be notified immediately.

3.02 INSTALLATION

A. Install the tanks in strict accordance with manufacturer's Tank Installation Manual and shop drawings.

B. Installation will be inspected by manufacturer representatives to verify system flexible connections, venting and fittings are properly installed. In addition to on-sight inspection tank system(s) to be reviewed using tank manual check list as supplied by manufacture as listed below.

C. Manufacturer to provide 1 hour training session to prepare operators to service and maintain the tank system. Included in training session will be the training manuals.

D. Manufacturer's trained technician to do an onsite inspection of installation. Inspection will verify chemical application, plumbing connections, venting, and applicable ancillary equipment such as restraints, etc. A verification of proper installation certificate will be supplied when equipment passes installation checklist.

E. Tank manuals will consist of installation check lists, tank drawing(s) as built, fitting drawings referencing nozzle schedule on tank drawing, materials of construction, and recommended maintenance program.

3.03 FIELD TESTING

A. Manufacturer recommends that all tanks be hydro-tested for 24 hours prior to commissioning.

END OF SECTION

SECTION 03000
CONCRETE REHABILITATION

PART 1 GENERAL

1.01 REFERENCES

A. Except as shown or specified, the Work of this Section shall conform to the requirements of International Concrete Repair Institute (ICRI), 3166 S. River Rd., Suite 132, Des Plaines, IL 60018, (847) 827-0830, www.icri.org.
   1. ICRI Guideline No. 310.1R-2008 Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion (formerly Guideline No. 03730).

1.02 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for factory packaged products.

1.03 QUALITY ASSURANCE

A. Field Examples: Prior to performing the Work of this Section, prepare a sample panel, or a portion of existing concrete which is to be repaired, to represent each type of rehabilitation work required. Approved samples will be used as quality standards for the Work. Maintain approved samples at the site until the Work is completed.

B. Material Container Labels: Material containers shall bear the manufacturer's label indicating manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable).

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in original, sealed containers. Do not deliver materials that have exceeded shelf life limitation set forth by the manufacturer.

B. Comply with manufacturer's printed instructions for storing and handling materials.

1.05 PROJECT CONDITIONS

A. Environmental Requirements: Comply with the product manufacturer's printed limitations and instructions.

PART 2 PRODUCTS

2.01 COMPANIES

A. The Euclid Chemical Company, 19218 Redwood Rd., Cleveland, OH 44110-2799, (800) 321-7628, www.euclidchemical.com.

B. Sika Corporation, 201 Polito Ave., Lyndhurst, NJ 07071, (800) 933-7452, www.sikausa.com.

C. Kaufman Products, Inc., 3811 Curtis Ave., Baltimore, MD 21226, (800) 637-6372, www.kaufmanproducts.net.

D. L&M Construction Chemicals, Inc., 14851 Calhoun Rd., Omaha, NE 68152, (800) 362-3331, www.lmcc.com.

E. Conproco Corp., 17 Production Dr., Dover, NH 03820, (800) 258-3500, www.conproco.com.

F. BASF Building Systems, 889 Valley Park Dr., Shakopee, MN 55379, (800) 433-9517, www.buildingsystems.basf.com.

2.02 MATERIALS

A. The following brand names are specified to establish product generic type and standard of quality. Other comparable products in the manufacturer's same product series may be required to closely fit the particular job conditions. Use appropriate product for depth of patch and temperature at time of application. More than one product may be required for a particular type of patching mortar. When a color choice is available, select the color to match adjoining concrete as closely as practicable. A bonding agent/primer and/or sealer shall be used as recommended by the patching mortar manufacturer.

B. Cement/Acrylic/Latex Base Patching Mortars (Use for patching vertical and overhead concrete surfaces. It may also be used for patching both vertical and horizontal surfaces of concrete steps.):

1. Type C-1 Patching Mortar (Use for patching vertical and overhead concrete surfaces. It may also be used for or patching both vertical and horizontal surfaces of concrete steps): "Verticoat", by The Euclid Chemical Company; "SikaTop 122 Plus" or "SikaTop 123 Plus" by Sika Corp; "Patchwell VO" or "HiCap Plus" by Kaufman Products, Inc.

2. Type C-2 Patching Mortar (Use for patching, resurfacing and leveling horizontal (except overhead) concrete surfaces, including treads of steps):
"SikaTop 121 Plus", "SikaTop 122 Plus" or "SikaTop 111 Plus" by Sika Corp.; "Patchwell Kit", "Patchwell Deep", "SureFlow 040", or "SureFlow 042" by Kaufman Products, Inc.; "Thincoat" or "Concrete Coat" by The Euclid Chemical Company;

3. Type C-3 Patching Mortar (Use for patching vertical/overhead work only. Their depths range from 2 ½" to feather-edge):"Patchwell VO", "HiCap", "HiCap Plus" or "DressUp" by Kaufman Products, Inc.; "SikaTop 123 Plus" or "SikaTop 144" by Sika Corp.; or "Verticoat Supreme" by The Euclid Chemical Company.

B. Epoxy Base Patching Mortars (Epoxy mortars should be limited to Maximum 1/2-inch-thick patches for exterior work. Do not apply epoxy to exterior slab on grade. Do not use epoxy mortars for interior patches thicker than 3 inches.):

1. Type E-1 Patching Mortar (Use for patching horizontal (except overhead) surfaces of non-structural concrete.):
100 percent solids, low modulus, low viscosity, moisture insensitive, epoxy resin and aggregate system; "Sikadur 21 Lo-Mod LV" by Sika Corporation; "Flexocrete Epoxy System"by The Euclid Chemical Company; "SurePoxy LMLV" by Kaufman Products, Inc.

2. Type E-2 Patching Mortar (Use subparagraph below for patching vertical and overhead surfaces of non-structural concrete):
100 percent solids, low modulus, high viscosity, moisture insensitive, epoxy resin and aggregate system; "Sikadur 23 Lo-Mod Gel" by Sika Corporation; "Flexocrete Gel" by The Euclid Chemical Company; "SurePoxy LM Gel" by Kaufman Products, Inc.;

3. Type E-3 Patching Mortar (Use for patching horizontal (except overhead) surfaces of structural concrete embers.):
High modulus, medium/low viscosity, moisture insensitive, epoxy resin and aggregate system; "Sikadur 35" or "Sikadur 52" by Sika Corporation, "Duralcrete" by The Euclid Chemical Company or "SurePoxy HM", "SurePoxy HM, Class B", "SurePoxy HMLV", "SurePoxy HMLV, Class B", "SurePoxy HMSLV", "SurePoxy HiBild" by Kaufman Products, Inc.

4. Type E-4 Patching Mortar (Use for patching vertical and overhead surfaces of structural concrete members.):
High modulus, high viscosity, moisture insensitive, epoxy resin and aggregate system; "Sikadur 31 Hi-Mod Gel" or "Sikadur 31 Hi-Mod Gel SBA Slow Set" by Sika Corporation; "Duralcrete Gel" by The Euclid Chemical Company; or "SurePoxy HM Gel", or "SurePoxy 117" by Kaufman Products, Inc.

5. Aggregate: As recommended by the patching mortar manufacturer for the binder and application.

D. Rebar Coating: "SurePoxy HMEPL" or SurePoxy HM 12" by Kaufman Products, Inc.; "ECB" by Conproco Corp.; or "MasterEmaco P122" or "MasterEmaco P124" by BASF Building Systems.

E. Cleaning Agent, Bonding Agent/Primer, Sealer/Topcoat: As recommended by the patching mortar manufacturer, including primer for the reinforcing steel and primer for the concrete substrate.

F. Concrete and Bonding Agent (for concrete): Normal weight cast-in-place concrete and adhesive bonding agent.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection: Cover or otherwise protect adjacent surfaces not being repaired.

B. Surface Preparation:

1. Prepare surfaces to be repaired in accordance with the Product manufacturer's printed instructions and as specified.

2. Cut out and remove cracked, spalled, and disintegrated concrete. Cut back to sound concrete. Cut edges of patch perpendicular to surface of patch, unless otherwise recommended by mortar manufacturer. If steel reinforcing bars are exposed, chip concrete out from behind exposed length of bars as required for a minimum clearance around circumference of bar of 3/4 inch. In addition, cut a minimum one inch length of sound concrete away from each end of exposed length of reinforcing bars.

3. Clean exposed steel reinforcement by oil-free abrasive blasting or high- pressure water blasting; remove bits of concrete and loose rust. If reinforcement is bowed out toward surface of the concrete, bend reinforcement back from surface.

4. Remove paint, oils, grease, dirt, salt deposits, laitance and other contaminants from surfaces to be patched. Use cleaning agent where required.

5. Clean areas to be patched with oil-free air or water under pressure, except as otherwise recommended by the mortar manufacturer.

3.02 COATING REBAR

A. Coat reinforcing as soon as possible after completion of surface preparation.

B. Place reinforcement coating complying with manufacturers printed instructions.

3.03 PATCHING CONCRETE

A. Patch concrete as soon as possible after completion of surface preparation.

B. Mixing Patching Mortar: Comply with mortar manufacturer's printed instructions. Proportion components and sizes of aggregate as recommended by mortar manufacturer for the particular job conditions.

C. Patch concrete in accordance with the product manufacturer's printed instructions.
   1. Coat contact surfaces of existing concrete and steel reinforcing with a bonding agent/primer as recommended in the product manufacturer's instructions.

D. Bring patches out to the original surfaces in true planes. Finish patches to match texture of adjoining concrete as close as possible.

E. Cure patches in accordance with the product manufacturer's printed instructions.

3.04 CLEANING

A. Clean up spatters and droppings.

3.05 PROTECTION

A. Protect mortar after placement in accordance with the product manufacturer's printed instructions.

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

PART 1 GENERAL

1.1 WORK INCLUDED

This section defines requirements for design, construction, erection and removal of concrete formwork.

1.2 RELATED WORK

Coordinate the requirements of this section with all other sections of Division 3 Concrete.

1.3 REFERENCE STANDARD

American Concrete Institute; ACI 347, "Recommended Practice for Concrete Formwork".

1.4 SUBMITTALS

Cement mixes and fill grout.

PART 2 PRODUCTS

2.1 FORM MATERIAL

A. Smooth Forms:

1. Construct formwork with plywood; tempered, concrete-form hardboard; dressed lumber faced with plywood or fiberboard lining; metal; plastic; or metal framed plywood-faced panel material to provide continuous, straight smooth surfaces. Form material shall be free of raised grain, torn surfaces, worn edges, patches, dents or other defects. Furnish material in largest practical sizes to minimize the number of joints and, when shown on the drawings, conform to the joint system shown. Form material shall have sufficient strength and thickness to withstand the pressure of newly placed concrete withstand bow or deflection.
2. Smooth forms shall be used on all concrete surfaces exposed to view or liquid in the complete structure.

B. Rough Forms:

1. Construct forms of dressed or undressed lumber free of knots, splits, or other defects; plywood; metal; or other material. Material shall have sufficient

strength and thickness to withstand the pressure of newly placed concrete without bow or deflection.

2. Rough forms may be used on concrete surfaces that will not be exposed to view or liquid in the completed structure.

C. Shores: Wood or adjustable metal type with bearing plates and with double wedges at bottom

2.2 FORM ACCESSORIES

A. Form Ties:

1. Form ties shall be of the removable end, permanently embedded body type and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders.
2. Use removable cones of one inch by one inch minimum size on the end of the form tie.
3. Grout depressions left in concrete by the cones with cement mix grout after the ends of the cones have been removed. Submit cement mix grout for approval.

B. Coating for Plastic Forms: Alkali-resistant gel-coat.

C. Chamfers: Provide a chamfer on all exposed edges by using either wooden or plastic chamfer strips. Chamfer strips shall be a forty-five degree right triangle in section with the two shorter sides measuring 3/4 inch.

2.3 DESIGN OF FORMWORK

A. Form Design: The design and engineering of all concrete form work, including all shoring, bracing and reshoring, shall be the responsibility of the Contractor. Design form work for loads, lateral pressure, and allowable stresses as described in ACI 347. Allow for design consideration, wind loads, allowable stresses and other applicable requirements of controlling local building codes. Camber form work to compensate for anticipated deflection during placement of concrete when required to maintain specified tolerances. Design form work to be readily removed without impact, shock, or damage to concrete surfaces and adjacent materials.

B. Slip Forming: Not permitted.

PART 3 EXECUTION

3.1 FORMWORK CONSTRUCTION

A. General:

1. All formwork, scaffolds and work platforms shall be safe and conform to OSHA Requirements.
2. Construct and maintain form work, complying with ACI 347 and these specifications so that it will maintain correct sizes of members, shape, alignment, elevation and position during concrete placement and until concrete has gained sufficient strength. Provide for openings, offsets, keyways, recesses, moldings, anchorages and inserts, as required.
3. Construct forms for easy removal without damage to concrete surface.
4. Formwork shall be sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
5. Chamfer strips shall be placed in forms to bevel all edges and comers permanently exposed to view, except the top edges of walls and slabs which are shown to be tooled. Edges of formed joints and interior comers shall not be beveled unless shown or specified otherwise. Equipment bases shall have formed beveled edges for all vertical and horizontal comers. Unless otherwise noted, bevels shall be 3/4 inch wide.
6. Provide temporary openings, at least 2 ft. x 2 ft., at the base of column and wall forms and at other points as required to facilitate observation and cleaning immediately before concrete is placed.
7. If runways are required for moving equipment, provide for support of runways with struts or legs resting directly on the formwork or structural member. Do not allow runways or supports to rest on reinforcing steel.
8. No form supports shall be cast in place or removed during or after placement of concrete.

B. Forms for Surfaces Exposed to View or Liquid:

1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes.
2. Form ties shall be uniformly spaced and aligned in horizontal and vertical rows.
3. Form ties shall not displace or interfere with reinforcing steel or other embedment placement.
4. Provide sharp, clean comers at intersecting planes, with out visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
5. Form molding shapes, recesses and projections with smooth-finish materials and install in forms with sealed joints to prevent displacement.
6. Form exposed comers of beams and columns to produce square, smooth, solid, unbroken lines. Provide all exterior exposed corners with % inch chamfer.
7. Arrange facing material in an orderly and symmetrical fashion. Keep the number of

seams to a practical minimum. Support facing material adequately to prevent deflection in excess of allowable tolerances.

8. For flush surfaces exposed to view in the completed structure, overlap previously placed, hardened concrete with form sheathing by approximately 1 inch. Hold forms against hardened concrete to maintain true surfaces, preventing offsets or loss of mortar.

C. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finish slab surface. Provide and secure units to support types of screeds required.

D. Surface to Receive Membrane Waterproofing: Provide chamfers for external comers in concrete surfaces that will be covered with membrane waterproofing. Provide a continuous relegate line of top of membrane waterproofing on vertical surfaces. Coordinate location with waterproofing applicators.

3.2 TOLERANCES

A. Construct formwork so that concrete surfaces will conform to tolerance limits.

B. Establish sufficient control points and benchmarks as references for tolerance checks. Maintain these references in undisturbed condition until final completion and acceptance of the project.

3.3 ADJUSTMENTS OF FORMWORK

A. Use wedges or jacks to provide positive adjustment of shores and struts. Wedges used for final adjustment of forms should be fastened in position after final inspection and before concrete placement.

B. Securely brace forms against lateral deflections. Prepare to compensate for settling during concrete placement.

C. For wall openings, construct wood forms that facilitate any necessary loosening to counteract swelling of forms.

3.4 PREPARATION OF FORM SURFACES

A. Before placing concrete, clean surfaces of forms and embedded materials. Remove accumulated mortar, grout, rust and other foreign matter.

B. Coat forms for exposed or painted concrete surfaces with form oil or form - release agent before placing reinforcement. Cover form surfaces with coating material used in strict accordance with the manufacturers printed instructions. Do not allow excess coating

material to accumulate in forms or to contact hardened concrete against which fresh concrete will be placed. Remove coating material from reinforcement before placing concrete.

C. Other than retained-in-place metal forms, forms for unexposed surfaces may be wet with water immediately before concrete placement in lieu of coating.

3.5 REMOVAL OF FORMS

A. Forms on vertical surfaces, when repair of surface defects or finishing is required before concrete is aged, may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations.
B. Remove top forms on sloping surfaces of concrete as soon as concrete has attained sufficient stiffness to prevent sagging. Loosen wood forms for wall openings as soon as this can be accomplished without damage to concrete. Formwork for columns, walls, sides of beams, and other parts not supporting weight of concrete may be removed after 12 hours provided that concrete has hardened sufficiently to resist damage from removal operations and provided the removal of these forms will not disturb members supporting the weight of the concrete.
C. All forms and shoring used to support weight of concrete or any construction loads shall remain in place until concrete has reached the minimum strength specified for removal of forms and shoring. In no case shall forms be removed in less than 4 days.

3.6 REMOVAL STRENGTH

A. Control Tests: Suitable strength control tests will be used as evidence that concrete has attained specified strength for removal of formwork or shoring supporting weight of concrete in beams, slabs, and other structural members.
    1. Field-Cured Test Cylinders. When field-cured test cylinders reach the specified removal strength, formwork or shoring may be removed from the respective concrete placements. Strength data from field-cured test cylinders shall be furnished by the Contractor.
    2. Laboratory-Cured Test Cylinders. When concrete has been cured as specified for cast-in-place concrete for the same time period required by laboratory-cured cylinders to reach specified strength, the formwork or shoring may be removed from respective concrete placements. Determine the length of time that the concrete placement has been cured by totaling the number of days or fraction of days, not necessarily consecutive, during which the air temperature surrounding the concrete is above 500° F and the concrete has been damp or thoroughly sealed against evaporation and loss of moisture.
B. Compressive Strengths: The minimum concrete compressive strengths for

removal of all formwork supporting the weight of concrete shall be 70 percent of the specified minimum 28-day strength of the class of concrete involved.

3.7 RESHORING

A. When reshoring is permitted or required, plan operations in advance and secure approval of such operations. While reshoring is under way, keep live load off the new construction. Do not permit concrete beams, slab, column or other structural member to be subjected to combined dead and construction loads in excess of loads permitted for developed concrete strength at the time of reshoring.

B. Place reshores as soon as practicable after stripping operations are complete but in no case later than the end of the working day on which stripping occurs. Tighten reshores to carry the required loads without overstressing construction. Leave reshores in place until tests representative of concrete being supported have reached specified strength at time of removal of formwork supporting the weight of concrete.

C. Floors supporting shores under newly placed concrete shall have their original supporting shores left in place or shall be reshored. The reshores shall be located directly under a shore position above unless other locations are permitted. Extend reshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms and construction live loads in such a manner that design superimposed loads of floors supporting shores are not exceeded.

3.8 FORM REUSE

Do not reuse forms that are worn or damaged beyond repair. Thoroughly clean and recoat forms before reuse. For wood and plywood forms to be used for exposed smooth finish, sand or otherwise dress concrete contact surface to original condition or provide form liner facing material. For metal forms, straighten, remove dents and clean to return to original condition.

END OF SECTION

SECTION 03213

PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes construction of portland cement concrete (PCC) paving.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03100, Concrete Formwork

B. Section 032100, Concrete Reinforcement

C. Section 03300A, Raw Water Intake Structure Cast-in-Place concrete

1.3 REFERENCES

A. AASHTO: American Association of State Highway Transportation Officials
   1. AASHTO M153: Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
   2. AASHTO M171: Standard Specification for Sheet Materials for Curing Concrete
   3. AASHTO M213: Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
   4. AASHTO M254: Standard Specification for Corrosion-Resistant Coated Dowel Bars
   5. AASHTO M282: Standard Specification for Joint Sealants, Hot-Poured, Elastomeric-Type, for Portland Cement Concrete Pavements
   6. AASHTO M284: Standard Specification for Epoxy-Coated Reinforcing Bars: Materials and Coating Requirements
   7. AASHTO T22: Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens (ASTM C39)
   8. AASHTO T23: Standard Method of Test for Making and Curing Concrete Test Specimens in the Field (ASTM C31)

9. AASHTO T24: Standard Method of Test for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (ASTM C42)
10. AASHTO T148: Standard Method of Test for Measuring Length of Drilled Concrete Cores (ASTM C174)
11. AASHTO T325: Standard Method of Test for Estimating the Strength of Concrete in Transportation Construction by Maturity Tests

B. ASTM: American Society for Testing and Materials
1. ASTM A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
2. ASTM A663: Standard Specification for Steel Bars, Carbon, Merchant Quality, Mechanical Properties
3. ASTM A706: Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
4. ASTM A775: Standard Specification for Epoxy-Coated Steel Reinforcing Bars
5. ASTM A996: Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
6. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field
7. ASTM C78: Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
8. ASTM C94: Standard Specification for Ready-Mixed Concrete
9. ASTM C172: Standard Practice for Sampling Freshly Mixed Concrete
10. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
11. ASTM D6690: Standard Practice for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

1.4 ABBREVIATIONS

A. GPT: Graphic profile test

B. PCC: Portland cement concrete

1.5 SUBMITTALS

A. Submit the following for approval:
1. Certification of aggregate sources.
2. Samples of fine and coarse aggregate.
3. Certified test results of fine and course aggregate.

4. Certification of cement.
5. Mix design and testing.
6. Paving plan and all joints layout.
7. Joint filler.
8. Joint sealer.
9. Curing material.
10. Certification of epoxy coating.
11. Performance qualifications.
12. Graphic profile testing profiles and results.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT CONCRETE

A. PCC shall be in accordance with Section 03300A Raw Water Intake Structure Cast-in-Place Concrete for Class 4500-1 1/2 concrete.

2.2 JOINT SEALER

A. The joint sealer for the joints in the concrete pavement shall meet the requirements of AASHTO M282.

B. Poured Joint Fillers: Furnish hot poured joint filler conforming to the requirements of ASTM D6690, Type II.

C. Preformed Expansion Joint Filler: Furnish preformed joint fillers for concrete conforming to the requirements of AASHTO M153 or AASHTO M213.

2.3 DEFORMED BAR REINFORCEMENT

A. Deformed bar reinforcement shall conform to the requirements of ASTM A706 or ASTM A615. Unless otherwise shown on the drawings, all reinforcing bars shall be Grade 60.

2.4 EPOXY COATED REINFORCEMENT

A. Epoxy coated reinforcement shall conform to the requirements of ASTM A775 and the following:
   1. Coating Voids: Patch visible voids in the epoxy coating, regardless of cause

a. Inspect coated bars before placement for damage to coating. Patch all visual defects in the coating with a prequalified patching material according to AASHTO M284 before installation. Clean areas to be patched to remove all surface contaminants and damaged coating. Promptly treat cleaned areas according to the resin manufacturer's recommendations and before detrimental oxidation occurs. Where rust is present, remove it by blast cleaning or power tool cleaning methods immediately before applying the patching material. Clean and roughen the metal before applying patching material. Feather the patching material 2 inches to 3 inches, or as recommended by the manufacturer, into undamaged coated areas. Apply patching material to a thickness greater than 8 mils.

b. Clean visual damage found after placement as specified above. Coating damage exceeding 2 percent of the surface area in any lineal foot section of a bar may be cause for rejection of that bar.

2. Handling: All systems for handling coated bars shall have padded contact areas for the bars wherever possible. Pad all bundling bands and lift all bundles with strongbacks, multiple supports or platform bridges so as to prevent bar-to-bar abrasion from sags in the bar bundle.

3. Coated Reinforcement Ties and Supports: Ties for coated reinforcement shall be nonmetallic coated. Where coated bars are tied to uncoated bars, the ties shall be nonmetallic coated.

4. Prequalification, Sampling, and Testing:

a. Prequalify all epoxy coating and patching/repair material according to ASTM A775. Perform all testing by a qualified private testing laboratory. The Client will review all test data to determine whether the material meets the pre-qualification requirements.

b. At the time of epoxy coated reinforcing bar shipment, submit a written certification that the coated bars were cleaned, coated and tested according to ASTM A775 and according to the specifications herein, and that the coating material used on the project is the same as that pre-qualified.

5. Plant Certification: Epoxy coated reinforcement shall be produced in a Concrete Reinforcing Steel Institute (CRSI) Certified Epoxy Coating Plant.

2.5 DOWEL AND TIE BARS

A. Tie bars shall be epoxy coated deformed steel bars and conform to the requirements of ASTM A615 or ASTM A996, except that rail steel bars, Grade 50 or 60, shall not be used for tie bars that are to be bent or restraightened during construction. Tie bars

designated as Grade 40 in ASTM A615 can be used for construction requiring bent bars.

B. Dowel Bars:
   1. Provide smooth, round, epoxy coated dowel bars. Coat with plastic, grease, heavy oil, or other approved material that will neither bond with nor be harmful to the PCC.
   2. Dowels shall conform to the requirements of ASTM A615 for Grades 40 and 60, or ASTM A663 for Grades 70, 75, and 80.
   3. Epoxy coated reinforcement shall conform to the requirements herein.

2.6 COVER MATERIAL FOR CURING

A. Curing materials shall conform to the following specifications:
   1. Liquid Compounds:
      a. Furnish liquid membrane-forming curing compounds meeting the requirements of ASTM C309.
      b. All compounds shall be Class A. Solvent-based compounds shall be Type 1-D.
   2. Polyethylene Films: Furnish clear or white polyethylene films for curing concrete meeting the requirements of AASHTO M171.
   3. Curing Blankets: Furnish curing blankets.
   4. Liquid Evaporation Reducer Compounds - Furnish evaporation reducer.

2.7 BONDING AGENTS

A. Epoxy Bonding Agents: Submit for approval.

B. Non-Epoxy Bonding Agents: Submit for approval.

2.8 GROUTS

A. Epoxy Grout: Submit for approval.

B. Non-Epoxy Grout: Submit for approval.

PART 3 - EXECUTION

3.1 SLIP-FORM PAVING QUALIFICATIONS

A. Performance Qualifications: The Contractor shall ensure that the PCC paving contractor responsible for performing PCC paving work has a satisfactory record of performance, as evidenced by successful completion of at least one slip-form concrete pavement project within the last 2 years with a minimum PCC thickness of 10 inches and a minimum placement of 10,000 square yards of concrete with dowel bars within a 6-month construction duration.

B. To qualify under this standard, the Contractor shall, upon request:
   1. Indicate in writing the name of the project, its location, the PCC placement start and end dates, and the number of square yards of PCC placed; and
   2. Provide contact information for the owner, general contractor, owner's project manager, or other authority who can verify the satisfactory record of performance of the PCC paving contractor.

3.2 EQUIPMENT

A. The equipment shall be at the job site before the start of construction operations for examination and approval.
   1. Mixers:
      a. General: Concrete shall be mixed at a central plant, except truck mixers may mix and deliver concrete only to areas inaccessible to paving equipment. Each mixer shall have attached in a prominent place a manufacturer's nameplate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.
         1) Examine mixers daily for the accumulation of hard concrete or mortar and the wear of blades.
      b. Truck Mixers and Truck Agitators: Truck mixers used for mixing and hauling concrete and truck agitators used for handling central-mixed concrete shall conform to the requirements of ASTM C94.
      c. Nonagitator Trucks: Nonagitating hauling equipment shall conform to the requirements of ASTM C94.
   2. Finishing Equipment:
      a. Finishing Machine: Equip the finishing machine with one or more oscillating-type transverse screeds.screening

b. Vibrators:

1) For side-form construction, vibrators may be either the surface pan type for pavements less than 8 inches thick or the internal type with either immersed tube or multiple spuds, for the full width of the concrete slab. They may be mounted on a separate carriage. They shall not come in contact with the joint, load-transfer devices, subgrade, or side forms. The frequency of the surface vibrators shall not be less than 3,500 vibrations per minute, and the frequency of the internal type shall not be less than 7,000 vibrations per minute for spud vibrators. When spud-type internal vibrators are used adjacent to the side forms, they shall have a frequency of not less than 3,500 vibrations per minute. Hand vibrators should be used to consolidate the concrete along forms and other isolated areas.

2) For slip-form construction, the paver shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Vibration shall be accomplished by internal vibrators with a frequency range variable between 7,000 and 12,000 vibrations per minute. The amplitude of vibration shall be between 0.025 and 0.06 inches.

3) The number, spacing, frequency, and eccentric weights shall be provided as necessary to achieve an acceptable concrete density and finishing quality. Adequate power to operate all vibrators at the weight and frequency required for a satisfactory finish shall be available on the paver. The internal vibrators may be supplemented by vibrating screeds operating on the surface of the concrete. The frequency of surface vibrators shall be not less than 3,500 vibrations per minute. Furnish a tachometer or other suitable device for measuring the frequency of the vibrators. The vibrators and tamping elements shall be automatically controlled so that they shall be stopped as forward motion ceases. Any override switches shall be of the spring- loaded, momentary contact type.

3. Concrete Saw: When sawing of joints is specified, provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions and at the required rate. Provide at least one standby saw in good working order. An ample supply of saw blades shall be maintained at the site of the work at all times during sawing operations. Provide adequate artificial lighting facilities for night sawing. All of this equipment shall be on the job both before and at all times during concrete placement.

4. Forms: Straight side forms shall be made of steel having a thickness of not less than 7/32 inch and shall be furnished in sections not less than 10 feet in length. Forms shall have a depth equal to the prescribed edge thickness of the concrete

without horizontal joint, and a base width equal to the depth of the forms. Provide forms with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Flange braces shall extend outward on the base not less than two-thirds the height of the form. Forms with battered top surfaces and bent, twisted, or broken forms shall be removed from the work. Do not use repaired forms until inspected and approved. The top face of the form shall not vary from a true plane more than 1/8 inch in 10 feet, and the upstanding leg shall not vary more than 1/4 inch. The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting.

5. Placer/Spreader: Provide a placer spreader that:
   a. Receives the concrete mixture in its hopper on the shoulder area.
   b. Delivers the concrete mixture to the slipform paver and uniformly spreads at the proper thickness for the full width of the area being paved.
   c. Does not segregate the concrete mixture or displace the reinforcing steel.
6. Slip-Form Pavers: Fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the drawings, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The Paver shall be equipped with the following:
   a. Electronic or hydraulic horizontal and vertical control devices to automatically control line and grade from both sides.
   b. Ability to vibrate, consolidate and finish the slab to proper grade and cross section for the full width and depth of the concrete being placed.
   c. Vibrating tubes or arms to work in the concrete.
   d. Sliding forms held together rigidly to prevent them from spreading.
   e. Sliding forms long enough so that slumping of the concrete does not exceed 1/4 inch at the edge.
   f. A positive interlock system to stop all vibration and tamping elements when the forward motion of the machine is interrupted.
   g. For projects that have more than 1,000 feet of concrete paving, an electronic monitoring device that:
      1) Is near the operator’s controls visible to the paver operator and Client.
      2) Operates continuously while paving.
      3) Displays the operating frequency of each individual internal vibrator for both manual and automatic sequencing.
      4) Records the time of day, station location, paver track speed and the operating frequencies.

7. Stationary Side Form Pavers: If a paving machine riding on stationary side forms is used:
    a. The machine used for initial strike-off and consolidation of PCC shall be self-propelled, screeding type and shall ride on and be guided by steel side forms or the edge of contiguous PCC pavement. The machine shall be designed and operated to strike-off, consolidate and compact the PCC to prescribed line, grade and cross section. Make provision to prevent chipping or marring previously placed PCC.
    b. Floating and finishing machines shall be self-propelled and shall ride on and be guided by steel side forms or the edge of contiguous PCC pavement. Provide floating action to the PCC surface by means of screeds, floats, rollers or combinations of them. Screed type machines shall have at least two oscillating type transverse screeds. The machines shall have sufficient wheelbase length, weight, float surface and adjustments to true up the PCC surface to accurate cross section and grade without dragging, marking or defacing the surface.

B. Surface and Smoothness Testing Equipment: Provide all equipment and supplies for determining smoothness.
    1. Straightedge: Provide two 16-foot straightedges
    2. Profilometer:
        a. Provide competent and experienced operator(s) for the equipment. The profilometer operator shall meet with the Client at a mutually agreed upon time prior to beginning surface measurements to discuss all aspects of smoothness measurement and testing on the project.

3.3 FORM SETTING

A. Sufficiently set forms in advance of the concrete placement to ensure continuous paving operation. After the forms have been set to correct grade, the grade shall be thoroughly tamped, either mechanically or by hand, at both the inside and outside edges of the base of the forms. Stake forms into place with not less than 3 pins for each 10-foot section. Place a pin at each side of every joint.

B. Form sections shall be tightly locked and free from play or movement in any direction. The forms shall not deviate from true line by more than 1/4 inch at any joint. Forms shall be so set that they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Clean and oil forms prior to the placing of concrete.

C. The alignment and grade elevations of the forms shall be checked, and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

3.4 PREPARATION OF BASE

A. Before paving operations begin, bring the base to the finished condition required by the Specifications. If the equipment requires additional width for support, provide the support necessary to assure the equipment maintains proper grade and cross section.

B. The base shall be moist before the concrete is placed. When the base is a treated base, the surface shall be clean and free of all loose material. Place concrete on existing and new treated base only when the surface temperature is less than 90°F. If water is used for cooling, remove all excess water standing in pools or flowing on the surface before placing concrete.

C. Manholes, inlets, and other such structures shall be completed, adjusted, cured, and otherwise prepared, as applicable. Make ready to have concrete placed in contact with them. Prepare manhole frames and other independent metal structures in the pavement area with an approved bond-preventing agent.

3.5 CONDITIONING OF UNDERLYING COURSE, SLIP-FORM CONSTRUCTION

A. The compacted base on which the pavement will be placed shall be widened approximately 3 feet to extend beyond the paving machine track to support the paver without any noticeable displacement. After the base has been placed and compacted to the required density, the areas which will support the paving machine and the area to be paved shall be trimmed to the proper elevation and profile by means of a properly designed machine. The grade of the base on which the concrete pavement is to be placed shall be controlled automatically by steel guide wires erected and maintained by the Contractor. If the density of the base is disturbed by the trimming operations, it shall be corrected by additional compaction before the concrete is placed except when stabilized subbases are being constructed. If damage occurs on a stabilized subbase, it shall be corrected full depth by the Contractor or the damaged areas filled with concrete integral with the pavement. The grading operations should be delayed as long as possible and immediately precede paving insofar as practical, particularly if the base course is subjected to haul traffic. If traffic is allowed to use the prepared grade, check the grade and correct immediately before the placement of concrete. The prepared grade shall be well moistened with water, without saturating, immediately ahead of

concrete placement to prevent rapid loss of moisture from concrete. In cold weather, the underlying base shall be protected so that it will be entirely free of frost when concrete is placed.

3.6 CONDITIONING OF UNDERLYING COURSE, SIDE-FORM CONSTRUCTION

A. The prepared grade shall be well moistened with water, without saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the concrete. Ruts or depressions in the subgrade or subbase caused by hauling or usage of other equipment shall be filled as they develop with suitable material (not with concrete or concrete aggregates) and thoroughly compacted by rolling. If damage occurs to a stabilized subbase, it shall be corrected full depth by the Contractor, or the damaged areas filled with concrete integral with the pavement. A multiple-pin template weighing not less than 1,000 pounds per 20 feet or other approved template shall be provided and operated on the forms immediately in advance of the placing of the concrete. The template shall be propelled only by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that they may be set and maintained at the correct contour of the underlying course. The adjustment and operation of the template shall be such as will provide an accurate retest of the grade before placing the concrete thereon. Remove all excess material. Low areas may be filled and compacted to a condition similar to that of the surrounding grade, or filled with concrete integral with the pavement. In cold weather, the underlying subbase shall be protected so that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. Maintain the template in accurate adjustment, at all times by the Contractor, and should be checked daily. The work described under the foregoing paragraphs does not constitute a regular subgrading operation, but rather a final accurate check of the underlying course.

3.7 CONSTRUCTION WIDTHS

A. When the pavement consists of two or more traffic lanes, construct at least two traffic lanes in one strip panel unless shown otherwise on the plans.

B. If the Contractor proposes a method of placement other than that shown or specified, the Contractor shall pay all costs to implement the change. Any changes require the Port's approval.

3.8 PLACING DOWEL BARS AND TIE BARS

A. Dowel Bars:

1. Provide smooth, round, epoxy coated dowel bars. Coat with plastic, grease, heavy oil, or other approved material that will neither bond with nor be harmful to the PCC. Use a framework to place dowels that is continuous across the entire lane width, holds the dowels parallel with each other, holds the dowels parallel with the surface of the pavement, and holds the dowels parallel to the roadway centerline. For dowels placed across an expansion joint, use a dowel bar basket or other system of support that leaves no permanent incompressible members in place within the joint. Maximum alignment tolerance shall be 5 degrees or 3/16 inch in the length of the dowel. Place dowels within 3/8 inch of the center of the slab vertically.
2. Place dowel bars for joint contact at existing concrete pavement surfaces by drilling the existing concrete section and then inserting the dowel bars and grouting them in place. Drill the holes large and deep enough to insert the dowel bars with adequate epoxy or nonepoxy grout. Adjust hole locations to avoid damaging any existing reinforcement when drilling the holes. Blow the dowel bar holes clean with compressed air before grouting. Center the bar in the hole for the full length of embedment before grouting. Pump the grout into the hole around the bar so the back of the hole will be filled first. Do not allow blocking or shimming to impede the flow of the grout into the hole. If dams are needed, place them at the front of the holes to confine the grout. Place the dams to permit the escape of air without leaking grout. Do not remove dams until grout has cured in the hole.

B. Tie Bars: Provide epoxy coated tie bars and place them for contact type longitudinal joints by one of the following methods:

1. By drilling the hardened concrete section and then inserting and grouting the tie bars into place. Drill the holes large and deep enough to insert the tie bars with adequate epoxy or nonepoxy grout. Take care not to damage the reinforcement when drilling the holes. Drill after the concrete attains enough strength so no damage to the concrete is caused by the drilling. Replace loose tie bars at no additional cost to the Client.
2. By inserting the tie bars into the plastic slipformed concrete before vibrating and finishing the concrete. The tie bars may be bent before insertion. Replace any loose tie bars by drilling and grouting, as described above, at no additional cost to the Client.

3. If using threaded mechanical splice couplers, submit splices for approval before using. Rebar splices shall be:
    a. Accompanied by manufacturer's quality compliance certificate.
    b. Installed according to manufacturer's recommendations.

3.9 HANDLING, MEASURING, AND BATCHING MATERIAL

A. The batch plant site, layout, equipment, and provisions for transporting material shall assure a continuous supply of material to the work site. Stockpiles shall be built up in layers of not more than 3 feet (1 m) in thickness. Each layer shall be completely in place before beginning the next layer and shall not be allowed to "cone" down over the next lower layer. Do not stockpile aggregates from different grading together. Improperly placed stockpiles will not be accepted.

B. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner to secure the specified grading of the material. Stockpile and remove the aggregate from stockpiles in a manner that holds segregation to a minimum. Do not use aggregates that have become segregated or mixed with earth or foreign material or contain lumps of hardened material. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall be stockpiled, or binned for draining at least 12 hours before being batched. Thaw frozen aggregates or aggregates containing frozen lumps before use. Rail shipments requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit free drainage. Separately weigh the fine aggregate and coarse aggregate into hoppers in the respective amounts set by the Client in the job mix. Cement shall be measured by weight. Separate scales and hopper, with a device to positively indicate the complete discharge of the batch of cement into the batch box or container, shall be used for weighing the cement.

C. When required or when permitted, batching plants shall be equipped to proportion aggregates and bulk cement, by weight, automatically using interlocked proportioning devices of an approved type. When bulk cement is used, use a suitable method of handling the cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, such as a chute, boot, or other approved device, to prevent loss of cement. The device shall be arranged to provide positive assurance of the actual presence in each batch of the entire cement content specified.

D. When cement is placed in contact with the aggregates, batches may be rejected unless mixed within 1 1/2 hours of such contact. Batching shall be conducted so that the results in the weights of each material required will be within a tolerance of 1 percent for cement and 2 percent for aggregates.

E. Water may be measured either by volume or by weight. The accuracy of measuring the water shall be within plus or minus 1 percent of required amounts. Unless the water is to be weighed, the water-measuring equipment shall include an auxiliary tank from which the measuring tank shall be filled. The measuring tank shall be equipped with an outside tap and valve to provide for checking the setting unless other means are provided for readily and accurately determining the amount of water in the tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

F. Methods and equipment for adding air-entraining agent or other admixtures to the batch, when required, shall be approved by the Client. All admixtures shall be measured into the mixer with an accuracy of plus or minus 3 percent.

3.10 FIELD TEST SPECIMENS

A. Any testing required shall be by Contractor. The specimens shall be taken in the field to determine the consistency, air content, and strength of the concrete. Flexural test beams shall be made each day that the concrete is placed. Each group of test beams shall be molded from the same batch of concrete and shall consist of a sufficient number of specimens to provide two flexural strength tests at each test age. One group of specimens will be made during the first half of each shift, and the other during the last portion of the shift. The specimens shall be made in accordance with ASTM C31. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test beams may be required until the Client is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages will be 7 days, 14 days and 28 days.

B. The flexural strength of the concrete shall meet the following requirements:
   1. The average of any 4 consecutive strength tests, tested at the end of 28 days, shall have an average flexural strength equal to or greater than the specified flexural strength.
   2. Not more than 20 percent of the beams tested at the end of 28 days shall have a flexural strength less than the specified strength. Specimens which are obviously defective shall not be considered in the determination of the strength. When it appears that the test specimens will fail to conform to the requirements for strength, the Client will have the right to order changes in the concrete sufficient to increase the strength to meet these requirements.

C. When a satisfactory relationship between 7-day and 28-day strengths has been established and approved, the 7-day test results may be used as an indication of the

28-day strengths. However, the 7-day test results will not replace the results of the 28-day tests if the 28-day results fall below the requirement. The concrete shall be sampled in accordance with ASTM C172. Flexural strengths specimens shall be made in accordance with ASTM C31 and tested in accordance with ASTM C78.

D. The concrete will be accepted without adjustment in payment if the average 28-day flexural strength, based on four acceptance tests is greater than or equal to the acceptance limit shown under the 1.00 pay factor in the table in this note. If the average strength does not meet this limit, the Contractor may elect to leave the concrete in place at a reduced unit price determined in accordance with the table. If the average 28-day flexural strength of the days pour fails to attain the lower acceptance limit shown for a 0.70 pay factor, the Client may order the removal of all the concrete in the day's pour. The pay factor for concrete which is allowed to remain in place when the pay factor is outside the 0.70 limit will be 0.50.

PAY FACTOR SCHEDULE FOR FLEXURAL STRENGTH AT 28 DAYS

PAY FACTOR	ACCEPTED LIMITS Average Flexural Strength (4 Tests)
1.00	Greater than M +0.120 R
0.95	M to M +0.115 R
0.85	M -0.090 R to M -0.005 R
0.75	M -0.170 R to M -0.095 R

Where: M = Modulus of Rupture (specified 28-day flexural strength

R = The range for a sample of Size N=4; the difference between the largest and smallest test.

3.11 MIXING CONCRETE

A. The concrete may be mixed at the work site, in a central mix plant or in truck mixers. Mix the concrete in a batch plant mixer, except truck mixers may mix and deliver concrete only to areas inaccessible to paving equipment. The mixer shall be of an approved type and capacity. Mixing time shall be measured from the time all materials, except water, are emptied into the drum. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C94, except that the minimum required revolutions of the mixing speed for transit mixed concrete may be reduced to

not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer. Furnish test data acceptable to the Client verifying that the make and model of the mixer will produce uniform concrete conforming to the provisions of ASTM C94 at the reduced number of revolutions shown on the serial plate.

B. When mixed at the work site or in a central mixing plant, the mixing time shall not be less than 50 seconds nor more than 90 seconds. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

C. The mixer shall be operated at the drum speed as shown on the manufacturer's nameplate on the approved mixer. Any concrete mixed less than the specified time shall be discarded at the Contractor's expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet (cubic meters), as shown on the manufacturer's standard rating plate on the mixer. An overload up to 10 percent above the mixer's nominal capacity may be permitted provided concrete test data for segregation and uniform consistency are satisfactory, and provided no spillage of concrete takes place. The batch shall be charged into the drum so that a portion of the mixing water shall enter in advance of the cement and aggregates. The flow of water shall be uniform, and all water shall be in the drum by the end of the first 15 seconds of the mixing period. Keep the throat of the drum free of such accumulations as may restrict the free flow of materials into the drum.

D. Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or nonagitating trucks. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the work site shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 2 hours when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by adding water or by other means will not be permitted, except when concrete is delivered in transit mixers. With transit mixers, additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Client. All these operations shall be performed within 45 minutes after the initial mixing operations and the water-cement ratio must not be exceeded. Admixtures for increasing the workability or for accelerating the set will be permitted only when specified for in the contract.

3.12 LIMITATIONS OF MIXING

A. No concrete shall be mixed, placed, or finished when the natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

B. Unless authorized in writing by the Client, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40ºF and shall not be resumed until an ascending air temperature in the shade and away from artificial heat reaches 50ºF.

C. Do not place concrete during periods of rain.

D. If the air temperature is 50ºF or less at the time of placing concrete, the Client may require the water and/or the aggregates to be heated to not less than 70ºF nor more than 150ºF.

E. During periods of warm weather when the maximum daily air temperature exceeds 90ºF, the following precautions should be taken. The forms and/or the underlying material shall be sprinkled with water immediately before placing the concrete. The aggregates and/or mixing water shall be cooled as necessary to maintain the concrete temperature at or not more than the specified maximum.

F. Protect the pavement from weather damage. Protect unhardened concrete from precipitation with protective material.

G. Remove and replace weather damaged pavement at no additional cost to the Client.

3.13 PLACING CONCRETE

A. Method:
   1. Place the concrete pavement with the slip-form method.
   2. Concrete pavement may be constructed by the side-form method only:
      a. In areas of continuous concrete pavement less than 1,000 square yards.
      b. In areas that are inaccessible to slip-form paving equipment.
      c. In areas of irregular geometry.
      d. In short sections of pavement which are necessary to facilitate traffic movement.

B. Delivery to Spreader: Deliver the concrete from the hauling vehicles to the placer/spreader hopper on the shoulder area. Do not permit equipment hauling concrete on the subgrade or on the base, except for a minimum number of approved right angle

or near right angle crossings. Correct damage to the subgrade or base due to the Contractor's operations, to the satisfaction of the Client, at no additional cost to the Client. Keep the surface of the subgrade or base moist in front of the paving operation.

C. Slip-Form Method:

1. One Lift: Place the concrete in final position by the slip-form method in one lift, so a minimum of finishing will be necessary to provide a dense, homogenous pavement conforming to true grade and cross section.
2. For the slip-form method, place the concrete with an approved slip-form paver designed to spread, consolidate, screed, and float-finish the plastic concrete in one complete pass of the machine so that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with requirements of the drawings and specifications. Use hand screeding and float finishing only on small irregular areas.
3. Consolidate the plastic concrete by internal vibration with transverse vibrating units located within the specified thickness of pavement sections for the full width of pavement. A series of equally spaced longitudinal vibrating units may be used to supplement or replace the transverse vibrating units.
4. Maintain the frequency of vibration of each vibrating unit above 7,500 cycles per minute. Maintain the frequency or amplitude of vibration to consolidate the plastic concrete along the entire length of the vibrating unit and for a distance of at least 1 foot. Vary the frequency or vibration of amplitude proportionately with the rate of travel to result in a uniform density and air content.
5. Horizontally space vibrators according to the manufacturer’s recommendations or not more than 18 inches, center-to-center, whichever is less. Do not exceed a 9 inch space from the outer edge of the pavement to the outside vibrator.
6. The concrete should be placed directly on top of the joint assemblies to prevent them from moving when the paver moves over them. Side forms and finishing screeds shall be adjustable to the extent required to produce the specified pavement edge and surface tolerance.
7. Coordinate all operations of mixing, delivering and spreading concrete to provide uniform progress. Operate the slip-form paver with as nearly continuous forward movement as possible. Hold stopping and starting the paver to an absolute minimum. If, for any reason, it is necessary to stop the forward motion of the paver, immediately stop the vibratory and tamping elements. Apply no external force to the paver.
8. Final finishing shall be accomplished while the concrete is still in the plastic state.
9. It is the intent of the specification to produce a high quality, dense, long lasting, and smooth pavement suitable for the operations of roughness-sensitive heavy jet aircraft or passenger buses. This requires that all joints, and particularly all

longitudinal joints, meet the specified tolerance throughout their length. The Client will designate the paving lanes to be used for the initial paving operations. In the event that slumping or sloughing occurs behind the paver or if there are any other structural or surface defects which, in the opinion of the Client, cannot be corrected within permissible tolerances, the Client may halt paving operations until proper adjustment of the equipment or procedures have been made. In the event that satisfactory procedures and pavement are not achieved after not more than 2,000 lineal feet of single lane paving, complete the balance of the work with the use of standard metal forms and the formed method of placing and curing.

D. Side-Form Method:

1. Place the PCC between stationary side forms by means that will prevent segregation of constituents of the PCC, displacement or deformation of the forms or base, forming of piles, and unequal consolidation.
2. For the side-form method, the concrete shall be deposited on the moistened grade to require as little rehandling as possible. Spread and distribute the PCC with a mechanical concrete spreader which will fill all corners and spaces with PCC and leave it at such height that after consolidation and finishing it will be at specified grade and cross section. Spread and vibrate the PCC against and along the forms, and in the vicinity of joints comprising load transfer devices, with care to avoid displacement of the forms or devices. Placing shall be continuous between transverse joints without the use of intermediate bulkheads.
3. Use shovels or muckrakes, not rakes, for hand spreading and distributing. Do not foul the PCC with foreign matter. Workers shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.
4. When concrete is to be placed adjoining a previously constructed lane of pavement and when mechanical equipment will be operated upon the existing lane of pavement, the concrete shall be at least 7 days old and at a flexural strength approved by the Client. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after 3 days, if approved by the Client.
5. After being placed, strike-off, vibrate and consolidate the PCC with equipment conforming to the requirements specified in this Section. If more than one machine is required to properly handle production, the vibrating of PCC shall normally precede or accompany the first or leading machine only. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not come in contact with a joint assembly, the

grade, or a side form. In no case shall the vibrator be operated longer than 15 seconds in any one location, nor shall the vibrators be used to move the concrete.

6. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.
7. Perform all strike-off, vibration, and consolidation operations within 15 minutes after the PCC is placed. The operations shall be continuous until the surface has been worked the equivalent of not less than two passes of a single screed machine. In each pass of the machine, maintain a roll of PCC ahead of the screed for the entire width of pavement being placed. The strike-off, vibrating and consolidating shall leave a surface of uniform texture, true to grade and cross section.
8. Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately by approved methods.
9. Equipment shall be in good mechanical condition at all times and be adjusted for wear at the direction of the Client. Keep forms and other controls of line and grade clean and true to line and grade.

E. Provision for Joints and Other Devices: While placing concrete, make provision for constructing joints, placing dowels, tie bars, and other devices as shown and directed, and as provided in these specifications.

F. Reject Concrete Material: Reject concrete if it:
1. Is not in place within two (2) hours after being mixed (90 minutes when delivered in ready mix truck).
2. Has begun to take an initial set before placement.do not
3. Has been retempered with water.

G. Protect Surface:
1. Equip supports of the slip-form paver, and other equipment which ride on previously placed pavement. Protect the concrete as required and specified to prevent marring, edge breaking, or chipping of the previously placed pavement.
2. When concrete is placed adjacent to an existing pavement, equip that part of the equipment which is supported on the existing pavement with protective pads on crawler tracks or use rubber-tired wheels. Offset the track or wheels to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

H. Hand Operated Equipment: Use shovels and muckrakes, not rakes, for hand spreading and distributing. Do not foul the concrete with foreign matter or disturb joint devices

during such operations. Furnish hand operated mechanical vibrators satisfactory to the Client. Use these vibrators to consolidate the concrete pavement at least 6 feet on each side of construction and expansion joints and any other areas as directed.

3.14 TEST STRIP

This section applies if concrete pavement length is more than 5 miles long.

A. At the beginning of paving operations, construct one initial test strip of concrete pavement at least 0.1 mile long at the specified paving width. Do not perform further paving until the test strip is evaluated for surface tolerance and profile and the Client allows the Contractor to proceed.

B. An additional test strip will be required when:
   1. The Contractor proposes using different paving equipment.
   2. Any portion of a test strip fails to meet the smoothness requirements specified.

C. Change methods and/or equipment and construct additional test strips until a test strip meets smoothness requirements without grinding or other corrective work. Limit these additional test strips to 0.1 mile in length.

D. If three test strips fail to meet smoothness requirements before grinding, remove all three strips and construct additional test strips at no additional cost to the Client

3.15 JOINTS

A. General:
   1. Types: Construct joints of the kinds shown and where shown on the drawings or directed. Joint types in the concrete pavement will be contraction, construction or expansion. They shall be transverse or longitudinal unless otherwise shown on the plans or directed by the Client. Extend all joints and joint filler to pavement edges or to each other.
   2. Longitudinal and Transverse Joints:
      a. Longitudinal and transverse joints shall be constructed as indicated on the drawings and in accordance with these requirements. All joints shall be constructed true to line with their faces perpendicular to the surface of the pavement.
      b. Joints shall not vary more than 1/4 inch from a true line or from their designated position. The tops of joint filler, when required, shall be slightly, but not more than 1/8 inch, below and paralleling finished

pavement grade and cross section. Protect top edges of filler from damage by paving operations.

c. All joints which contain preformed filler are to be constructed before the final floating and surface finishing of the concrete, unless otherwise directed by the Client.

d. Test the surface across the joints with a 10-foot straightedge as the joints are finished and any irregularities in excess of 1/4 inch shall be corrected before the concrete has hardened. When required, keyways shall be accurately formed with a template of metal or wood. The gauge or thickness of the material in the template shall be such that the full keyway, as specified, is formed and is in the correct location. Transverse joints shall be at right angles to the centerline of the pavement and shall extend the full width of the slab. The transverse joints in succeeding lanes shall be placed in line with similar joints in the first lane. All joints shall be so prepared, finished, or cut to provide a groove of the width and depth shown on the drawings.

3. Tie Bars: Tie bars shall consist of deformed bars installed principally in longitudinal joints as shown on the drawings. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals of 30 inches, unless otherwise specified. They shall be held in position parallel to the pavement surface and midway between the surfaces of the slab. When tie bars extend into an unpaved lane, they may be bent at right angles against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. These bars shall not be painted, greased, or enclosed in sleeves.

4. Dowel Bars: Dowel bars or other load-transfer units of an approved type shall be placed across transverse or other joints in the manner as specified on the drawings. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. Each dowel painted with rust preventative paint, as required under Article 2.06, shall be thoroughly coated with asphalt MC-70, or approved equal lubricant, to prevent the concrete from binding to that portion of the dowel. If free-sliding plastic-coated or epoxy-coated steel dowels are used, a lubrication bond breaker shall be used except when approved pullout tests indicate it is not necessary. In lieu of using dowel assemblies in contraction joints, dowel bars may be placed in the full thickness of pavement by a mechanical device approved by the Client.

5. Slip-Form Construction: For slip-form construction, the following shall apply: When keyed construction joints are called for, a sheet metal keyway liner shall be required. The liner may remain in place permanently and become part of the

keyed joint and shall be galvanized, copper clad, or of similar rust-resistant material, of sufficient stiffness to support the upper keyway flange. If a bent tie bar installation is used, the tie bars shall be inserted through the sheet metal keyway liner only on the female side of the joint. The bent tie bar installation may cause breaking of some small amount of laitance where the bar goes through the liner when the exposed portion of the bar is bent for extension into the adjacent lane. In no case shall a bent tie bar installation for male keyways be permitted which will require chipping away of concrete to perform the straightening of the tie bar. Alternate methods of bar installation may be approved by Client if the keyway can be formed to a tolerance of 1/4 inch in any dimension and without distortion or slumping of the top of the male flange. Transverse joints with dowels will require particular care to ensure the dowels are accurately placed and not disturbed during concrete placement. Transverse dowels will require use of an apparatus to firmly hold the dowels perpendicular to the joint and parallel to the slab surface. During the concrete placement operation, place plastic concrete directly on the dowel assembly immediately prior to passage of the paver to help maintain dowel alignment. In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the full thickness of pavement by a mechanical device approved by the Client.

B. Installation:

1. The top of an assembled joint device shall be set at the proper distance below the pavement surface and the elevation shall be checked. Set such devices to the required position and line and securely hold in place by stakes or other means during the pouring and finishing of the concrete. Place and hold the premolded joint material in a vertical position; if constructed in sections, there shall be no offsets between adjacent units. Check dowel bars for exact position and alignment as soon as the joint device is staked in place, and the device shall be tested to determine whether it is firmly supported. The maximum permissible tolerance on dowel bar alignment in each plane, horizontal and vertical, shall not exceed 2 percent or 1/4 inch per foot of a dowel bar. Use a well-fabricated dowel basket and power assembly to maintain proper alignment. In lieu of using dowel assemblies at contraction joints, dowel bars may be placed in the full thickness of pavement by mechanical device approved by the Client.
2. When joints in concrete pavements are sawed, cut the joints as shown on the drawings. The circular cutter shall be capable of cutting a groove in a straight line and shall produce a slot at least 1/8 inch wide and to the depth shown on the drawings. When shown on the drawings or required by the specifications, the top portion of the slot or groove shall be widened by means of a second shallower cut or by suitable and approved beveling to provide adequate space for joint sealers.

Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting without chipping, spalling, or tearing. Sawing shall be carried on both during the day and night, as required. Saw the joints at the required spacing consecutively in sequence of the concrete placement, unless otherwise approved by the Client.

C. Longitudinal Joints: A longitudinal joint shall be considered a joint parallel with the long dimension of the paving area. If the Contractor elects to pour the entire width of pavement at one time, construct the longitudinal joint as indicated on the drawings. Longitudinal joints shall be the contact type or weakened plane type.

1. Contact: Construct longitudinal contact joints when concrete is placed against hardened concrete regardless of age, between strips of pavement or between a strip of pavement and a concrete gutter.
2. Construction:
    a. Construct construction joints when there is an interruption of more than 45 minutes in the concrete placing operations.
    b. The new concrete placed against the joint shall conform closely to the proportions and consistency of the previously placed concrete except vibrate and consolidate it to a greater degree and with more care than normal. Unless otherwise indicated on the drawings, do not construct construction joints within 10 feet of a transverse expansion or contraction joint. If sufficient concrete has not been mixed at the time of interruption to form a slab at least 10 feet long, remove the concrete back to the last joint and dispose of as directed.
    c. Longitudinal construction joints necessary for lane construction shall be formed against suitable side forms (usually made of steel) with or without keyways, as indicated in the drawings. Wooden forms may be used under special conditions, when approved by the Client. When the concrete is placed using slip-form pavers, the keyway shall be formed in the plastic concrete by means of preformed metal keyway liners which are inserted during the slip-form operations to form the female side of the key and which may be left in place. The dimensions of the keyway forms shall not vary more than plus or minus 1/4 inch from the dimensions indicated and shall not deviate more than plus or minus 1/4 inch from the mid-depth of the pavement. A male keyway may be used providing the keyway and edge tolerances are met. Where butt-type joints with dowels are designated, the dowels for this type shall be painted and greased. The edges of the joint shall be finished with a grooving tool or edging tool, and a space or slot shall be formed along the joint of the dimensions, as indicated, to receive the joint sealing material. Longitudinal construction joints shall be sawed

to provide a groove at the top conforming to the details and dimensions indicated on the drawings. Provisions shall be made for the installation of tie bars as noted on the drawings.

3. Contraction or Weakened-Plane Type:
    a. The longitudinal groove formed or sawed in the top of the slab shall be installed where indicated on the drawings. The groove shall be formed in the plastic concrete with suitable tools or material to obtain the width and maximum depth specified, or it shall be sawed with approved equipment in the hardened concrete to the dimensions required.
    b. Perform sawing at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. Saws may be single or tandem, as the Contractor elects, and be controlled by guides to true line. Restore curing agents broken or damaged by the sawing operations. Repair any damage to the curing material immediately after the sawing is completed.
    c. When the groove is formed in plastic concrete, it shall be true to line with not more than 1/4 inch variation in 10 feet; it shall be uniform in width and depth; and the sides of the groove shall be finished even and smooth with an edging tool. If an insert material is used, the installation and edge finish shall be according to the manufacturer's instructions. The sawed groove shall be straight and of uniform width and depth. In either case, the groove shall be clean cut so that spalling will be avoided at intersections with transverse joints. Install tie bars across these joints where indicated on the drawings.

D. Transverse Joints: A transverse joint shall be considered a joint perpendicular to the long dimension of the paving area.
    1. Contraction:
        a. Install transverse contraction joints, weakened-plane joints, or both, at the locations and spacing as shown on the drawings. These joints shall be installed by forming a groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into the concrete surface after the concrete has hardened. Install dowel bar or tie bar assemblies when required or as shown on the drawings.
        b. Weakened plane joints shall be to the depths and maximum width indicated on the drawings.
        c. Perform sawing at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. Saws may be single or tandem, as the Contractor elects, and be controlled by guides to true line. Restore curing agents broken or damaged

by the sawing operations. Repair any damage to the curing material immediately after the sawing is completed.

2. Construction:
   a. Install transverse construction joints only if mechanical problems occur or when a paving lane is interrupted for more than 45 minutes or it appears that the concrete will obtain its initial set before fresh concrete arrives. When the installation of the joint can be planned in advance, it shall be located at a contraction joint.
   b. The new concrete placed against the joint shall conform closely to the proportions and consistency of the previously placed concrete except vibrate and consolidate it to a greater degree and with more care than normal. Unless otherwise indicated on the drawings, do not construct construction joints within 10 feet of a transverse expansion or contraction joint. If sufficient concrete has not been mixed at the time of interruption to form a slab at least 10 feet long, remove the concrete back to the last joint and dispose of as directed.

E. Sealing Sawed Joints: Fill sawed longitudinal weakened plane joints and transverse contraction joints with poured joint filler. Thoroughly clean joints at the time of sealing. Ensure the curing period for joints is complete before allowing construction equipment and vehicles on the pavement.

3.16 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING

A. Sequence: The sequence of operations shall be the strike-off and consolidation, floating and removal of laitance, straightedging, and final surface finish. The addition of superficial water to the surface of the concrete to assist in finishing operations generally will not be permitted. If the application of water to the surface is permitted, it shall be applied as a fog spray by means of approved spray equipment.

B. Finishing at Joints: The concrete adjacent to joints shall be compacted or firmly placed without voids or segregation against the joint material; it shall be firmly placed without voids or segregation under and around all load-transfer devices, joint assembly units, and other features designed to extend into the pavement. Concrete adjacent to joints shall be mechanically vibrated as required in Article 3.9. After the concrete has been placed and vibrated adjacent to the joints, the finishing machine shall be operated in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the finishing machine, to, over, and beyond the joints, cause segregation of concrete, damage to, or misalignment of the joints, the finishing machine shall be stopped when the screed is approximately 8 inches from the joint. Segregated concrete shall be

removed from the front of and off the joint; the screed shall be lifted and set directly on top of the joint, and the forward motion of the finishing machine shall be resumed. Thereafter, the finishing machine may be run over the joint without lifting the screed, provided there is no segregated concrete immediately between the joint and the screed or on top of the joint.

C. Machine Finishing: Spread the concrete as soon as it is placed, and it shall be struck off and screeded by an approved finishing machine. The machine shall go over each area as many times and at such intervals as necessary to give the proper consolidation and to leave a surface of uniform texture. Avoid excessive operation over a given area. When side forms are used, keep the tops of the forms clean by an effective device attached to the machine, and the travel of the machine on the forms shall be maintained true without lift, wobbling, or other variation tending to affect the precision finish. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length. When in operation, move the screed forward with a combined longitudinal and transverse shearing motion, always moving in the direction in which the work is progressing, and so manipulated that neither end is raised from the side forms during the striking-off process. If necessary, repeat until the surface is of uniform texture, true to grade and cross section, and free from porous areas.

D. Hand Finishing:
   1. Hand finishing methods will not be permitted, except under the following conditions: In the event of breakdown of the mechanical equipment, hand methods may be used to finish the concrete already deposited on the grade; in areas of narrow widths or of irregular dimensions where operation of the mechanical equipment is impractical. Concrete, as soon as placed, shall be struck off and screeded. Use an approved portable screed.
   2. The screed for the surface shall be at least 2 feet longer than the maximum width of the slab to be struck off. It shall be approved design, sufficiently rigid to retain its shape, and shall be constructed either of metal or of other suitable material covered with metal. Consolidation shall be attained by the use of a suitable vibrator.

E. Floating: After the concrete has been struck off and consolidated, it shall be further smoothed, trued, and consolidated by means of a longitudinal float, using one of the following methods:
   1. Hand Method: The hand-operated longitudinal float shall not be less than 12 feet in length and 6 inches in width, properly stiffened to prevent flexibility and warping. The longitudinal float, operated from foot bridges resting on the side forms and spanning but not touching the concrete, shall be worked with a sawing

motion, while held in a floating position parallel to the pavement centerline and passing gradually from one side of the pavement to the other. Forward movement along the centerline of the pavement shall be in successive advances of not more than one-half the length of the float. Any excess water or soupy material shall be wasted over the pavement edge of each pass.

2. Mechanical Method: A machine composed of a cutting and smoothing float(s), suspended from and guided by a rigid frame may be used. The frame shall be carried by four or more visible wheels riding on, and constantly in contact with, the side forms or pavement subgrade. If necessary, long-handled floats having blades not less than 5 feet in length and 6 inches in width may be used to smooth and fill in open-textured areas in the pavement. Long-handled floats shall not be used to float the entire surface of the pavement in lieu of mechanical methods. When strike-off and consolidation are done by hand and the crown of the pavement will not permit the use of the longitudinal float, the surface shall be floated transversely by means of a long-handled float. Take care not to work the crown out of the pavement during the operation. After floating, remove any excess water and laitance from the surface of the pavement by a straightedge 10 feet or more in length. Successive drags shall be lapped one half the length of the blade.

F. Straightedge Testing and Surface Correction: After the pavement has been struck off and consolidated and while the concrete is still plastic, test for trueness in both the longitudinal and transverse directions with a 16-foot straightedge. For this purpose, furnish and use an accurate 16-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. The straightedge shall be held in contact with the surface in successive positions parallel to the centerline and perpendicular to the centerline, and the whole area gone over from one side of the slab to the other, as necessary. Advancing shall be in successive stages of not more than one-half the length of the straightedge. Remove any excess water and laitance from the surface of the pavement. Any depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be cut down and refinished. Give special attention to assure that the surface across joints meets the requirements for smoothness. Continue straightedge testing and surface corrections until the entire surface is found to be free from observable departures from the straightedge and until the slab conforms to the required grade and cross section. Client may waive graphic profile testing if it is successfully demonstrated that required pavement profile surface is produced which conforms to the surface tolerance requirements.

1. Edge Slump: Correct any edge slump of the concrete in excess of 1/4 inch before the concrete hardens.

G. Failure to Meet Plastic Concrete Straightedge Requirements: If the specified requirements are not met, stop the paving operations until revised methods, changes in equipment, or correction of procedures are made or proposed for trial, and are approved by the Client for trial. Also stop those revisions, changes and corrections if they do not produce a specified surface.

3.17 SURFACE TEXTURE

A. Upon completion of the machine floating, straightedge testing, edge tooling and, if necessary, hand floating, and before initial set of the surface concrete, give the surface of the concrete a textured finish.

B. Roadway Textured Finish: Accomplish the textured finish with a steel-tine tool with 1/8 inch wide tines spaced 3/4 inch apart that will mark the finished surface to a depth of 1/8 to 3/16 inch without tearing the surface. Avoid overlaps of the texturing. Texture the surface parallel to the roadway centerline and full roadway width.

C. Airfield Textured Finish: Finish the surface of the pavement with a light brush or broom finish for all newly constructed concrete pavements. Demonstrate the surface texture method and finish for the Port's approval.

D. Brush or Broom Finish: Apply a brush or broom finish when the water sheen has practically disappeared. Operate the equipment transversely across the pavement surface, providing corrugations that are uniform in appearance and approximately 1/16 of an inch in depth. It is important that the texturing equipment not tear or unduly roughen the pavement surface during the operation. Correct any imperfections resulting from the texturing operation.

3.18 MODIFICATION OF STRIKE-OFF, CONSOLIDATION, FINAL FLOATING, AND SURFACE FINISHING

A. Where the width of pavement is narrow, tapering or of irregular pattern, not lending itself to being constructed by prescribed machine methods, the Contractor will be allowed to perform the strike off, consolidation, final floating, and surface finishing with equipment, tools, means, labor and methods other than those specified, provided the work meets with the approval of the Client and the following requirements.

1. Without causing segregation, vibrate throughout the concrete being placed until it is uniformly consolidated.

2. Strike-off the concrete with templates or screeds designed and manipulated to shape the concrete to specified cross section between the forms, carrying a slight excess of concrete in front of the leading edge of templates or screeds at all times.
3. Following the vibrating and strike-off operations, float the concrete. Include transverse floating or other smoothing and finishing actions as necessary. Check and correct the surface. Keep the surface free from laitance, soupy mortar, marks or irregularities.
4. Finish the surface to conform to the requirements of this Section.

3.19 EDGE TOOLING AND FILLING

A. Tool edges at longitudinal contact joints and construction joints of new pavement and clean joints of previously placed concrete to remove laitance and mortar resulting from finishing operations, and to provide clean rounded edges without ridges on the surface. Perform tooling of the edges of concrete pavement so that a nominal 5/8 inch diameter radius is produced. Perform tooling of edges at construction joints so that no more than a 1/8 inch radius is produced.

B. Fill any areas of minor honeycomb or other minor defect in composition of the concrete along the exposed sides of concrete with a stiff mortar of cement and fine aggregate, and apply to the moistened concrete to the satisfaction of the Client. Remove and replace areas showing serious defects in composition of the concrete with specified quality concrete for full panel width between longitudinal joints or edges, and for a length not less than 10 feet. Low spots exceeding 1/4 inch in depth, if in hardened concrete, may be filled with an epoxy grout provided the area is prepared according to grout manufacturer's directions and the filling is neat and blends inconspicuously with adjoining concrete.

3.20 SURFACE TOLERANCES

A. Exercise extreme care to assure the pavement will pass the specified tolerances. The following tolerances are applicable:
1. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot in any lane.
2. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot at any point.
3. Surface smoothness deviation shall not exceed 1/4 inch from a 16-foot straightedge in any direction, including placement along and spanning any pavement joint or edge.

3.21 SURFACE TEST

A. As soon as the concrete has hardened sufficiently, test the pavement surface for smoothness in the longitudinal and transverse directions with a 16-foot straightedge or other specified device. The extent of the testing will be as the Client determines necessary or expedient. The pavement surface shall not deviate from the straightedge at any point by more than 1/8 inch for all areas that are constructed by the prescribed machine methods and for all traffic lanes and ramps. Other areas shall not deviate by more than 1/4 inch. Areas in a slab showing high spots of more than 1/4 inch but not exceeding 1/2 inch in 16 feet shall be marked and immediately ground down with an approved grinding machine to an elevation that will fall within the tolerance of 1/4 inch or less. Where the departure from correct cross section exceed 1/2 inch, the pavement shall be removed and replaced at no added cost to Client when so directed by the Client.

B. Any area or section so removed shall not be less than 10 feet in length nor less than the full width of the paving lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet in length shall also be removed and replaced.

C. Abrasive grinders shall be equipped with a cutting head comprised of multiple diamond blades. For all areas corrected by grinding, restore the required surface texture as specified. Roadway textured surface shall be restored by transverse sawing with diamond blade saws.

D. Longitudinal straightedge testing will not be required for pavement accepted by graphic profile testing.

3.22 GRAPHIC PROFILE TESTING (GPT)

A. General: When the project exceeds 25,000 feet of continuous roadway pavement construction, conduct graphic profile testing. Furnish and operate the equipment as soon as the hardness of the concrete permits. Test the longitudinal surface of all traffic lanes, ramps shoulders and bridges for smoothness by the graphic profile method approved by the Client. Before paving commences on the Project, demonstrate the profilograph or profilometer operation by conducting a calibration test according to Client standards and running the machine twice over a 0.1 mile section of pavement with repeating results.

1. Graphic Profile Tolerance: The pavement shall have a profile index of 7.0 inches per mile or less for each wheel path in each 0.1 mile segment or partial segment, and shall have no individual deviation of 0.3 inch or more. On ramps, shoulders

and auxiliary lanes the profile index shall be 12.0 inches per mile subject to the above criteria.

2. Daily GPT: If the average profile index exceeds 7.0 inches per mile for all segments and partial segments of pavement constructed in any day's production, discontinue paving operations and construct one or more test strips as described in this Section. The test strip may be comprised of pavement placed during the shift that the shutdown is ordered, but in no case shall it be less than 0.1 mile in length.

B. Surface Test:

1. Run the profilograph or profilometer over the full length of the project and 50 feet beyond the project ends to provide a complete graphic profile. This includes all concrete traffic lanes and auxiliary lanes.
2. Obtain profiles on the pavement surface along lines parallel to and approximately 3 feet from each edge and longitudinal joint(s) for 12 foot wide lanes and 4 feet from each edge and longitudinal joint(s) for 14 foot wide lanes. The intent is to provide a profile in each vehicle wheel path. Take profile(s) on transition areas of entrance and exit ramps as close to the wheel path as practical.
3. Start the profiles that represent a day's production 50 feet before the beginning of that day's production and stop 50 feet before the end of that day's production.
4. Run the profiles for each day's production as soon as possible without damaging the surface. Analyze the daily GPT profiles according to the requirements of this section and submit the profiles and results to the Client within 24 hours of the conclusion of the day's production.

C. Determining Profile Index:

1. General:
    a. Determine the profile index of pavement in 0.1 mile segments and partial segments. Segments shall begin 13 feet into the Project and run consecutively in either the direction of travel or the concrete placement, as determined by the Client. A segment will end as a partial segment and a new segment will begin when the segment sequence is interrupted by stage construction or by profiled areas excluded from the GPT smoothness requirements.
    b. The following profiled areas of pavement are excluded from the GPT smoothness requirements:
        1) Profiles extending beyond the project ends.
        2) Bridge decks and bridge panels.
        3) First and last 13 feet at the Project ends and bridge end panels.
        4) Pavement on horizontal curves with radii less than 1,000 feet.

c. Include and analyze separately those areas in the profile charts that are not subject to the GPT smoothness profile index requirements.

2. Method of Analysis: Determine the profile index and individual deviations of 0.3 inch or more by analyzing the profile charts according and submit the profile charts and results to the Client for review.

3. Profile Index: The profile index is the inches per mile in excess of the 0.2 inch blanking band. The formula for converting counts to profile index is:

$$\text{Profile Index} = \frac{\text{Total Count x } 0.10}{\text{Length of Full } 0.10 \text{ Mile Segment or of Partial } _*_ \text{Mile Segment}}$$

*Report to the nearest 0.01 mile

4. Correcting Deficiencies for Failure to Meet Graphic Profile Requirements:
   a. Correct any segment or partial segment that exceeds the requirements of the GPT tolerance in either wheel path by one of the methods listed below to the specified limits except correct deviations of 0.3 inch or more at least to the edge of the blanking band:
      1) Remove the non-specification concrete pavement as determined by the Client and replace with specification concrete pavement.
      2) Profile with abrasive grinder(s), equipped with a cutting head comprised of multiple diamond blades. The Client will determine and mark the areas to be profiled. For all areas corrected by grinding, restore the required roadway surface texture as specified by transverse sawing with diamond blade saws.
   b. Retest their entire length, according to the requirements of this article, all segments requiring corrective work with the profilograph or profilometer under the supervision of the Client. Perform all corrective work and graphic profiling, including traffic control, at no additional cost to the Client.

3.23 CURING

A. Immediately after the final floating, surface finishing and edging operations have been completed, while the concrete surface is still moist and marring of the concrete will not occur, cover and cure the entire surface of the newly placed concrete in accordance with the method below. The concrete shall not be left exposed for more than 1/2 hour during the curing period.

1. Liquid Membrane-Forming Compounds Method: The entire surface of the pavement shall be applied uniformly by pressure-spray methods with white

pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place. Apply the curing by mechanical sprayers under pressure at the rate of 1 gallon to not more than 150 square feet. The spraying equipment shall be of the fully atomizing type equipped with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, continuously stir the compound by effective mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms may be permitted. Do not apply curing compound to the inside faces of joints to be sealed, but use approved means to ensure proper curing for 72 hours. The curing compound shall be of such character that the film will harden 30 minutes after application. Should the film become damaged from any cause within the required curing period, immediately repair the damaged portions with additional compound. Upon removal of side forms, immediately protect the sides of the exposed slabs to provide a curing treatment equal to that provided for the surface.

2. Other Coverings: Apply the covering to damp concrete as soon as it can be placed without marring the surface. Place the membrane in contact with the surface, extend beyond the sides or edges of the slabs or forms, and weight down as required to hold it in position as a waterproof and moisture-proof covering. Laps shall be sufficient to maintain tightness equivalent to the sheeting and use:
   a. Polyethylene Film: Clear or white.
   b. Waterproof Paper: Transverse laps shall be at least 18 inches, and cement longitudinal seams.
   c. Cotton or Jute Mats: Before placing, saturate the mats with water and keep fully wetted during the curing period.

3.24 REMOVING FORMS

A. Unless otherwise specified, do not remove forms from freshly placed concrete until it has set for at least 24 hours, except where auxiliary forms are used temporarily in widened areas. Carefully remove forms so as not to damage the pavement. After the forms have been removed, the sides of the slab shall be cured as outlined in one of the methods indicated in the Joint article. Major honeycombed areas are considered defective work and shall be removed and replaced. Any area or section so removed shall not be less than 10 feet in length nor less than the full width of the paving lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 10 feet in length shall also be removed and replaced.

3.25 SEALING JOINTS

A. Each lot or batch of sealing compound shall be delivered to the job site in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, and the safe heating temperature and shall be accompanied by the manufacturer's certification stating that the compound meets the requirements of this specification.

B. Each lot of preformed joint sealer delivered to the job site shall be accompanied by the manufacturer's certification stating that it meets the requirements of this specification.

C. Seal joints as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be above 50ºF (10ºC) at the time of installation of the poured joint sealing material.

D. Immediately before sealing, thoroughly clean joints of all curing compound and other foreign material. Clean joints by sandblasting or wire brushing. Upon completion of cleaning, use compressed air to blow out the joints. The joint faces shall be surface dry when the seal is applied.

E. Inspect joints for proper width, depth, alignment, and preparation, and obtain Client approval before sealing. Apply joint sealant uniformly solid from bottom to top and shall be filled without formation of entrapped air or voids. A backing material shall be placed as shown on the drawings and shall be nonadhesive to the concrete or the sealant material. The heating kettle shall be an indirect heating type, constructed as a double boiler. A positive temperature control and mechanical agitation shall be provided. Do not heat the sealant to more than 20ºF below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. A direct connecting pressure type extruding device with nozzles shaped for insertion into the joint shall be provided. Immediately remove any sealant spilled on the surface of the pavement.

3.26 PAVEMENT CRACKS

A. Within 28 days after concrete placement and before opening the pavement to public traffic, the Client will perform a pavement crack survey. Clean the pavement before the crack survey. Pavement with uncontrolled longitudinal or transverse cracks which are visible without magnification will be considered unacceptable and be repaired or removed as determined by the Client. Perform all remedial work at no additional cost to the Client.

3.27 PAVEMENT THICKNESS

A. Construct the pavement to the thickness shown on the drawings. Deficient pavement will be subject to replacement, or to payment at adjusted prices.

B. Sticking Measurements:
   1. Determine conformance with minimum thickness requirements by random sticking measurements of the plastic concrete under the Client's observation. Report thickness to the nearest 0.1 inch.
   2. Divide the panel into units and partial units equivalent to a maximum of 200 lane feet. Normally, unit lengths will be 200 feet for one lane, 100 feet for two lanes, 70 feet for three lanes and as appropriate for transition areas. When directed, take one sticking measurement at a randomly selected location in each unit and partial unit. Record measurements to the nearest 0.1 inch.
   3. Take the measurements:
      a. After consolidation and screeding and before the float finish.
      b. No closer than 2 feet from the panel edges.
      c. Within 10 feet longitudinally and 1 foot transversely from the calculated random location determined by the Client.
   4. If a sticking is not obtained for a unit or a partial unit or is not available to represent the area of pavement remaining after the limits of pavement over 1.0 inch deficient is determined, the measurement will be assumed to be the same as the preceding or following sticking measurement, that is nearest in distance.

C. Thickness 0.5 Inch Deficient: If a sticking measurement depth measurement indicates the pavement is 0.5 inch or more deficient in thickness, stop forward paving progress until appropriate adjustments are made or corrective action is taken.

D. Coring Requirements: Perform required coring, or coring requested by the Client according to AASHTO T24 and repair core holes as directed, at no additional cost to the Client. Cores will be measured by the Client according to AASHTO T148 and the measurements reported to the nearest 0.1 inch. Core measurements will replace survey methods.

1. Corrective Grinding Areas: If corrective grinding is performed at a sticking depth measurement site, a core shall be obtained at the sticking measurement site according to the following:
    a. Profile Indexes 7.0 Inches Per Mile or Less: If the original profile indexes for a segment or partial segment determined by graphic profile testing is 7.0 inches per mile or less in each wheel path, a core is not required after corrective grinding is performed at a depth measurement site within the segment or partial segment represented by the profile indexes.
    b. Profile Index Greater Than 7.0 Inches Per Mile: If an original graphic profile index for a segment or partial segment determined by graphic profile testing is more than 7.0 inches per mile for a wheel path, obtain a core, after corrective grinding has been performed, at a sticking depth measurement site within the segment or partial segment represented by the profile indexes if the depth measurement is the specified depth or less.
2. Cores Requested By Contractor: If the Contractor believes that a depth measurement determined according to the sticking measurement, or a core obtained according to the coring requirements, is not representative of the actual pavement thickness, the Contractor may take a replacement core. Take replacement cores at a location as directed, 10 feet from the depth measurement or core site in question and the same distance from centerline. The replacement core measurement will replace the original depth or core measurement.

E. Thickness Over 1.0 Inch Deficient:
1. If a depth measurement determined according to the sticking measurement shows pavement over 1.0 inch deficient, obtain a core at the depth measurement site. If this core, or a core determined by the coring requirements, shows pavement over 1.0 inch deficient, obtain additional cores. Take these additional cores at the same distance from the centerline and at 25 foot intervals each direction from the first core until a core in each direction shows pavement 1.0 inch deficient or less. These two core locations will be considered the limits of the pavement more than 1.0 inch deficient. The pavement panel between these two cores will represent the area of pavement subject to removal and replacement or no payment.
2. When it is suspected by the Client that the pavement in the adjacent travel lane(s) in the panel may be more than 1.0 inch deficient for a greater distance than determined by the above procedure, core the pavement in the adjacent travel lane(s) in the nearest wheel track (3 feet from the nearest edge) opposite both limit cores. If these cores are more than 1.0 inch deficient, the above procedure shall be followed to determine the limits.

3.28 DEFICIENT PAVEMENT

A. Remove and replace pavement deficient in thickness by more than 1.0 inch at no additional cost to the Client. If allowed by the Port, the pavement may be left in place without payment.

B. Replacement pavement shall be of the specified design, quality and thickness as follows:
   1. Be the full width of the pavement panel involved.
   2. Extend far enough to replace at least a 20-foot length.
   3. Extend to the construction joint if closer than 20 feet to a construction joint.

3.29 PROTECTION OF PAVEMENT

A. Protect the pavement and its appurtenances against both public traffic and traffic caused by the Contractor's employees and agents. This shall include flaggers to direct traffic and the erection and maintenance of warning signs, lights, pavement bridges, or crossovers, etc. The contract documents will indicate the location and type of device or facility required to protect the work and provide adequately for traffic. Repair or replace any pavement damaged prior to final acceptance shall be repaired or the pavement replaced at no added cost to the Client. In order that the concrete be properly protected against the effects of rain before the concrete is sufficiently hardened, materials available at all times for the protection of the edges and surfaces of the unhardened concrete. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils thick of sufficient length and width to cover the plastic concrete slab and any edges. The sheeting may be mounted on either the paver or a separate movable bridge from which it can be unrolled without dragging over the plastic concrete surface. When rain appears imminent, stop all paving operations and all available personnel shall begin covering the surface of the unhardened concrete with the protective covering.

B. Do not operate construction equipment on newly placed concrete and do not allow public traffic on newly placed concrete until all of the following requirements are met:
   1. Restrict loads and speeds as necessary to avoid displacement or loss of materials.
   2. Restrict weights to legal loads and travel at speeds of no more than 45 mph or the posted construction speed, whichever is less, on treated bases, pavement, or wearing courses.
   3. Assume responsibility for damages caused by excessive equipment speed or loads while performing the work. The Port's permission to operate equipment will not relieve the Contractor from responsibility for load-caused damages.

4. Minimum Compressive Strength:
    a. The concrete attains a compressive strength of at least 70% of the specified 28 day strength as determined by testing at least three cylinders cured according to AASHTO T23 (field cure) and tested according to AASHTO T22.
    b. The maturity method, AASHTO T325, may be used to estimate concrete strength for opening pavement to construction traffic. Install at least two maturity thermocouples for each day's placement in areas where the maturity method will be used for early opening. Install the thermocouples near the day's final placement for areas being evaluated for early opening.
    c. When the maturity method is used, the Client may verify the maturity method with strength specimens. Establish a new strength maturity relationship if strength specimens deviate more than 10 percent from the maturity-estimated strengths. Suspend use of the maturity method for opening pavements to traffic when the strength maturity relationship deviates by more than 10 percent until a new strength maturity relationship is established.
5. The surface of the concrete is protected from scarring or abrasion and kept free of stones, loose mortar, and other matter apt to be deleterious to the concrete in the paths of equipment.
6. The pavement meets all of the requirements for surface tolerance, testing, and correction.

3.30 OPENING TO TRAFFIC

A. The Client will decide when the pavement shall be opened to traffic. The pavement will not be opened to traffic until test specimens molded and cured in accordance with ASTM C31 have attained a flexural strength of 550 pounds per square inch when tested in accordance with ASTM C78. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the concrete was placed. Clean the pavement prior to opening to traffic.

END OF SECTION

SECTION 03251
EXPANSION, CONSTRUCTION, AND CONTROL JOINTS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
   a. A36, Standard Specification for Structural Steel.
   b. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   c. D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
   d. D227, Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing.
   e. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type) (AASHTO M33).
   f. D 1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
   g. DI 751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
2. Corps of Engineers (COE): CRD-C-572, Corps of Engineers Specifications for Polyvinylchloride Waterstop.
3. American National Standards Institute (ANSI): ANSI/NSF 61, Drinking Water System Components, Health Effects.

1.2 SUBMITTALS

A. Shop Drawings:

1. Plastic Type Water Stops: Details of splices to be used and method of securing water stop in the forms and supporting water stop so as to maintain proper orientation and location during concrete placement.
2. Construction Joints: Layout and location indicating type to be used.
3. Joint fillers for horizontal and sloped joints.
4. Preformed control joints.
5. Water stop.

B. Samples: Splice, joint, and fabricated cross of each size, shape, and fitting of water stop(s) proposed for use.

C. Quality Control Submittals:

1. Water stop: Manufacturer's written instructions for product shipment, storage, handling, installation field splices, and repair.
2. Joint Filler and Primer: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.
3. Preformed Control Joint: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Acceptance of pourable joint filler for potable water structures by federal EPA or by a state health agency.

1. Pourable Joint Filler: Certified as meeting NSF 61.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site: Verify that water stops delivered are in accordance with cross-section dimensions as shown and manufacturer's product data prior to unloading and storing onsite.

PART 2 PRODUCTS

2.1 CHEMICAL RESISTANT WATER STOP

A. Thermoplastic Elastomeric Rubber Waterstop for joint waterproofing of secondary containment structures like Wester TPER or approved equal.

2.2 GALVANIZED SHEET METAL WATER STOPS

A. ASTM A525, 16-gauge, G-90 hot-dip galvanized sheet metal, 6 inches wide, unless otherwise shown with galvanized self-tapping sheet metal screws for securing 12-inch laps.

2.3 LABYRINTH WATER STOP

A. Extruded from polyvinyl chloride (PVC) in conformance with Corps of Engineers' Specification CRD-C-572.

B. Size and configuration as shown.

2.4 PLASTIC WATER STOP

A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride (PVC). Reclaimed PVC in the compound is not

acceptable.

B. Specific Gravity: Approximately 1.37.

C. Shore Durometer Type A Hardness: Approximately 80.

D. Performance Requirements: Corps of Engineers' Specification CRD-C-572.

E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.

F. Corrugated or tapered type water stops are not acceptable.

G. Thickness: Constant from bulb edge to the outside stop edge.

H. Minimum Weight per Foot of Water Stop:

1. 0.90 pound for 3/16-inch by 4-inch.
2. 1.62 pounds for 3/8-inch by 6-inch.
3. 2.30 pounds for 3/8-inch by 9-inch.

I. Manufacturers and Catalog Numbers:

1. Vulcan Metal Products, Inc., Construction Materials Division, Birmingham, AL; Catalog No. 3/81-15M: Type 8067 (4-inch by 3/16-inch), Type 8069 (6-inch by 3/8-inch), and Type 8070 (9-inch by 3/8-inch), or Approved Equal.
2. Vinylex Corp., Knoxville, TN; Catalog No. 03250NIN: No. RB6-38H (6-inch by 3/8-inch) and No. RB9-38H (9-inch by 3/8-inch), or Approved Equal.
3. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03250/GRD: Style 732 (6-inch by 3/8-inch) and Style 735 (9-inch by 3/8-inch), or Approved Equal.
4. A. C. Hom, Inc., Beltsville, MD; Catalog No. CSP-162: Type 3 (4-inch by 3/16-inch), Type 9 (6-inch by 3/8-inch), and Type 10 (3/8-inch by 9-inch), or Approved Equal.

2.4 WIRE LOOPED PLASTIC WATER STOP

A. Furnish as an alternative to plastic water stops.

B. Same material and geometry as plastic water stops.

C. Furnish with continuous galvanized wire looping at edge for

convenience in positioning and securing stop in place in the forms.

D. Manufacturers and Catalog Numbers: Paul Murphy Plastics, Roseville, MI; "Wire Stop Water Stop"; geometry numbers ACR 6380, ACR 9380, as shown on Paul Murphy Plastics Co. Drawing No. CCP-120-12M, or Approved Equal.

2.5 BOND BREAKER

A. Tape for Expansion Joints: Adhesive-backed glazed butyl or polyethylene tape, same width as the joint, that will adhere to the pre-molded joint material or concrete surface.

B. Use either bond breaker tape or a bond prevention material as specified in Section 03300A, Raw Water Intake Structure Cast-in-Place Concrete, except where a tape is specifically called for.

2.6 PREMOLDED JOINT FILLER

A. Bituminous Type: ASTM D994 or Dl751.

B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.

1. Manufacturer and Product: Rubatex Corp.; R451N, or Approved Equal.

2.7 PREFORMED CONTROL JOINT

A. One-Piece, Flexible, Polyvinyl Chloride Joint Former:

1. Manufacturer and Product: Vinylex Corp., Knoxville, TN; Kold-Seal Zip-Per Strip KSF-150-50-50, or Approved Equal.

B. One-Piece Steel Strip with Preformed Groove:

1. Manufacturer and Product: Burke Concrete Accessories, Inc., San Mateo, CA; Keyed Kold Retained Kap, or Approved Equal.

C. Furnish in full-length, unspliced pieces.

1.5 POURABLE JOINT FILLERS

A. Filler for Potable Water Structures:

1. Meet requirements of ANSI/NSF 61.
2. Multicomponent sealant, self-leveling or nonsag as required for level, sloping, or vertical joints.
3. Color: White.
4. Manufacturers and Products:
   a. Sika Chemical Co., Lyndhurst, NJ; Sikaflex-2C or Sikaflex-lA, or Approved Equal.
   b. Product Research Chemical Corp., Gloucester City, NJ; Permapol RC-270SL Reservoir Sealant or RC-270 Gun Grade Reservoir Sealant, with PRC Primer No. 57, or Approved Equal.

B. Filler for Nonpotable Water Structure:

1. Specific Gravity: Greater than 1.0 for cured, in-place filler.
2. Sloped Joints: Furnish Gun Grade material that will remain as placed in joints and will not run down slope.
3. Manufacturers and Products:
   a. W. R. Meadows, Inc., Elgin, IL.:No. 164 Polymeric sealing compound, hot-pour, or Hi-Spec Polymeric joint sealing, hot-pour compound, or Approved Equal.
   b. A. C. Hom, Inc., North Bergen, NJ.:No-Track two-component material (Code 2323), cold-applied, self-leveling filler; or
   c. W. R. Meadows, Elgin, IL.: Gardox, two-component, cold-applied compound filler, or Approved Equal.

C. Urethane or Polyurethane Filler for Aeration or Oxygenation Basins: Two- component, pourable, immersible, and compatible with a high purity oxygen environment; of self-leveling or nonsag consistency.

1. Manufacturers and Products or approved equal:
   a. Sika Chemical Co., Lyndhurst, NJ; Sikaflex 427.
   b. H. S. Peterson Co., Pontiac, MI; Isoflex 814.
2. Primer: As recommended by the manufacturer.

2.9 STEEL EXPANSION JOINT DOWELS

A. Dowels: ASTM A36 round smooth steel bars.

B. Bar Coating: Two-coat System No. 29A, FUSION BONDED, STEEL DOWEL COATING, as specified in Section 099100, PAINTING with a factory-applied lubricating coating.

2.10 ACCESSORIES

A. Joint Sealants: As specified in Section 079212, JOINT SEALERS.

B. Nonshrink Grout:

1. As specified in Section 03600, GROUT.
2. Compatible with joint sealant.

C. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated or equal weight of ASTM D227 coal-tar saturated felt.

D. Reinforcing Steel: As specified in Section 032100, Concrete Reinforcement.

E. Nails: As required for securing bituminous type premolded joint filler.

F. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

PART 3 EXECUTION

3.1 GENERAL

A. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.

B. Commence concrete placement after the joint preparation is complete.

C. Time Between Concrete Pours: As specified in Section 03300A, Raw Water Intake Structure Cast-in-Place Concrete.

D. Prestressed Reservoir Walls:

1. Horizontal construction joints are not permitted.
2. Vertical joints in addition to those shown may be used; meet design requirements for joints in walls.

3.2 SURFACE PREPARATION

A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:

1. Remove laitance and spillage from reinforcing steel and dowels.
2. Roughen surface to a minimum of 1/4-inch amplitude:
   a. Sandblast after the concrete has fully cured.
   b. Water blast after the concrete has partially cured.
   c. Green cut fresh concrete with high pressure water and hand tools.

3. Perform cleaning so as not to damage water stop, if one is present.

B. Expansion Joint with Pourable Filler:

1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
3. Prime surfaces before placing joint filler.
4. Avoid damage to water stop.

C. Expansion Joint without Pourable Filler:

1. Coat concrete surfaces above and below plastic water stop with bond breaker.
2. Do not damage water stop.

D. Control Joint:

1. Coat concrete surfaces above and below plastic water stop with bond breaker.
2. Do not damage water stop.
3. Furnish correct type and size of reinforcing and dowels.

3.3 INSTALLATION OF WATER STOPS

A. General:

1. Join water stops at intersections to provide continuous seal.
2. Center water stop on joint.
3. Secure water stop in correct position to avoid displacement during concrete placement.
4. Repair or replace damaged water stop.
5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
   a. Ensure that space beneath plastic water stop is completely filled with concrete.
   b. During concrete placement, make a visual inspection of the entire water stop area.
   c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab.

d. Apply procedure to full length of plastic water stops.

B. Chemical Resistant Water stop
1. Install in construction joints unless otherwise shown
2. Place prior the placement of new concrete.
3. All transitions, intersections, and splices should be heat welded to maintain continuity.
4. Factory Made Fabrications are recommended for all intersections and changes of direction.
5. Specific installation requirements will vary depending on the style of profile, so it's important to follow the manufacturer guide.

C. Galvanized Steel Water Stops:

1. Install in construction joints unless otherwise shown.
2. Place water stops in wall construction joints by tamping into place immediately after the concrete placement is completed and before concrete has begun to set.
   a. Puddle each side to level the concrete and assure that the water stop is properly embedded.
3. Place water stop in other joints and secure in forms prior to placing concrete.
4. Where metal water stops are spliced, lap at least 12 inches and secure together with sheet metal screws.
5. After the concrete around water stops has set to the point where the surface can be cut with a broom or a stream of water, cut off the surface to a rough finish, minimum roughness of 1/4-inch amplitude, with all laitance removed and the concrete left clean.
6. Plastic water stop 6-inch by 3/8-inch may be substituted for use in construction joints where galvanized sheet metal water stop is shown.

D. Labyrinth Water Stops: Install in accordance with the manufacturer's written instructions. Use heat butt weld splices only.

E. Plastic Water Stop:

1. Install in accordance with manufacturer's written instructions.
2. Splice in accordance with the water stop manufacturer's written instructions using a thermostatically controlled heating iron. Butt splice unless specifically detailed otherwise.
   a. Allow at least 10 minutes before the new splice is pulled or strained in any way.
   b. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent

of the unspliced materials.

3. Wire looped plastic water stop may be substituted for plastic water stop.

3.4 EXPANSION JOINT INSTALLATION

A. General:

1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.
2. Premolded Joint Filler:
   a. Sufficient in width to completely fill the joint space where shown.
   b. Ifa water stop is in the joint, cut premolded joint filler to butt tightly against the water stop and the side forms.
3. Precut premolded joint filler to the required depth at locations where joint filler or sealant is to be applied.
4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately shaped material. Entire joint above water stop, in slabs, shall be formed and removed so that entire space down to water stop can be filled with the pourable joint filler.
5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

B. Bituminous Type Premolded Joint Filler:

1. Drive nails approximately I-foot 6 inches on center through the filler, prior to installing, to provide anchorage embedment into the concrete during concrete placement.
2. Secure premolded joint filler in forms before concrete is placed.
3. Install in walkways, at changes in direction, at intersections, at each side of driveway entrances, and at 45-foot intervals, maximum.

C. Pourable Joint Filler:

1. General: Install in accordance with the manufacturer's written instructions, except as specified below:
   a. Apply primer prior to pouring joint filler.
   b. Fill entire joint above the water stop with joint filler as shown.
   c. Use masking tape on top of slabs at sides of joints; clean spillage. Remove masking tape afterwards.
2. Rubber Asphalt Type, Hot-Applied:
   a. Heat filler material in a double-walled boiler.
   b. Place filler in the joint by means of a nozzle from a portable pouring type container to prevent spillage outside of the joint.
   c. Begin pouring joint filler at the bottom of the horizontal joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.

3. Rubber Asphalt Type, Cold-Applied: Place cold-applied, two-component fillers in accordance with manufacturer's written instructions.
4. Multicomponent Type for Potable Water Structures: Install in accordance with manufacturer's written instructions.

D. Steel Expansion Joint Dowels:

1. Install coated and lubricated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section view, so as to permit joint to expand or contract without bending the dowels.
2. Secure dowels tightly in forms with rigid ties.
3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

3.5 CONTROL JOINT INSTALLATION

A. Locate reinforcing and dowels as shown.

B. Install PVC water stop.

C. Concrete surfaces shall be dense and smooth.

D. Install bond breaker to concrete surfaces above and below water stop.

3.6 PREFORMED CONTROL JOINTS

A. Use only where specifically shown; do not use in water-holding basins.

B. Locate flush, or slightly below the top of slab.

C. Install in accordance with manufacturer's written instructions in straight, full- length unspliced pieces.

D. Steel Strip Type with Preformed Groove: Brace to withstand pressure of concrete during and after placement.

END OF SECTION

SECTION 03300A
RAW WATER INTAKE STRUCTURE
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE

A. This section gives requirements for normal weight and structural concrete.
B. Coordinate the requirements of this section with all other sections of Division 3, Concrete.

1.2 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).
   1. ASTM C 33 - Standard Specification for Concrete Aggregate.

   2. ASTM C 40 - Standard Test Method for Organic Impurities Sands for Concrete.

   3. ASTM C 136 - Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregate.

   4. ASTM C 150 - Standard Specification for Portland Cement.

B. American Concrete Institute (ACI).
   1. ACI 211.1-22, Recommended Practice for Selecting Proportions for Concrete.

   2. ACI 304.2-17, Placing Concrete by Pumping Methods.

   3. ACI 318, Building Code Requirements for Reinforced Concrete.

   4. Mixer Manufacturer's Bureau of the Associated General Contractors of America.

1.3 SUBMITTALS

A. Admixtures: Submit brochures on admixtures proposed for use if different from those specified.

   1. A submittal is required from the manufacturer of the approved air-entraining admixture. Give requirements to control percent of air content under all conditions including temperature variations. Provide three copies.

2. A submittal is required from the manufacturer of the approved water-reducing retarder. Give requirements for quantities and types to be used under various temperatures and job conditions to produce a uniform, workable concrete mix.

B. Concrete mix design for each class of concrete.

1.4 STORAGE OF MATERIALS

A. Cement: Store cement in watertight buildings, bins, or silos to provide protection from dampness and contamination and to minimize warehouse set.

B. Aggregate: Arrange and use aggregate stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding three feet in thickness. Complete each layer before the next is started.

C. Sand: Before using, allow sand to drain until a uniform moisture content is reached.

D. Admixtures: Store admixtures to avoid contamination, evaporation, - or damage. For those used in the form of suspensions or non-stable solutions, provide suitable agitating equipment to assure uniform distribution of ingredients. Protect liquid admixtures from temperature changes which would adversely affect their characteristics.

1.5 CONTROL OF CONCRETE MIXTURES

A. Consistency: Test for slump shall be performed at the job site immediately prior to placing in accordance with Method of Slump Test for Consistency of Portland Cement Concrete (ASTM Cl43). If the slump is greater than that specified, the concrete shall be rejected. Concrete showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finish ability are observed, changes in the concrete mix shall be obtained only by an adjustment of one or more of the following:

1. The gradation of aggregate.

2. The proportion of firm and coarse aggregate.

3. The percentage of entrained air, within the allowable limits.

B. Air Content: Test for air content shall be made on a fresh concrete sample. Air content for concrete made of ordinary aggregates having low absorption shall be made in accordance with either Method of Test for Air Content of Freshly

Mixed Concrete by the Pressure Method (ASTM C23 l), or Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (ASTM Cl73). If light weight aggregates or aggregates with high absorptions are used, the latter test method shall be used.

C. Unit Weight: Test in accordance with method of test for weight per cubic Foot, Yield, and Air Content (Gravimetric) of Concrete (ASTM C 138), may be used in lieu of the air content test, provided the relationship between air content and unit weight has been established for the materials being used.

D. Strength: Compression test specimens shall be made and cured in accordance with Method of Making and Curing Concrete Compression and Flexural Test Specimens in the Field (ASTM C31); Strength of Molded Concrete Cylinders (ASTM C39).

E. Number of Specimens: Number of sets of concrete test cylinders to be cast for each concrete pour shall be as follows:

No. of CY Concrete Poured	Minimum No. of Sets of Cylinders
0-25	1
25-75	2
75-150	3
150-550	4

A "set" of test cylinders consists of six cylinders, two to be broken and strengths averaged at seven days; and two broken and strengths averaged at 28 days. Two cylinders will remain unbroken so that they will be available to be broken upon unforeseen circumstances or upon the option of the Engineer to break cylinder at different times.

PART 2 PRODUCTS

2.1 MATERIALS.

A. Portland Cement: Type II:
   a. Meet ASTM C150.
   b. Alkalies: Maximum 0.60 percent.
   c. Tricalcium Aluminate Content of Type I Cement: Maximum 12 percent.
   d. Nonhydraulic Abovegrade Structures: Type I or Type II cement.
   e. Hydraulic and Belowgrade Structures and Sewers: Type II cement or combination of Type I mixed with fly ash.

f. Combine fly ash with cement at batch plant or during production of cement in accordance with ASTM C595, Type IP cement.
   1. Use only brands of cement upon which the selection of concrete was based. Submit specific mix designs for each brand of cement used.
   2. Cement used in concrete placed in openings in existing water bearing structures shall be shrinkage compensating cement, ASTM C845.

B. Admixtures: Using the following admixtures as required or permitted. The use of calcium chloride will not be permitted. The products must conform to the referenced standards.

1. Integral Concrete Hardener Admixture as Kryton Hard Cem ® or approved equal. This admixture shall be used in all Class A concrete mixes. Admixture shall be applied following manufacturer recommendations.

   a. Hardened Properties

Compressive Strength, ASTM C39, C192, (28 Days)	No Change
No change Drying Shrinkage	No Change
Freeze / Thaw Durability, ASTM C666	No Change
Deicing Chemical Resistance (Mass Loss), ASTM C 672, (50 cycles)	No Change
Abrasion Resistance, ASTM C627 (Robinson Type Floor Tester 5,000 revolutions)	66% reduction in mass loss compared to control (28 days curing)

2. Chemical Admixtures. Conform to ASTM C 494, "Standard Specifications for Chemical Admixtures for Concrete."

3. Water-reducing Retarder. Use of an admixture containing chloride is not permitted. The product must be non-staining. User Master Builder's "MBHC," Sika's "Plastiment", or approved equal.

4. High-Range Water Reducer (Superplasticizer). Conform to ASTM C 494 Type F.Acceptable products are W.R. Grace -"WRDA-19", American Admixtures - "Melment"

PSI Super by Gifford-Hill or approved equal.

5. Pozzolan (Fly Ash):Class F fly ash in accordance with ASTM C618, 15% Fly Ash.
   a. Loss on Ignition: Maximum 3percent
   b. Water Requirement: Maximum 100percent of control.

$$\frac{CaO(\%) - 5}{Fe_2O_3\%} : Maximum\ 1.5$$

   c. ASTM C618, Table l-A shall apply when aggregates or portion of coarse or fine aggregates used are reactive as specified hereinbefore in paragraph Nonpotentially Reactive Aggregates.
   d. ASTM C618, Table 2 Reactivity with Cement Alkalies, apply when aggregates or portions of aggregates are reactive as specified under paragraph Nonpotential Reactive Aggregates.
   e. ASTM C618, Table 2 Uniformity Requirements, apply when loss on ignition of fly ash furnished exceeds 3 percent.

C. Mixing Water: Fresh, clean and drinkable.

D. Aggregates: Use coarse aggregate from only approved sources and fine aggregate from only approved sources for exposed concrete in a single structure.

1. Coarse aggregate for concrete of normal weight shall conform to ASTM C 33. Grading limits for all members six inches or less in least dimension, 3/4 inch to No.4. Grading for all other normal weight concrete, 1inch to No.4.
2. Use natural sand complying with ASTM C 33 for fine aggregate in normal weight concrete.

E. Membrane-forming Curing Compound: ASTM C 309, commercial curing compound which will not permanently discolor concrete. All curing compounds shall be white.

F. Sheet Material for Curing Concrete: ASTM C 171, waterproof paper, polyethylene film or white burlap-polyethylene sheeting.

2.2 PROPORTIONING

A. Objective: Select proportion of ingredients to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will work readily into comers and angles of forms and around reinforcement

by methods of placing and consolidation employed on the work, but without permitting materials to segregate or allowing excessive free water to collect on the surface.

B. Strength: Provide ultimate strength concrete in all portions of the work. Strength must conform to values for the class of concrete specified for each portion of the structure. Requirements are based on 28-day compressive strength. If high early-strength concrete is specified, requirements are based on:

Class A4.0	Miscellaneous
Class A5.0	Pump Station

C. Mix Design: If the relationship between strength and the water-cement ratio has been determined previously for materials specified for normal weight concrete, the ratio may be used. Otherwise, determine the proper water-cement ratio by using the following procedures.

1. Make concrete trial mixtures having suitable proportions and consistency. Use at least three different water- cement ratios which will produce a range of strengths encompassing those required. Design trial mixes to produce the maximum allowable slump.
2. Determine proportions of ingredients and conduct tests in accordance with basic relationships and procedures out lined in ACI 613, "Recommended Practice for Selecting Proportions for Concrete."
3. Make and cure specimens in sets of six (6) according to ASTM C 192, "Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory." For each water-cement ratio prepare at least three specimens for each age test. Test for strength at 7, 14, 21 and 28 days, or other age as required. Conduct tests according to ASTM C 39, "Method of Test for Compressive Strength of Molded Concrete Cylinders."
4. From results of these tests, plot a curve showing the relationship between watercement ratio and compressive strength. Determine the maximum permissible watercement ratio for ultimate strength concrete by using the value from the curve that corresponds to a minimum strength 25 percent greater than the specified strength.
5. Submit concrete mix design for approval.

2.3 MIXING NORMAL WEIGHT CONCRETE

A. Ready-Mixed Concrete: Mix and transport ready-mixed concrete according to ASTM C 94, "Specifications for Ready-Mixed Concrete." In

addition to normal batch plant procedures as outlined in ASTM C 94, provisions must be made at the batch plant for the following items:

1. Arrangement. Provide separate bins or compartments for different sized aggregates and for bulk cement. Compartments of ample size constructed so that materials will be kept separate under all working conditions are required.
2. Weighing of Materials. Aggregates may be weighed in separate weigh batchers with individual scales. Weigh bulk cement on a separate scale in a separate weigh batcher. Observe the following limits of accuracy when weighing or measuring materials.

Materials	Percent accuracy
i. Cement	1
ii. Water	1
iii Aggregates	2
iv. Admixtures	3

3. Water Meter or Batcher. Provide a suitable measuring device capable of measuring mixing water within the specified accuracy for each batch. Note the number of gallons of water as batched on printed batching tickets.
4. Moisture Control. Provide a moisture meter to measure the amount of free water in fine aggregates within 0.3 of a percent. Compensate for varying moisture contents of fine aggregates and change batch weights of materials if necessary, before batching.
5. Scales. Provide adequate facilities for accurate measurement and control of each material entering each batch of concrete. Accuracy of weighing equipment must conform to applicable requirements of ASTM and NRMCA for such equipment.
6. Recorders or Printers. Provide recorders/printers to produce tickets. Each ticket will provide a printed record of volume of water and weights for cement as batched and for separate aggregates as batched individually. Use the type of indicator that returns for zero punch or to zero after a batch is discharged. Clearly indicate by stamped letters or numerals the difference between aggregates and cement as batched. Show the time of day stamped or printed at intervals of not more than six minutes. The delivery ticket shall also show the volume of water, in gallons, added at the batch plant. Deliver recorded ticket copies with concrete. The testing agency will keep one copy.

7. Protection. Protect weighing, indicating, recording or printing, and

control equipment against exposure to dust and weather.

B. Transit Mix Truck Requirements:

1. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant.
2. Keep the water tank valve on each transit truck locked at all times that the truck is in use. Added water must be incorporated by additional mixing of at least 35 revolutions.
3. Equip each transit-mix truck with a continuous, noneversible, revolution counter showing the number of revolutions at mixing speeds. Counter shall be reset to zero at the batch plant.
4. Transmit mix trucks are to be in good working condition. Trucks which are not mechanically sound, have worn or obstructed mixing fins, have non-functioning drum counters, or leaking water valves shall not be used.

C. Admixtures:

1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
2. Measure admixture to an accuracy within ± three percent. Do not use admixtures in powdered form.
3. Two or more admixtures may be used in the same concrete, provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other. Inject the admixtures separately during the batching sequence.
4. Add retarding admixtures as soon as practicable after the addition of cement.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordination: Mix concrete only in quantities for immediate use. Discard concrete which has set. Retempering of set concrete is not permitted. Completely discharge concrete at the site within one hour and 30 minutes after adding cement to aggregate. In hot weather, reduce this time to one hour or less to prevent stiffening of concrete before it is placed.

B. Protection from Adverse Weather: Do not permit rainwater to increase mixing water or to damage the surface finish. If rainfall occurs after placing operations begin, provide adequate covering to protect the work.

C. Placing Temperature:

1. Hot Weather Concreting. Except as modified herein, hot weather concreting shall comply with ACI 305. At air temperature of 90° F or above, concrete shall be kept as cool as possible during placement and curing. The temperature of the concrete when placed in the work shall not exceed 94°F. Plastic shrinkage cracking, due to rapid evaporation of moisture, shall be prevented. Concrete shall not be placed when the evaporation rate (actual or anticipated) equals or exceeds 0.2 pound per square foot per hour, as determined by Figure 2.1.5 in ACI 305.

D. Adjusting Slump. If concrete arrives at the project with slump below that specified, water may be added if authorized by the batch plant. Written authorization from the plant is required at least 7 days prior to the concrete pour. Indiscriminate addition of water to increase slump is prohibited. Do not exceed either the maximum permissible water-cement ratio or maximum slump. Mix adjustments to obtain specified slump must be approved and directed by the Engineer.

3.2 CONVEYING

A. Objectives: Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Use methods which prevent loss of ingredients and segregation.

B. Equipment: Obtain approval of the conveying equipment. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Conform to the following equipment and operations requirements.

1 . Provide truck mixers, agitators and no agitating units and manner of operation conforming to requirements of ASTM C 94, "Specifications for Ready-Mixed Concrete."
2. Provide metal or metal-lined chutes. Arrange for slopes not-exceeding one vertical to two horizontal and not less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
3. Pumping of concrete will be permitted only after written approval.. Use a batch design and aggregate sizes suitable for pumping.

3.3 PLACING

A. Preparation: In addition to the previous requirements, confirm that formwork has been completed. Remove excess water, dirt and other foreign materials from forms. Confirm that reinforcement is securely in place and positioned. Have a

competent workman at the pour location who can assure that reinforcement and embedded items remain in design locations while concrete is being placed. Sprinkle semiporous subgrades to eliminate suction. Seal extremely porous subgrades in an approved manner. Clean and moisten existing concrete surface prior to placing new concrete.

B. Joint Preparation:

1. Prepare surfaces of previously placed concrete against which fresh concrete will be placed as follows:
   a. Clean surfaces of all debris, curing compounds, scum, latence, standing water, or other foreign matter.
   b. Where requirement for a "roughened joint" is specified or shown, verify that the hardened concrete has been finished rough or roughen any smooth surfaces. A rough surface is defined as having a textured amplitude of approximately 1/4 inch and this is free of loose particles and pockets that restrict concrete from flowing into the roughened concrete surfaces.
   c. Apply appropriate bonding agent or cement slurry to joints only where shown or specified.
   d. Apply bonding agent in joints between new concrete and existing water containing structures.

C. General Procedure:

1. Deposit concrete continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. Ifthe section cannot be placed continuously, place construction joints as specified or as approved.
2. Proceed with placement at a rate such that concrete which is being integrated with fresh concrete is still plastic. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials.
3. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only if made of galvanized metal or concrete, and if prior approval has been obtained.
4. Do not start placing of concrete in supported elements until concrete previously placed in columns and walls is no longer plastic.
5. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to a procedure, which will cause segregation.
6. Where surface mortar is to be the basis of a finish, especially those designated to be painted, work coarse aggregate back from forms with a

suitable tool to bring the full surface of mortar against the form. Prevent formation of excessive surface voids.

7. Consolidate concrete by vibration, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items and into comers of forms. Eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness. A minimum frequency of 7000 revolutions per minute is required for mechanical vibrators. Do not use vibrators to transport concrete within forms. Insert vibrators and withdraw at points from 18 to 30 inches apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from five to 15 seconds. Do not over-vibrate causing segregation. Keep a spare vibrator on the site during concrete placing operations.

D. Slabs:

1. After suitable bulkheads, screeds and if specified, jointing materials, have been positioned the concrete shall be placed continuously between construction joints, beginning at a bulkhead, edge form, or comer. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
2. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints.
3. Concrete shall then be brought to correct level with a straightedge and struck off. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

E. Formed Concrete:

1. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall be in contact with the concrete already placed. Do not drop concrete free more than five feet, or so that it can ricochet from reinforcing steel.
2. In walls, place concrete in 12" to 24" lifts, keeping the surface horizontal. Compaction shall be by vibrator and by puddling stick. The vibrator shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any. It shall be removed as soon as the surface begins to liquefy around the vibrator.
3. Vibration shall be supplemented by hand spading or rodding; puddling shall be continuous while pouring concrete and shall be done primarily between forms and reinforcing steel, around openings, or wherever needed to prevent honeycomb, fill voids or drive out large air bubbles.

F. Concrete Poured Against Rock:

1. Where concrete is poured against undisturbed rock, especially in drilled shafts, place concrete as soon as practicable after excavation to prevent weathering of exposed rock.

    a. Complete drilled piers within 2 hours after completion of the excavation.
    b. For footings and slabs, place mud slabs within 4 hours after the excavation is at final grade.
2. Remove all water from excavation or shaft before placing concrete.

3.4 COMPACTION OF CONCRETE

A. General: All concrete shall be placed and compacted with mechanical vibrators.

B. Concrete Slabs: Concrete for slabs shall be compacted with vibrators.

C. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete, but not to move or transport concrete in the forms. Vibration shall continue until:
    1. Frequency returns to normal.
    2. Surface appears liquefied, flattened and glistening.
    3. Trapped air ceases to rise.
    4. Coarse aggregate has blended into surface, but has not disappeared.

3.5 JOINTS

A. General: Construction, control and isolation joints shall be installed and sealed as called for by the plans.

B. Construction Joints:

1. Construction joints shall be cast in such a manner that abutting members are bonded, and free of honeycomb or voids.
2. The joint surface of the previously cast member shall be cleaned free of all oil, grease, curing compound, dirt, or latence film, and shall be wetted. Cleaning shall be accomplished by scrubbing. Scrubbing shall be done initially when concrete is green, so that any latence film will be removed.

3.6 REPAIRING SURFACE DEFECTS

A. Defective Areas: Repair defective areas immediately after the removal of forms and inspection by the Engineers or Company's Representative. Engineers or Company's Representative may reject the work if necessary.

1. Remove honeycombed and other defective concrete down to sound concrete. To prevent absorption of water from patching mortar, dampen the defective area and a strip six inches wide surrounding the area to be patched. Prepare bonding grout by mixing approximately one part cement to one part fine sand passing a No. 30 mesh sieve. Mix to a consistency of thick cream, and brush thoroughly into the surface.
2. Make patching mortar of the same materials and of approximately the same proportions as concrete, except omit coarse aggregate. Prepare mortar with not more than one part cement to 2-1/2 parts sand by damp loose volume. Substitute white Portland cement for part of the gray Portland cement on exposed concrete in order to produce a color matching the color of surrounding concrete. Determine color by making a trial patch.
3. Use no more mixing water than necessary for handling and placing. Mix patching mortar in advance and allow to stand. Mix frequently with a trowel until it has reached the stiffest consistency that will permit placing. Do not add water.
4. After surface water has evaporated from the area to be patched, thoroughly brush a coat of bond grout into surface. When bond grout begins to lose its water sheen, apply the premixed patching mortar. Thoroughly consolidate the mortar into place and strike off to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, leave undisturbed for at least one hour before final finishing. Keep the patched area damp for seven days. Do not use metal tools in finishing patches in a formed wall which will be exposed.

B. Tie Holes: Patch tie holes immediately after removal of forms. After cleaning and thoroughly dampening the tie hole, fill solid with grout.

C. Proprietary Materials: If permitted or required, proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the forgoing patching procedures. Use such compounds according to the manufacturer's recommendations.

3.7 FINISHING OF FORMED SURFACES

A. Surfaces Requiring No Finish: A finish is not required on surfaces concealed from view by earth, in the completed structure.

B. Smooth Form Finish:

1. Use plywood or fiberboard linings or forms in as large sheets as practicable and with smooth, even edges and close joints.
2. Patch tie holes and defects. Rub fins and joint marks with carborundum stone to leave a smooth, unmarred finish surface.
3. Use a smooth form finish on all surfaces exposed to view and liquid.

C. Related Unformed Surfaces: Tops of piers, walls, bent caps and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed. Float unformed surfaces to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

3.8 FINISHING SLABS AND SIMILAR FLAT SURFACES

A. Consolidation: Thoroughly consolidate concrete in slabs and use internal vibration in beams and girders of framed slabs and along bulkheads of slabs on grade. Obtain consolidation of slabs and floors with vibrating bridge screeds, roller pipe screeds, or other approved means. Concrete to be consolidated must be as dry as practicable. Do not permit manipulation of surfaces prior to finishing operations.

B. Tolerances for Finished Surfaces: Tolerances are checked by placing a straightedge of specified length anywhere on the slab. The gap between slab and straightedge must not exceed the tolerance listed for the specified class.

Class	Straightedge Length in Feet	Tolerance in Inches
A	10	1/8
B	10	1/4
C	10	1/2

C. Floated Finish:

1. After concrete has been placed, struck off, consolidated and leveled, do not work further until ready for floating. Begin floating when water sheen has disappeared, or when the mix has stiffened sufficiently to permit proper operation of a power-driven float. Consolidate the surface with power- driven floats. Use hand floating with wood or cork-faced floats in locations inaccessible to a power-driven machine and on small, isolated slabs.
2. Recheck tolerance of the surface after initial floating with a IO-foot

straightedge applied at not less than two different angles. Cut down high spots and fill low spots to Class B tolerance. Immediately re-float slab to uniform, smooth, granular texture.

3. Provide a floated finish for the sidewalks.

D. Troweled Finish:

1. To obtain a troweled finish, a floated furnish as previously specified must be applied. After power floating, use a power trowel to produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Do additional trowelings by hand after the surface has hardened sufficiently. Do final troweling when a ringing sound is produced as the trowel is moved over the surface. Thoroughly consolidate the surface by hand troweling operations.
2. Produce a finished surface free of trowel marks, uniform in texture and appearance and conforming to class A tolerance. On surfaces intended to support floor coverings, remove defects which might show through covering by grinding.
3. Provide a troweled finish for inside floors intended as walking surfaces.

E. Broom or Belt Finish:

1. Immediately after completing the floated finish, draw a broom or burlap belt across the surface to give a coarse transverse scored texture.
2. Provide a broom or belt finish for exterior paving and walks.

F. Rubbed Finish: All fins shall be removed, ties and wires broken off and driven back, holes pointed up with mortar. The surface shall be wetted and rubbed with carborundum until a cement film is formed. This shall be rubbed into the surface until all voids are filled and the entire surface has a uniform appearance. The surface shall turn white and set hard. It must not dust off. All interior and exterior exposed structural concrete surfaces not receiving a painted texture coating shall be rubbed. Rubbing should begin immediately on form removal. The use of cement or grout to form a paste during rubbing shall not be allowed.

3.9 CURING PROCEDURES

A. All Freshly Cast Concrete: Shall be protected from damaging effects of the elements and from subsequent construction operations.

B. Curing for Slabs and Footings:

1. Initial Curing. Immediately after the finishing operations are

completed, the concrete shall be covered with two thicknesses of 10-ounce burlap or other approved materials, thoroughly saturated with water before placement. This covering shall remain in contact with the concrete and be kept saturated with water by spraying until the peak temperature produced by hydration has passed, but for at least 24 hours. At the end of this time, initial curing may be terminated and final curing begun.

2. Final Curing. Cover concrete with an approved curing compound conforming to ASTM Designation C309 (latest). Color to be white. Waterproof curing paper conforming to ASTM Designation Cl71 (latest) is also acceptable. Total curing time shall be at least seven days during which interface temperature of concrete shall be above 50 F curing compound shall be applied heavily and evenly in two coats until no pinhole or other coating break remains, and an opaque white coating is achieved. "Curing compound" will not be allowed for final curing of structural floor slabs or for construction joints on surfaces to be painted. Final curing will be accomplished by continuing initial curing process for the time with regard to temperature as stated above."

C. Curing for Walls and Columns:

1. Initial Curing. Immediately after concrete is completed, the exposed surface of the concrete shall be covered with two thicknesses of l0-ounce burlap or other approved absorptive materials, thoroughly saturated with water before placement. This covering shall remain in contact with the concrete and be kept saturated with water by spraying for at least 96 hours. At the end of this time, initial curing may be terminated and final curing begun.
2. Final Curing. Cover concrete with an approved curing compound conforming to ASTM Designation C309. Color to be white. Waterproof curing paper conforming to ASTM Designation Cl71 is also acceptable. Total curing time shall be at least ten days, during which interface temperature of concrete shall be above 50°F. "Curing compound will not be allowed for final curing of any interior or exterior exposed structural concrete. Final curing will be accomplished by continuing initial curing process for an additional ten days." Curing compound shall not be used on walls to be painted or to receive a water proofing system.
3. Alternate Initial Curing. In case forms are removed before end of initial cure period, or in the Case of unformed wall surfaces (shot-crete), the exposed surfaces of the concrete shall be covered with two thicknesses of 10-ounce burlap or other approved absorptive materials, thoroughly saturated with water before

placement. This covering shall be held in contact with the concrete and be kept saturated with water by spraying until the end of the initial curing period (96 hours curing).

D. In hot weather, suitable precautions shall be taken to avoid drying of the slab prior to the finishing operation. Wind-breaks, and/or sunshade shall be provided as directed by the Company's Representative. During extremes in weather, floors shall not be cast unless the slab is protected by a roof and other suitable measures can be taken. After curing has been completed, the floor shall be exposed to the air for at least 48 hours prior to allowing wheel traffic on the floor.

END OF SECTION

SECTION 03370
CONCRETE CURING

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):C309, Liquid Membrane-Forming Compounds for Curing concrete.

1.2 SUBMITIALS

A. Shop Drawings:

1. Curing methods proposed.
2. Manufacturers' data for the following products:
   a. Exposed aggregate finish retardant on formed surface.
   b. Evaporation retardant.
   c. Curing compound.
   d. Clear sealer.
   e. Clear floor hardener.

B. Quality Control Submittals:

1. Curing Compound: Manufacturer's Certificate of Compliance showing moisture retention requirements.
2. Retardants for Exposed Aggregate Finish: Manufacturer's Certification of Compliance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Curing Compound:

1. Solvent-based, high chlorinated rubber solids content curing compound meeting requirements of ASTM C309.
   a. Moisture Loss: 0.030 gm/square cm/72 hours maximum.
   b. Capable of meeting moisture retention with one coat.
2. Manufacturers and Products:
   a. Master Builders Co., Cleveland, OH; Masterkure CR, or approved equal.

b. Euclid Chemical Co., Cleveland, OH; Euco Super Floor Coat, or approved equal.

B. Evaporation Retardant:

1. Optional: Fluorescent color tint that disappears completely upon drying.
2. Manufacturers and Products:
   a. Master Builders Co., Cleveland, OH; CONFILM, or approved equal.
   b. Euclid Chemical Co., Cleveland, OH; Eucobar, or approved equal.

C. Clear Sealer (One-Component Penetrating Silane Siloxane Sealer):

1. Manufacturers and Products:
   a. Master Builders, Inc.; MASTERSEAL SL, or approved equal.
   b. Euclid Chemical Co.; Eucoguard 200, or approved equal.

D. Clear Floor Hardener:

1. Colorless, aqueous premixed solution of zinc and maguesium fluosilicate.
2. Each gallon of fluosilicate solution shall contain minimum 2 pounds of crystals.
3. Manufacturers:
   a. Master Builders Co., Cleveland, OH, or approved equal.
   b. Euclid Chemical Co., Cleveland, OH, or approved equal.
   c. Sonneborn, Minneapolis, MN, or approved equal.

E. Retardant for Exposed Aggregate Finish on Slabs:

1. Manufacturers and Products:
   a. Preco Industries, Plainview, NY; EAC-S, or approved equal.
   b. Silca Chemical Corp., Lyndhurst, NJ; Rugasol, or approved equal.
   c. Conrad Sovig Co., San Francisco, CA; Conreveal Top Surface, or approved equal.
   d. Burke Co., San Mateo, CA; Burke True Etch Surface Retarder, or approved equal.
   e. Euclid Chemical Co., Cleveland, OH; Surface Retarder S, or approved equal.

F. Retardant for Exposed Aggregate Finish on Formed Surface:

1. Manufacturers and Products:
   a. Preco Industries, Plainview, NY, or approved equal.
   b. L. M. Scofield Co, Los Angeles, CA, or approved equal.

c. Conrad Sovig Co.; Control Set, or approved equal.
d. Burke Co., San Mateo, CA; Burke True Etch Surface Retarder, or approved equal.

e. Euclid Chemical Co., Cleveland, OH**;** Surface Retarder F, or approved equal.

G. Water: Clean and potable, containing less than *50* ppm of chlorides.

PART 3 EXECUTION

3.1 CURING OF CONCRETE

A. Use one of the following methods as approved by ENGINEER:

1. Walls:
   a. General: Where walls are to receive coatings, painting, cementitious material, or other similar finishes, or where solvent- based coatings are not permitted, use only water curing procedures.
   b. Method 1: Leave concrete forms in place and keep entire surfaces of forms and concrete wet for 7 days.
   c. Method 2: Apply curing compound, where allowed, immediately after removal of forms.
   d. Method 3: Continuously sprinkle with water 100 percent of exposed surfaces for 7 days starting immediately after removal of forms.
2. Slabs and Curbs:
   a. Method 1: Protect surface by water ponding for 7 days.
   b. Method 2: Cover with burlap or cotton mats and keep continuously wet for 7 days.
   c. Method 3: Cover with 1-inch layer of wet sand, earth, or sawdust, and keep continuously wet for 7 days.
   d. Method 4: Continuously sprinkle exposed surface for 7 days.
   e. Other agreed upon method that will keep moisture present and uniform at all times on surface of slabs. Do not use curing compounds.
   f. Where water curing for slabs during cold weather is not possible, use an ENGINEER-approved curing compound at manufacturer's recommended coverage per gallon.
   g. Where curing compound cannot be used, special methods using moisture shall be agreed upon prior to placing the concrete slabs.
   h**.** Protect slabs during cold weather with plastic sheets or other

material inside required heated enclosure if foot traffic is permitted on slabs.

B. Use only water curing on potable water structures.

C. Use only water curing methods where solvents in the curing compounds are prohibited by state or federal air quality laws.

D. Use only water curing where additional finishes such as clear sealer, hardeners, painting, and other special coatings are required.

3.2 EVAPORATION RETARDANT APPLICATION

A. Spray onto surface of fresh flatwork concrete immediately after screeding to react with surface moisture.

B. Reapply as needed to ensure a continuous moist surface until final finishing is completed.

3.3 CURING OF PRESTRESSED TANK CONCRETE

A. Keep concrete surfaces and form continuously wet for 7 days where portland cement is used, or 3 days where high-early-strength cement is used.

B. Begin curing immediately after initial concrete set has occurred.

C. Do not use curing compounds.

3.4 CLEAR SEALER APPLICATION

A. Apply to floor slabs

B. Before application, water cure concrete walls and floors to receive sealer for a minimum of 28 days, keep clean, unpainted, free from membrane curing compounds, with Work above them completed.

C. Apply with stiff brush, short nap roller, squeegee, garden sprayer, or conventional paint spray equipment.

D. Apply at a coverage rate of 125 to 200 square feet per gallon and cure the sealer on slabs for the following minimum cure time at the ambient temperatures shown prior to allowing foot traffic:

1. 90 degrees F-2 hours.
2. 75 degrees F-4 hours.
3. 50 degrees F-8 hours.
4. 35 degrees F-16 hours.

3.5 CLEAR HARDENER APPLICATION

A. Before application, water cure floors to receive hardener for a minimum of 28 days, keep clean, unpainted, free from membrane curing compounds, and perfectly dry with all work above them completed.

B. Apply hardener evenly, using three coats, allowing 24 hours between coats:

1. First coat 1/3 strength, second coat 1/2 strength, and third coat 2/3 strength, mix with water.
2. Apply each coat so as to remain wet on surfaces for 15 minutes.
3. Apply approved hardeners in accordance with manufacturer's instructions.
4. After final coat is completed and dry, remove surplus hardener from surface by scrubbing and mopping with water.

3.6 MANUIFACTURER'S SERVICES

A. Provide clear sealer manufacturer's representative to demonstrate proper application of product.

B. Provide floor hardener manufacturer's representative to demonstrate proper mixing and application of product.

C. Provide curing compound manufacturer's representative to demonstrate proper application of curing compound to show coverage in one coat.

END OF SECTION

SECTION 03456

PRECAST STRUCTURES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install in the locations as shown on the Drawings, the drop inlets, manholes and other precast structures, as specified herein.

B. All precast structures shall be manufactured and installed in accordance with details included herein, and as shown on Drawings.

1.2 QUALIFICATIONS

A. All precast structures shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of items to be furnished. The structures shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.3 SUBMITTALS

A. Submit for approval seven (7) sets shop drawings showing details of construction, reinforcing, joints and connections.

B. Submit Manufacturers certificates that precast structures meet the requirements of the Specifications.

1.4 INSPECTION

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval or other representative of the Engineer. Such inspection may be made at the place of manufacture, or on the work after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample section may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to site shall be marked for identification and shall be removed from the site at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the CONTRACTOR's expense.

B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these

Specifications, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch- strength", blisters, crack, roughness, soundness, etc. The surface shall be dense and close-textured.

C. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 27,580 KPa (4,000 psi) at the end of 7 days and 34,475 KPa (5,000 psi) at the end of 28 days, when tested in 7.5 cm x 15 cm cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS AND DESIGN

A. Precast drainage structures shall conform to ASTM Designation C478 and meet the following additional requirements:

1. Type II cement shall be used except as otherwise approved.
2. Holes to accommodate pipe shall be precast into the section at the foundry.
3. All sections shall be cured by an approved method and shall not be shipped nor manhole rungs subjected to loading until the concrete compressive strength has attained 20,685 KPa (3,000 psi) and not before 6 days after fabrication and/or repair, whichever is the longer.
4. Precast concrete top slabs shall be designed for an H-20 wheel loading.
5. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside on each precast unit.
6. If the Engineer feels the precast sections do not meet the Specification, the Engineer shall require the sections to be tested by a certified testing laboratory. The Engineer shall pay for the test if the test shows the Specifications are met and the CONTRACTOR shall pay for the tests if the test shows the Specifications are not met.
7. Base unit, reducer slabs and flat top slabs shall have steel reinforcement as shown in details.

B. Openings for pipes larger than 15 cm (six (6) inches) in diameter are to be precast. A minimum of 15 cm (six (6) inches) between the circumference is to remain between any two holes.

C. The CONTRACTOR will furnish the fabricator with the angle of alignment and size of all pipes to enter manhole and the height of structure.

D. Base units shall have sufficient height to allow for minimum of 15 cm (six (6) inches) of wall between top of highest opening for pipes and bottom of joint.

E. Pipes are to be extended into structure wall a minimum of 10 cm (four (4) inches), but should not extend beyond interior wall of structure.

2.2 HEADWALLS AND MANHOLES

A. Construction of manholes shall meet the requirements of Section 02D205, CONCRETE MANHOLES

B. For Drop Inlets and Manholes exceeding 1.35 m in depth, provide imbedded metal steps to bottom of Box Manholes.

PART 3 EXECUTION

3.1 INSTALLATION

A. The trench shall be excavated carefully to depth in accordance with details shown on the Drawings.

B. Precast concrete sections shall be set so as to be vertical and with sections in true alignment with a 65 mm maximum tolerance to be allowed. The outside and inside joint shall be filled with a comparatively dry mortar (one part cement and two parts sand) and finished flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. Ifany leaks appear in the manholes, the inside joints shall be caulked with lead wool. The CONTRACTOR shall install the precast sections in a manner that will result in a watertight joint.

C. Holes in the concrete pipe sections required for handling or other purposes shall be plugged with a non-shrinking grout or by grout in combination with concrete plugs.

D. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

E. The precast concrete base shall be placed as shown on the Drawings to provide even bearing and grade control.

END OF SECTION

SECTION 03500
MASS CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification covers the requirements for concrete used in mass concrete elements.

1.2 DEFINITIONS

A. Mass Concrete is defined as any elements so specified on the Plans and any other concrete placement where the ratio of the total surface area to the volume of the element equals or exceeds 0.6 and has a minimum dimension of 3 feet in any of the three planes.

B. Requirements for mass concrete construction include laboratory testing, thermal modeling, temperature monitoring, and providing concrete temperature control before, during, and after placement. All testing shall be performed at a laboratory with recognized accreditations for performing the necessary tests, with the provision that no exception is taken by the Engineer with the Contractor's choice of laboratory.

C. The peak temperature is defined as the average of the values measured at any given time by the two temperature sensors placed at the location of the highest temperature as determined by the thermal model for the structural element. The highest acceptable peak temperature is 155°F.

D. The differential temperature is defined as the value measured at any given time by the temperature sensor in any given location (or the average, if two sensors placed in the location) in the structural element and the peak temperature as defined above. The highest acceptable differential temperature until the completion of temperature control is 35°F.

E. The performance-based differential temperature is defined as a limit that changes as the concrete gains strength, determined as a function of the established maturity curve for the mix. The benefit of this method is a potential acceleration of the production schedule over the use of a fixed limit. This option may be considered by the Engineer, with the proper submission of an implementation plan for the process as described herein, after the contractor has demonstrated good control of the concrete mix during batching, placement and curing.

PART 2 MATERIALS AND EQUIPMENT

2.1 CONCRETE

A. Unless specified in the contract documents, calcium nitrite based corrosion inhibitor shall not be allowed in Mass Concrete mixtures. Any proposed mixture adjustment that meets the requirement in ACI standards for a new approval of the mix design will also require a new approval of the mass concrete temperature control plans per this specification.

2.2 TEMPERATURE AND MATURITY RECORDING

A. Primary temperature measuring loggers shall be designed specifically for determining the maturity of concrete in accordance with ASTM C1074. They shall operate in the range of 0°F to 212°F to an accuracy of +/- 1°F and internally record the time and temperature at a minimum of 1 hour intervals for a minimum of 90 days. Each logger shall have a unique serial number and shall upon download of the information using the compatible reader or other appropriate data connection, produce a secure (unalterable) Windows PC-readable file that identifies the logger by its serial number and the start date. Software shall be provided to develop maturity curves to predict strength and display the temperature versus time data for any or all of the loggers in a given placement.

B. The data leads shall be sized to reach from the logger's installed location to an accessible site where a handheld reader can be employed. A data cable that can connect the loggers to a notebook computer or other standard mobile device will be considered equivalent to a handheld reader, providing a Windows PC-readable file can be created that can be transferred to a Windows PC. The Contractor shall provide a reader and any necessary software for the exclusive use of the Engineer. The reader and software provided for the Engineer shall become the property of the Owner at the completion of the project.

C. The loggers selected by the Contractor shall have the capability to use battery operated Wireless Remote Boxes for the downloading of data. The transmission range of the system shall be sufficient to provide a reliable connection to both the Contractor's and Engineer's field offices. A Windows PC-Compatible Wireless System Radio Base Station shall be provided and capable of downloading the data file as described above. The Wireless System Radio Base Station shall be maintained by the Contractor for monitoring the mass concrete placement. An additional Wireless System Radio Base Station shall also be provided for the Engineer's field office. The additional device and any associated software provided for the Engineer shall become the property of the Owner at the completion of the project.

D. The requirement for a wireless communications system may be waived by the Engineer, if the Engineer determines that access to the placement does not warrant it.

E. The Contractor shall provide the Engineer recording equipment that will allow intermediate downloading of measurements to a computer without restarting the logger. The recording equipment provided for the Engineer shall become the property of the Owner at the completion of the project. An automatic temperature monitoring system shall be provided with email, phone, or text message alarm capability to notify the Contractor when temperature control limits are about to be exceeded.

F. The Contractor must submit technical literature on the complete maturity logger system, including the loggers, handheld reader, wireless system, software and any other components to the Engineer for approval at least 60 days prior to the first mass concrete placement. This shall include manufacturer contact information for the responsible technical representative and product performance history showing at least one year of successful use of the complete system on a minimum of three projects with mass concrete placements comparable to those within the scope of this project. Contact information shall be provided for the project owners. No mass concrete placements shall proceed until approval of the maturity logger system has been given in writing by the Engineer.

PART 3 EXECUTION

3.1 SUBMITTALS

3.1.1 MASS CONCRETE TEMPERATURE CONTROL PLANS

A. As part of the submittals, the Contractor shall submit a “Mass Concrete General Temperature Control Plan" for approval at least 60 days prior to the first mass concrete placement and shall be stamped by a Registered Professional Engineer. This shall show the general procedures proposed for temperature control. A "Mass Concrete Specific Temperature Control Plan" shall be prepared for each unique placement and shall be based on the general plan. Each specific temperature control plan shall provide guidance for the Contractor, developed based on a concrete hydration temperature model, to indicate when the peak and differential temperatures might exceed the specification limits. The guidance shall provide specific concrete placement temperature restrictions based on anticipated ambient temperatures and other environmental factors, passive and active cooling, and insulation practices that could produce peak or differential temperatures that require remedial action. Guidance shall also be provided on appropriate remedial actions to be taken when concrete temperatures approach specification limits. At a minimum, these guidelines shall take effect when the concrete peak temperature reaches 3°F below the specification limit of 155°F and when the differential temperature reaches 2°F below the specification limit of 35°F or the temperature value at the specified maturity, for the variable differential limit, (if approved). Each specific plan shall be submitted for approval at least 30 days prior to the placement and shall be stamped by a Registered

Professional Engineer. Any costs related to the development of Mass Concrete Temperature Control Plans shall be considered incidental to the project.

B. Approval of any Mass Concrete Temperature Control Plan by the Engineer will not relieve the Contractor of his responsibility to maintain concrete temperatures within specification limits.

C. General Mass Concrete Temperature Control Plan. The General Mass Concrete Temperature Control Plan shall include the following:

1. Concrete mixture proportions, indicating aggregate sources and physical properties, cementitious material sources, and admixture product names and doses for each concrete mixture. The Class MC concrete mixture design and prequalification test results shall be submitted for approval separately, following Section 03300A Raw Water Intake Cast-in-Place Concrete.

2. Anticipated mass concrete placement schedule, including proposed concrete mixture adjustments for the full range of conditions that may occur during placement and curing operations.

3. Concrete temperature rise for each mixture shall be tested directly in an adiabatic concrete calorimeter cast from laboratory trial batches using the same material sources and proportions as intended for use on the project.

4. Concrete compressive strength development in standard moist curing environment (73.5 ± 3.5 deg F) at 3, 7, 14, 28, and 56 days for each mixture, based on the average of three 6" x 12" cylinders for each age. Cylinders shall be cured and tested per AASHTO T-22. Cast a temperature sensor in the center of two additional cylinders and cure these cylinders alongside those used for compressive strength. Record the average temperatures of the cylinders hourly. Report the compressive strength and maturity for each specimen at each test age and the average values.

   The following test shall also be performed following PRASA Standard Technical Specification 03300A Raw Water Intake Cast-in-Place Concrete:

   a) Consistency: Test for slump.

   b) Air Content: Test for air content

   c) Unit Weight: Test

5. Calculate and report the concrete strength development-maturity equation for each mixture from the standard cured strength results as described in ASTM C 1074 "Estimating Concrete Strength by the Maturity Method".

6. Demonstration Mock-up(s) shall be performed at least 120 days prior to the first scheduled Mass Concrete Placement. The Contractor shall cast at least one mock-up to verify that the concrete thermal properties and temperature control procedures required for the Mass Concrete General Temperature Control Plan are adequate to meet the specification limits. The mock-up(s) shall use the same concrete mixture proportions and materials, form materials, curing materials, and monitoring devices

defined in the General Temperature Control Plan, and shall use the same batching and placing operation as intended for the project. The mock-up shall be a cube or other element measuring 4 ft or more in the least dimension. Temperature monitoring of the mock-up shall be as specified in the General Mass Concrete Temperature Control Plan and shall continue for at least seven (7) days. As a minimum, the demonstration mock-up shall be insulated with R-20 insulation on all sides. If various insulation, cooling, or curing options are proposed, a separate demonstration mock-up cube shall be cast and instrumented for each option. The engineer responsible for the design of the temperature control plan shall be present at the placement for each mock-up.

Sensor Placement:

a. Two sensors shall be located at the center of the mock-up. The average of these two shall be used.

b. Two sensors shall be located within one inch from the top surface located directly above the center of mass sensors. The average of these two shall be used.

c. Two sensors shall be located within one inch from the center of a vertical face. The average of these two shall be used.

d. Two sensors shall be located in an upper corner of the cube. The average of these two shall be used.

e. One sensor shall be used to record the ambient temperature. This sensor shall be placed at approximately ten (10) feet from the placement, in a shaded area.

Note: A 5°F or greater variation between adjacent sensors pairs, or erratic variations or outright failure of a sensor shall be brought to the attention of the Engineer immediately upon discovery of the problem. At the time of the notification, the Contactor shall provide the Engineer with a course of corrective action for approval. If the approved corrective action requires that the data from one sensor in a pair no longer be used, the other functioning sensor shall be used solely for the peak and maximum differential temperature measurements.

D. From the concrete batched for the mock-up, the Contractor shall have tests conducted for air content (AASHTO T152), placement temperature (ASTM C1064, unit weight (AASHTO T121) and fabricate cylinders (per AASHTO T23) from the same concrete by an ACI Certified Concrete Field Technician Level I. The cylinders shall be tested for compression strength by an AASHTO Accredited independent concrete testing laboratory (AASHTO T22) at 3,7, 14, 28, and 56 days. The Contractor shall coordinate the mock-up with the Engineer, and shall provide the Owner at least one week advance notice of the casting date. The Engineer shall be provided the opportunity to witness the placement and functioning of temperature recording sensors prior to casting, and may perform concrete property tests on companion samples selected by the Engineer.

E. A letter report documenting the concrete properties and temperatures developed in the mock-up compared against the thermal analysis contained in the General Mass Concrete General Temperature Control Plan models shall be submitted as part of the General Temperature Control Plan. Any revisions/corrections required to the General Mass Concrete Temperature Control Plan for differing ambient conditions shall be outlined in the letter report. Strength results may be submitted separately.

F. If the project involves four or less unique mass concrete placement designs, the Engineer may waive the requirement for a General Mass Concrete Temperature Control Plan. If waived, the Specific Mass Concrete Temperature Control Plans shall meet all of the requirements listed above.

G. Specific Mass Concrete Temperature Control Plans. Each Specific Concrete Temperature Control Plan shall include the following:

1. Form and form liner R-value and anticipated time of form removal.
2. Insulating material(s) R-value and anticipated periods of use
3. Curing procedure and duration
4. Thermal modeling analysis for typical placement scenarios shall be provided. The analysis shall incorporate, but not be limited to: A range of anticipated ambient placement temperatures, anticipated water temperatures for active cooling, effects of water temperature for placements in water, effects of convection cooling in locations where high winds may be a factor, anticipated concrete placement temperatures, assumed R-values for concrete forms and insulation, and shall calculate maximum core and surface temperatures vs. time after placement. The impact of planned construction activities, such as form removal, shall be included in the analysis. Concrete strength at form removal shall be estimated from the maturity relationship using the lowest calculated maturity value shown by the sensors placed within the concrete.
5. Drawings identifying temperature monitoring locations for each placement, and product data for all sensors and recording instrumentation shall be provided. With the exception of the ambient sensor, the sensors shall be installed in pairs for the redundancy. The minimum number of automated temperature monitoring locations shall be nine (9) per element for placements less than 500 yd3, and seventeen (17) for placements 500 yd3 or larger. Minimum sensor locations are noted below. Each of the sensors in a pair shall be placed in separate locations, no less than 6” and no more than 18” apart: The relative locations shall be as shown for the mock-ups.

a. Two sensors shall be placed in the geometric center of the placement. This location shall be based on the isocurves developed for the model, with the approval of the Engineer. The average of the two will be used to determine the peak temperature at any given time and to measure the maximum temperature differential in the placement based on the difference between the peak temperature and each sensor location at any given time. The average of the two sensors shall be used.

b. Two sensors shall be placed at the location as determined by isocurves developed for the model that shows the point where the lowest temperature is predicted during temperature control. The average of the two sensors shall be used.

c. Two sensors shall be located within one inch from the top surface located directly above the center of mass sensors. This location may be adjusted, based on the isocurves developed for the model, with the approval of the Engineer. The average of the two sensors shall be used.

d. Two sensors shall be located within one inch from the center of vertical formed surfaces at mid-height. This location may be adjusted, based on the isocurves developed for the model, with the approval of the Engineer. The average of the two sensors shall be used.

e. One sensor shall be used to record the ambient temperature. This sensor shall be placed at approximately ten (10) feet from the placement, in a shaded area.

f. The Contractor shall also provide up to four (4) additional sensor pairs to be located at the discretion of the Engineer.

g. Use similar sensor distribution for placements greater than 500 yd^3.

Note: A 5°F or greater variation between adjacent sensors pairs, or erratic variations or outright failure of a sensor shall be brought to the attention of the Engineer immediately upon discovery of the problem. At the time of the notification, the Contactor shall provide the Engineer with a course of corrective action for approval. If the approved corrective action requires that the data from one sensor in a pair no longer be used, the other functioning sensor shall be used solely for the peak and maximum differential temperature measurements.

H. Following a mass concrete pour, the Engineer may require the Contractor to perform thermal modeling analysis of the placement using actual concrete and ambient temperatures to evaluate the effects of construction practices such as, but not limited to, form removal or curing. If required, this shall be performed at no additional cost to the Owner.

I. Procedures for achieving temperature restrictions including contingencies for severe weather events shall be provided. Procedures may incorporate either active (cooling pipes) or passive control methods (insulation, tenting, venting, etc.) or both. The Temperature Control Plan shall show the expected duration of all temperature control measures for each model condition model provided.

J. If cooling pipes are proposed, submit detailed description of the system describing the layout and size of pipes, anticipated coolant flow rate, temperature of the raw coolant source, pump size, flow and recirculation control equipment, instrumentation, coolant temperature control procedure, and contingency plans.

3.1.2 Performance-Based Variable Temperature Differential Limit.

A. After the Contractor has established, to the satisfaction of the Engineer, that proper control can be maintained of the concrete mix properties, including curing temperatures, the Contractor shall have the option of submitting a plan to use a performance-based criteria for

a variable differential limit, based on the concrete strength as determined by the maturity at any given time. This will supersede the 35 degree F limit. Failure to maintain proper temperature control under this plan will result in reversion to the 35 degree F limit for subsequent placements until such time that the Contractor demonstrates to the Engineer that causes for the loss of control have been identified and corrected. Temperature control will be considered to have failed if one of the following conditions occurs:

- The differential exceeds the variable value by more than 3 degrees F at any time during the first 40 hours after placement.
- The differential exceeds the variable value by more than 5 degrees F at any time after the first 40 hours after placement during temperature control.
- The differential exceeds the variable value by 2 degrees F or more for any period of 8 hours or more at any time during temperature control.
- Cracking of the placement determined to be the result of thermal issues will also be considered to be failure of the temperature control and will result in reversion to the 35 degree F limit.

B. Plan Submission Requirements. The Contractor's written implementation plan shall include complete back-up data such as, but not limited to, listing of all assumptions used in the analysis, published reference documents, coefficient of the thermal expansion for the mix being placed, tensile strength development versus maturity equations for the mix being placed, elastic modulus versus maturity equations for the mix being placed, example implementation of the method using a predicted thermal gradient analysis and complete test data justifying the prediction equations for the proposed mixture. Each placement shall also include a specific plan with an assumed restraint factor, consideration of the placement geometry and other factors that can affect the differential limit. The other factors shall include, but not be limited to, anticipated concrete placement temperature, ambient temperatures, cooling water temperature (if active cooling is used), convection effects from wind and design elements of the temperature control plan.

C. For acceptable demonstration of the submission of an implementation plan, the Contractor may use a mass concrete pour defined and conducted using the 35 degree F differential limit. The gradients predicted in the thermal model for the performance-based temperature limit shall match the actual temperatures to the satisfaction of the Engineer. It shall have as a minimum a set of at least eleven temperature/maturity sensors. Locate sensors as follows:

1. At the location of the maximum temperature, at least one sensor shall be placed as defined.
2. Near the formed surface, at least one sensor shall be placed as defined.
3. Near the top surface, at least one sensor shall be placed as defined.
4. A minimum of two equally spaced between the location of the maximum temperature and top surface sensor in an approximate straight line configuration

5. A minimum of two equally spaced between the location of the maximum temperature and formed surface sensor in an approximate straight line configuration
6. At the location of the minimum temperature, at least one sensor shall be placed as defined.
7. A minimum of two equally spaced between the location of the maximum temperature and the location of the minimum temperature, in an approximate straight line configuration
8. One sensor should be used to record the ambient temperature remote from the placement.

For items 1, 2, 3 and 6, the sensors may be the same as those used for the actual temperature control of the placement as specified. While redundant sensors are not required, failure at any of the required locations without a backup will invalidate the results.

The performance-based temperature limit plan shall be submitted for approval at least 30 days prior to the first placement for which it is proposed to be used and shall be stamped by a Registered Professional Engineer. Should the plan be approved by the Engineer, this will become the standard sensor distribution for as long as this plan is in effect and shall be used to verify the accuracy of the performance-based temperature limit plan thermal model for each placement. The plan shall show a relationship between the maturity and the appropriate maximum acceptable temperature differential that will prevent cracking of the concrete. The relationship shall be shown in tabular form, at intervals of one (1) degree F for the first forty (40) hours after placement and two (2) degrees F for more than forty (40) hours after placement. to a minimum of fourteen (14) days. The maturity value used to determine the appropriate differential at any given time shall be the lowest measured within the placement.

3.2 TEMPERATURE CONTROL REQUIREMENTS

A. Mass concrete temperature control shall be monitored by maturity loggers cast into the concrete. Use of low heat concrete mixtures, pre-cooling of the concrete, insulated curing blankets, insulated forms, cooling pipes, and other measures may be necessary satisfy the temperature control requirements.

B. The Contractor shall notify the Engineer immediately when temperature control limits are exceeded. Complete concrete temperature records for each placement including the secure files generated by the automated temperature sensors shall be provided to the Engineer. The Engineer shall be provided unobstructed access to temperature sensors at any time to verify compliance with temperature control criteria.

1. When forms are placed in water, the forms and insulation shall be waterproof or otherwise protected against water absorption. The required combined form and

insulation R-Value shall be determined through thermal analysis prior to placement using forecasted temperatures to meet the requirements to maintain the maximum peak and differential temperatures within the limits defined in tis specification.

2. The temperature of the concrete at placement must not exceed 65 degrees for cold weather placements, nor 85 degrees F for hot weather placements, unless active temperature control precautions are employed. All active temperature control piping shall be non-metallic and shall be filled with a non-shrink grout on the Owner Approved Products List (Section 03600-Grout) upon completion of cooling operations. The temperature of the concrete at placement shall be within the acceptable range of values shown in the temperature control plan for the structural element.

3. Temperature sensors shall be maturity loggers. The logger will be programmed with the appropriate datum temperature.

4. Wiring for loggers that must be cast into the concrete shall be secured to reinforcing or otherwise protected to prevent damage during concrete placement. The method of protection of the wires cast into the concrete shall be approved by the Engineer and shall use methods satisfactory to the Engineer. Wiring for loggers shall be clearly labeled to identify the location within the form at both ends before being placed into the form. Ambient temperature sensors shall be located no closer than 10 feet from the Mass Concrete Placement and shall be placed as to provide an accurate measurement of the environmental condition. Wire runs outside of concrete shall be encased in conduit where necessary to prevent damage during subsequent construction operations.

5. The Contractor shall not perform installation and verification checks for operation of any loggers unless the Engineer is present. The Contractor shall provide as-built versions of the temperature control plans showing the location of the loggers as identified by the unique serial numbers. Upon completion of monitoring all visible wires shall be removed from the concrete and any conduit penetrations filled with a non-shrink grout on the Owner Approved Product List.

6. Each logger will be programmed with notes identifying the placement and relative location within the placement. Loggers shall be secured into position and function shall be verified at least one day prior to concrete placement. Temperature recording for each placement shall start no less than 2 hours prior to the initial concrete placement. The Contractor shall provide the Engineer safe access to the locations where readings will be taken, to observe the initialization of the loggers and record relevant information. This information shall include each logger

serial number, location in the placement and start time. Access shall also be provided as needed for subsequent readings, as required by the Engineer.

7. Each logger for each placement shall be connected to the Wireless Remote Boxes purchased by the Contractor. The Contractor shall provide as many Wireless Remote Boxes as necessary to monitor all loggers simultaneously. The Contractor shall be aware that a sufficient quantity of Wireless Remote Boxes must be on hand to monitor all of the loggers for all of the placements being actively monitored at any given time during the project. The Contractor shall also maintain two (2) spare Remote Boxes or 10% of the total on hand, whichever is larger, in operating condition at all times.

8. The Contractor shall maintain the wireless system in operating condition, including maintaining any batteries at sufficient charge and protecting the units from damage due to the environment and other factors. This shall be done to insure that the Remote Boxes are capable of retrieving and transmitting data on a daily basis for the duration of the specified monitoring period for the concrete placement.

9. The Contractor shall have at the Contractor's field office a Wireless System Radio Base Station compatible with the Wireless Remote Boxes and an equivalent model provided to the Engineer. Both Wireless System Radio Base Stations shall be configured to access all of the active Wireless Remote Boxes at any given time without reconfiguration of any component. Upon setup of each Wireless Remote Box and prior to placement of the concrete, the Contractor shall test the remote operation of the system to verify that it works properly and that all loggers that are to be connected to the Wireless Remote Box can be accessed. The Contractor may, at his discretion, have a handheld reader for the loggers. However, this shall not be used, except to configure the loggers initially or to collect data in the event of a problem with a Wireless Remote Box. Any such problem shall be corrected within 24 hours, unless permission is granted by the Engineer for a longer delay. Upon connection/reconnection of a Wireless Remote Box, the operation shall be tested as described above.

10. Automated temperature measurements shall be downloaded within one hour of the start of each calendar day during which any element of temperature control is in place. Secure data files from each logger shall be provided to the Engineer on a daily basis.

11. The peak concrete temperature at any location within the mass shall not exceed 155 degrees F at any point in time. Failure to maintain a maximum peak concrete

temperature less than or equal to 155 degrees will be cause for rejection of the concrete placement by the Engineer.

12. The temperature differential calculated as the difference between the mean of the peak temperature and any concrete surface sensor temperature shall not exceed 35 degrees F or the value of the variable limit (if approved) at any point in time. Failure to control the maximum concrete temperature differential less than or equal to the specified limit may be cause for rejection of the concrete placement by the Engineer. Malfunctioning sensors, as determined by the Engineer, shall be excluded from the differential calculation.

13. The placement shall be completely protected from exposure to precipitation to prevent cooling of the surface. Such protection shall be maintained until temperature control is no longer required.

14. Forms shall remain in place until the estimated strength of the concrete surface exceeds 2500 psi based on the lowest indicated maturity from the data loggers and until the differential between the mean center temperature and ambient temperature is less than 30 degrees F and decreasing. Ambient temperatures must be rising at the time of form removal. Forms shall not be removed prior to meeting all other requirements listed elsewhere in the Contract Documents.

15. Tenting, erecting windbreaks, covering with plastic or curing blankets or other means may be necessary to protect the concrete surface from rapid cooling after form removal. Any and all such measures shall be at no additional cost to the Owner.

16. Concrete surfaces shall be protected when the temperature differential between the peak temperature and ambient temperature is greater than 30 degrees F.

17. Mass concrete temperature control procedures shall remain in effect until the temperature differential between the mean center temperature and the 3-day mean ambient low temperature is less than 35 degrees F.

18. Mass concrete elements exposed to seawater, brackish water or freshwater shall have reached at least 28 days compressive strength as indicated by the approved Maturity Curve and shall have a core temperature-to-water temperature differential less than 35 degrees F prior to exposure.

19. Verbal approval shall be obtained from the Engineer before removing temperature control.

3.3 CURING

A. Mass concrete placements shall be continuously moist cured for at least 14 days and until the 28 day compressive strength as indicated in the structural notes on design drawings and following the approved Maturity Curve is achieved. Maintaining moisture on the top surface with forms in place shall be considered adequate moist curing. If strength and thermal control are achieved prior to 14 days, forms may be removed but moist curing must be continued.

B. Water used for curing shall be fresh water and shall not contain any salts or other components harmful to concrete. The temperature of any water used for moist curing of mass concrete shall be controlled to within 30 degrees F of the mean concrete center temperature.

3.4 TEMPERATURE CONTROL FAILURE

A. Failure to meet the temperature control requirements of this specification will be cause for rejection of the concrete. Subsequent mass concrete placements shall be immediately halted. The Contractor shall investigate the events that produced the failure and shall submit a written report to the Engineer. The investigation shall include a thorough examination of the concrete placement, the reasons for non-compliance with these requirements and shall document the width and extent of all visible cracks (if any), after cleaning the surface to fully expose them. Surface crack intensity will be measured after monitoring shows the maximum internal temperature has dropped to within 10°F of the outer concrete temperature.

B. The Contractor shall remove all equipment and materials from the mass concrete element and clean the surface for the Engineer to verify the Contractor's measurements of the crack intensity. The Contractor shall provide safe access for the Engineer's inspection, at no additional cost to the Owner.

C. At the discretion of the Engineer, repair or removal and replacement of the rejected placement may be required of the Contractor. If required, repair, or removal and replacement of the rejected placement shall be performed at no additional cost to the Owner.

D. At the discretion of the Engineer, the Contractor shall be required to submit a revised Mass Concrete General Temperature Control Plan to address any deficiencies identified by the investigation, at no additional cost to the Owner.

E. Subsequent mass concrete placements shall not resume without written approval by the Engineer.

F. There shall be no claims for additional payment by the Contractor nor will there be an extension of the project Completion Dates for any corrective actions required as a result of the

rejected concrete and subsequent corrective measures to address any deficiencies identified by the investigation.

3.5 CRACK REPAIRS

A. Cracking determined to be due to thermal issues shall be repaired by methods submitted to the Engineer. Determination of when cracking is caused by thermal issues will be solely by the Engineer. No repairs shall begin until the Engineer has approved the repair plan.

B. In case of thermal cracking, the Contractor shall suspend further work on members of similar size and configuration, submit a written explanation of the thermal cracking and additional steps to be taken to eliminate future thermal cracking, and submit proposed modifications in writing to the Engineer for review. Concrete placement may not resume until the Engineer approves the proposed modifications.

END OF SECTION

SECTION 03600
GROUT

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work included in this Section consists of grouting the various items listed hereinafter and indicated on the Drawings.

1.02 RELATED WORK

A. Section 03300A Raw Water Intake Cast-in-Place Concrete

1.03 SUBMITTALS

A. Manufacturer's literature shall be submitted for review on the following items.

1. Nonshrink grout data shall include grout properties, mixing, surface preparation and installation instructions.

1.04 DELIVERY AND STORAGE

A. Grouting materials shall be delivered and stored in unbroken containers with seals and labels intact as packaged by the manufacturer.

1.05 QUALITY ASSURANCE

A. If the project includes patching, throughbolt holes, epoxy anchors, and/or blockouts, the manufacturer shall, if necessary, train the CONTRACTOR's employees in the mixing and curing of the epoxy grouts for each of these applications.

B. Furnish one year warranty. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Class I Non-Shrink Grout (5000 psi) shall be Masterflow 713 Plus by BASF, Five Star Grout by Five Star Products, Sikagrout 212 by Sika Corporation, Premier by L&M Construction Chemicals; High-Flow Grout by Euclid Chemical Company, CG 200 PC by Hilti, or approved equal.

B. Class II Non-Shrink Grout (7500 psi) shall be Masterflow 928 by BASF, Five Star Fluid Grout 100 by Five Star Products, Crystex by L&M Construction Chemicals, or approved equal.

C. Nonshrink Metallic Grout: Master Builders Embeco 636 Grout pre-mixed type, or approved equal.

D. Epoxy Grout: DP Five Star epoxy grout by U.S. Grout Corp., or approved equal.

2.02 BASE FOR VIBRATING PUMPS AND MACHINERY

A. The Department requires an expansive, non-shrink epoxy grout to service as a base for pump bases and other machinery. The slab shall be constructed with an epoxy grout that can absorb vibration and provide support for precision machinery. Pump bases shall be constructed to the dimensions and thickness required by the pump or machinery manufacturer for the application.

B. Pump bases over 100 horsepower shall be constructed with DP Five Star Epoxy Grout. Approved equals to the Five Star Epoxy Grout product shall be considered only a detailed analysis for vibration and harmonic interference are provided for the application.

2.03 EPOXY ANCHOR GROUT

A. Epoxy anchor grout shall conform to ASTM C 881 - Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class A, B and C, Grade 3 with the exception of gel time.

B. Heat deflection temperature per ASTM D 648 -- Test Method for Deflection Temperature of Plastics Under Flexural Load shall be a minimum 120 degrees.

C. Manufacturer shall certify that the epoxy anchor grout will maintain 90 percent of its strength up to a temperature of 125 degrees F.

D. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.

E. Epoxy anchor grout shall be capable of being used in submersed applications once cured.

F. Compressive strength per ASTM D 695 - Test Method for Compressive Properties of Rigid Plastics shall be 10,000 psi minimum.

G. If the average working or operating temperature will be over 100 degrees F or in a high fire risk area, use cement based non-shrink grout and oversized holes.

H. Overhead anchors and anchors in fire-resistive construction shall be cast-in anchors.

I. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar. Embedment shall not exceed 67 percent of the member depth.

J. Epoxy anchor grout shall be SET-XP by Simpson Strong-Tie Co., Inc.; Powers PE1000+ by Powers Fasteners, Inc.; RE 500 SD by Hilti, Inc.; or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

A. All bonding surfaces shall be clean and dust and oil free. Grout shall be mixed and applied in accordance with manufacturer's recommendations.

B. Grout Mix proportions (for grout to fill cores in reinforced masonry walls):

1. One part Portland cement, Type I or II.
2. 2-1/4 parts damp, loose sand.
3. Parts shot gravel (3/8" maximum).
4. Mix to conform to ASTM C476-83 with a minimum compressive strength of 2500 psi at 28 days, have an 8" minimum and 10" maximum slump.

C. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the ENGINEER. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

D. Mechanical, electrical, and finish WORK shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively where accepted by the ENGINEER, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.

3.02 INSTALLATION

A. Nonshrink Grout:

1. Nonshrink, nonmetallic grout shall be used for grouting precast concrete wall panel connections, column base plates, anchor bolts, reinforcing bars, pipe sleeves, and machinery supports.
2. Grout shall be mixed as close to the work area as possible and transported quickly to its final position in a manner which will not permit segregation of materials.
3. Nonshrink grout shall be cured with water saturated burlap for at least three days or with an application of Super Rez Seal cure and seal compound applied immediately after grout placement.
4. Machinery set on grout pads shall not be operated until the grout has cured for at least 24 hours.
5. Expansive, non-shrink epoxy grout in the category of the DP Five Star Epoxy Grout shall be used for installation of vibrating machinery such as pumps.

B. Epoxy Adhesive Anchors: Grout shall be proportioned and mixed with automatic equipment. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICC-ES report, but shall not be less than 8 diameters for threaded rod or 12 diameters for reinforcing or smooth bars. Holes shall be dry.

C. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, and cleaned. Drilled anchors shall not be installed until the concrete has reached the required 28 Day compressive strength. Anchors shall not be loaded until the grout has reached its indicated strength in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 05050
WELDING

PART l GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Nondestructive Testing (ASNT): SNT-TC-IA, Recommended Practice.
2. American Water Works Association (AWWA):
   a. C206, Field Welding of Steel Water Pipe.
   b. DlO0, Welded Steel Tanks for Water Storage.
3. American Welding Society (AWS):
   a. B2.1, Standard for Welding Procedure and Performance Qualification.
   b. D1.1, Structural Welding Code-Steel.
   c. Dl.4, Structural Welding Code-Reinforcing Steel.
   d. QC-1, Standard for AWS Certification of Welding Inspectors.
4. American Society of Mechanical Engineers (ASME):
   a. BPVC SEC V, Nondestructive Examination.
   b. BPVC SEC IX, Welding and Brazing Qualifications.

1.2 RELATED SECTIONS:

A. Section 05500, METAL FABRICATIONS AND CASTINGS.

1.3 SUBMITTALS

A. Shop Drawings:

1. Shop and field welding procedures.
2. Procedure qualification records.
3. Welding Documentation: Submit on appropriate forms in referenced welding codes.
4. Nondestructive testing procedure specifications prepared in accordance with ASME BPVC SEC V.

B. Quality Control Submittals:

1. Welder/welding operator qualifications.
2. Welding inspector credentials.
3. Testing agency personnel credentials.
4. Welding Inspector's Report.

1.4 QUALIFICATIONS

A. Welding Procedure Specifications: In accordance with AWS D1.1 (Annex E) or AWS B2.1 (App. A) or ASME BPVC SEC IX (Forms QW-482 and QW-483).

B. Welder/Welding Operator: In accordance with AWS DI.I (Annex E), AWS B2.1 (App. A), or ASME BPVC SEC IX (Form QW-484).

C. Welding Inspector: Certified in accordance with AWS QC1 and having prior experience with the welding codes specified.

D. Testing Agency: Personnel performing tests shall be NDT Level II Certified in accordance with ASNT SNT-TC-1A.

1.5 SEQUENCING AND SCHEDULING

A. Unless otherwise specified, all Submittals required in this Section shall be submitted and approved prior to commencement of welding operations.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. The certified welding inspector (CWI) shall be present whenever shop welding is performed and shall:

1. Verify conformance of specified job material and proper storage.
2. Monitor conformance with approved welding procedure specifications (WPSs).
3. Monitor conformance of welder/welding operator qualification (WPQs).
4. Provide 100 percent visual inspection of all welds.
5. Supervise nondestructive testing personnel and evaluate test results.
6. Maintain records and prepare reports confirming results of inspection and testing.

PART 3 EXECUTION

3.1 GENERAL

A. Welding and Fabrication by Welding: Conform to governing welding codes referenced in the attached Welding and Nondestructive Testing Table.

3.2 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

A. All Welds:

1. Selection of Welds to be Tested: As agreed upon between OWNER's Representative and CONTRACTOR.
2. Unless otherwise specified, perform nondestructive testing (NDT) of welds at a spot testing frequency as shown below or in the attached table in accordance with the referenced welding codes as follows. In case there is a conflict the higher frequency level of NDT shall apply:
   a. Butt Joint Welds: 10 percent randomly radiographically tested and repaired.
   b. Groove Welds: 10 percent randomly ultrasonically tested and repaired.
   c. Fillet Welds: 10 percent randomly examined and repaired, using either dye penetrant or magnetic particle inspection methods.
   d. All Welds: 100 percent visually inspected.
3. Unless otherwise specified, perform all nondestructive testing in accordance with Chapter 6 of AWS D1.1 for statically loaded non-tubular connections.

3.3 FIELD QUALITY CONTROL

A. The certified welding inspector (CWI) shall be present whenever field welding is performed and shall:

1. Verify conformance of specified job material and proper storage.
2. Monitor conformance with approved welding procedure specifications (WPSs).
3. Monitor conformance of welder/welding operator qualification (WPQs).
4. Provide 100 percent visual inspection of all welds.
5. Supervise nondestructive testing personnel and evaluate test results.
6. Maintain records and prepare report confirming results of inspection and testing.

3.4 WELD DEFECTS REPAIR

A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

3.5 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are a part of this Specification.

1. Welding and Nondestructive Testing table.

END OF SECTION

WELDING AND NONDESTRUCTIVE TESTING

Specification Section	Governing Welding Codes or Standards	Submit Welding Procedure Spec.	Submit Welder/ Welding Operator Qual.	Onsite Welding Inspector Req'd	Submit Written Nondestructive Testing Procedure Specifications	Nondestructive Testing Requirements
032100 CONCRETE REINFORCEMENT	AWS Dl.4, Structural Welding Code- Reinforcing Steel	Yes	Yes	Yes	No	100% MT(3) of all rebar splices; see 032100
05500 METAL FABRICATIONS AND CASTINGS	AWSDl.1, Structural Welding Code- Steel	Yes	Yes	Yes	No	10% UT (1) or RT(2) of all groove-and-butt joint welds; 10% MT(3) of all fillet welds; see 05500
055210 PIPE RAILINGS	AWSDl.1, Structural Welding Code- Steel	Yes	No	No	No	100% VT(4)

(1)UT-Ultrasonic Testing.
(2)RT-Radiographic Testing.
(3)MT-Magnetic Particle Testing.
(4lVT-(4)Visual Testing

SECTION 05500
METAL FABRICATIONS AND CASTINGS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. American Institute of Steel Construction (AISC):
   a. Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design.
   b. Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
   c. Code of Standard Practice for Steel Buildings and Bridges.
   d. AISC Quality Certification Program.

2. American National Standards Institute (ANSI):
   a. A14.3, Ladders, Fixed, Safety Requirements.
   b. Bl.I, Unified Inch Screw Threads (UN and UNR Thread Form).

3. American Society for Testing and Materials (ASTM):
   a. A36 REV B, Standard Specification for Structural Steel.
   b. A48, Standard Specification for Gray Iron Castings.
   c. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
   d. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and SteelProducts.
   e. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   f. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   g. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High- Temperature Service.
   h. A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
   i. A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
   j. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   k. A325,Standard Specification for High-Strength Bolts for Structural Steel Joints.
   l. A385, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
   m. A395, Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

n. A489, Standard Specification for Carbon Steel Eyebolts.
o. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
p. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
q. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
r. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
s. B308, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes.
t. B429, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
u. C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
v. D648 E2, Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.
w. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
x. D746, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
y. D1056, Standard Specification for Flexible Cellular Materials- Sponge or Expanded Rubber.
z. D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
aa. D1525, Standard Test Method for Vicat Softening Temperature of Plastics.
bb. F436, Standard Specification for Hardened Steel Washers.
cc. F468, Standard Specification for Nonferrous Nuts for General Use.
dd. F844, Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

4. American Welding Society (AWS):
   a. AWS D1.1, Structural Welding Code-Steel.
   b. AWS Dl.2, Structural Welding Code-Aluminum.
5. Federal Specifications (FS):
   a. QQ-F-461 C(l), Floor Plate, Steel, Rolled.
   b. RR-S-001301, Safety Equipment, Climbing.
6. The Aluminum Association, Inc. (AA): 30, Specifications for Aluminum Structures, Fifth Edition.

1.2 DEFINITIONS

A. Submerged: A location at or below a point 1 foot 6 inches above maximum water surface elevation in water-holding basins and channels.

1.3 SUBMITTALS

A. Shop Drawings:

1. Metal fabrications, including welding and fastener information.
2. Specific instructions for concrete anchor installation, including drilled hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.
3. Major suppliers or manufacturer's credentials.

B. Quality Control Submittals:

1. Adhesive Anchors:
   a. Manufacturer's product description and installation procedures.
   b. Current test data or ICBO evaluation report.
   c. Adhesive Anchor Installer Certification.
2. Ladders: Results of load tests.
3. Welding inspector credentials.
4. Testing agency personnel credentials.
5. Welding Inspector's Report.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Welding Inspector: Certified in accordance with AWS QCl, and having prior experience with the welding codes specified.
2. Weld Testing Agency: Personnel performing tests shall be NDT Level II Certified in accordance with ASNT SNT-TC-lA.

B. Regulatory Requirements:

1. Ladders, Load Test:
   a. Test assemblies with specified loads.
   b. Cycle load 200,000 times to demonstrate fatigue resistance, then check for defects.

1.5 DELIVERY, STORAGE AND HANDLING

A. Preparation for Shipment:

1. Insofar as practical, factory assemble items specified herein.
2. Package and clearly tag parts and assemblies that are of necessity shipped unassembled, in a manner that will protect materials from damage, and facilitate identification and field assembly.

B. Storage of Adhesive:

1. Store adhesive cartridges on pallets or shelving in a covered storage area.

2. Control storage temperature in accordance with manufacturer's written instructions.
3. Dispose of cartridges if shelf life has expired.

1.6 SPECIAL GUARANTEE

A. Manufacturer's extended guarantee or warranty, with OWNER named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the OWNER, removal and replacement of sidewalk doors found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as defined in General Conditions.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, meet the following requirements:

Item	**ASTM / Reference**
Steel Shapes and Plates	ASTM A36 (Rev B)
Steel Pipe	ASTM A501 or ASTM A53, Type E or S, Grade B
Structural Steel Tubing	ASTM A500, Grade B
Stainless Steel — Bars	ASTM A276, AISI Type 304 or Type 316
Stainless Steel — Plate, Sheet, and Strip	ASTM A167, AISI Type 304 or Type 316
Bolts and Threaded Rods (Stainless)	ASTM A193, Grades B8 (Type 304), B8M (Type 316), B8MN, B8M2, or B8M3
Nuts (Stainless)	ASTM A194, Grades 8 (Type 304), 8M (Type 316), 8MN, 8M2, or 8M3
Bolts and Threaded Rods (Carbon Steel)	ASTM A307 or ASTM A36 (Rev B)
High-Strength Bolts	ASTM A325, Type 1
Galvanized Steel Bolts and Nuts	ASTM A307 or A36 (Rev B) with ASTM A153 zinc coating; threads per ANSI B1.1
Eyebolts	ASTM A489
Threaded Rods (Carbon Steel)	ASTM A36 (Rev B)
Flat Washers (Unhardened)	ASTM F844-90; use ASTM A153 for zinc coating when galvanized
Flat Washers (Hardened)	ASTM F436
Aluminum — Structural Shapes and Plates	ASTM B209 and ASTM B308; Alloy 6061-T6
Aluminum Bolts and Nuts	ASTM F468; Alloy 2024-T4
Cast Iron	ASTM A48, Class 35

2.2 ANCHOR BOLTS/SLEEVES

A. Anchor Bolts: As shown in FASTENER SCHEDULE at the end of this section and as specified in various equipment sections.

B. Anchor Bolt Sleeves:

1. Plastic:
   a. Single unit construction with deformed sleeve.
   b. The top of the sleeve shall be self-threading to provide adjustment of the threaded anchor bolt projection.
   c. Material Requirements:
      1) Plastic: High density polyethylene.
      2) Density: ASTM D1505.
      3) Vicat Softening Point: ASTM D1525.
      4) Brittleness Temperature: ASTM D746.
   d. Manufacturer: Sinco West, Simi Valley, CA, or approved equal.

2. Fabricated Steel: ASTM A36 REV B.

2.3 CONCRETE AND MASONRY ANCHORS

A. General:

1. AISI Type 316 stainless, galvanized, or zinc-coated steel. Refer to FASTENER SCHEDULE at the end of this section.
2. Current evaluation and acceptance reports by ICBO or other similar code organization.
3. Acceptable for use in potable water structures by EPA and local health agencies or NSF.

B. Wedge Anchors:

1. Manufacturers and Products:
   a. ITW Ramset/Red Head, Wood Dale, IL; Trubolt Wedge Anchor.
   b. Hilti, Inc., Tulsa, OK; Kwik-Bolt II Stud Anchor.
   c. The Rawlplug Company, New Rochelle, NY; Rawl-Stud Anchor.
   d. Wej-It Corp., Tulsa, OK; ANRtite Wedge Anchor.
   e. Or approved equal.

C. Expansion Anchors:

1. Self-drilling anchors, snap-off or flush type, zinc-coated.
2. Non-drilling Anchors: Flush type for use with zinc-coated or stainless steel bolt, or stud type with projecting threaded stud.
3. Manufacturers and Products:

a. ITW Ramset/Red Head, Wood Dale, IL; Multi-Set II Drop-In and Self Drill Anchors.
b. Hilti, Inc., Tulsa, OK; Hilti HDI Drop-In Anchor.
c. The Rawlplug Company, New Rochelle, NY; Rawl Steel Drop-In and Rawl Saber-Tooth Anchors
d. Or approved equal.

D. Sleeve Anchors:

1. Manufacturers and Products:
   a. ITW Ramset/Red Head, Wood Dale, IL; Dynabolt Hex Nut Sleeve Anchor.
   b. The Rawlplug Company, New Rochelle, NY; Hex Head Rawl- Bolt Anchor.
   c. Wej-It Corp., Tulsa, OK; Wej-It Sleeve Anchor.
   d. Or approved equal.

E. Adhesive Anchors:

1. Anchor Rod:
   a. Stainless steel threaded rod, diameter as shown.
   b. Length as required to provide minimum depth of embedment.
   c. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
   a. ASTM C881.
   b. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
   c. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
   d. Non-sag, with selected viscosity based on installation temperature and overhead application where applicable.
3. Packaging:
   a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
   b. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date.
4. Manufacturers and Products:
   a. Adhesives Technology Corp., Kent, WA; Anchor-It Fastening Systems, HS 200 Epoxy.
   b. ITW Ramset/Red Head, Wood Dale, IL; Epcon Ceramic 6 Epoxy Anchor System.
   c. Covert Operations Inc., Signal Hill, CA; CIA-Gel 7000 Epoxy Anchors.
   d. The Rawlplug Co., Inc., New Rochelle, NY; Foil Fast Epoxy Injection Gel System.

e. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System (HIT C-100).
f. Ackerman Johnson Fastening Systems, Inc., Addison, IL; Poly-All PAC-24 Epoxy.
g. Unitex, Kansas City, MO; Pro-Poxy 300.
h. Or approved equal.

2.4 LADDERS

A. Material: Steel

B. Fabricate ladders with rails, rungs, landings, and cages to meet applicable requirements of OSHA, CFR Part 1910.27, and ANSI A14.3.

1. Concentrated load of 250 pounds plus 30 percent impact on rungs.
2. Maximum rung deflection of 1/360.
3. Concentrated load of 250 pounds plus 30 percent impact between consecutive attachments.
4. Self-closing gates at all landings.

C. Ladder Safety Post:

1. Telescoping tubular, spring balanced and automatically locking in the raised position, with release lever for unlocking.
2. Hot-dip galvanized post.
3. Spring Mechanism: Corrosion-resistant steel alloy.
4. Furnish dissimilar metal protective coatings at connections.
5. Manufacturer and Product: Bilco Co., New Haven, CT; "Ladder Up" to fit ladder rungs, or approved equal.

2.5 CASTINGS

A. Floor Boxes:

1. Cast iron except as otherwise shown.
2. Depth: Equal to slab thickness where installed.
3. Diameter: As shown.
4. Manufacturers and Products:
   a. Neenah Foundry, Neenah, WI; R 7506.
   b. Mueller, Decatur, IL.; No. A-27010
   c. Olympic Foundry Co., Seattle, WA; No. 5680
   d. Or approved equal.

2.6 ACCESSORIES

A. Antiseizing Lubricant: Loe Tite Co., Permatex.

B. Neoprene Gasket:
   1. ASTM D1056 RE-41-E, soft, closed-cell neoprene gasket material, suitable for exposure to sewage and sewage gases, unless otherwise shown.
   2. Thickness: Minimum 1/4-inch.
   3. Furnish without skin coat.
   4. Manufacturers and Products:
      a. Rubatex Division of Great American Industries, Bedford, VA; Rubatex No. R-411-N.
      b. Garlock Manufacturing, San Francisco, CA.
      c. Or approved equal.

2.7 FABRICATION

A. General:

   1. Finish exposed surfaces smooth, sharp, and to well-defined lines.
   2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
   3. Conceal fastenings where practical; where exposed, flush countersink.
   4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
   5. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
   6. Material Thinner than 1/8 Inch: Either galvanize before fabrication in accordance with ASTM A525, Coating Designation G210, or after fabrication in accordance with ASTM A123, except the weight of zinc coating shall average minimum 1.2 ounces per square foot of actual surface area with no individual specimen having a weight of less than 1 ounce per square foot.

B. Materials: Use steel shapes unless otherwise noted.

C. Fabrication:

   1. Fit and assemble in largest practical sections for delivery to site.
   2. Fabricate as shown on Drawings and in accordance with ASTM A385.
   3. Welding:
      a. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.

PART 3 EXECUTION

3.1 INSTALLATION OF METAL FABRICATIONS

A. General:

1. Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.
2. Install rigid, substantial, and neat in appearance.
3. Erect steel in accordance with AISC Code of Standard Practice for Steel Buildings and Bridges.
4. Install manufactured products in accordance with manufacturer's recommendations.
5. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
6. Field weld components indicated.
7. Perform field welding in accordance with AWS D1.1.
8. Obtain ENGINEER approval prior to site cutting or making adjustments not scheduled.
9. After erection, apply prime or galvanize coating to welds, abrasions, and surfaces not in contact with concrete.

B. Erection Tolerances:

1. Maximum Variation from Plumb: 1/4-inch per story, non-cumulative.
2. Maximum Offset from True Alignment: 1/4-inch.

C. Pipe Sleeves:

1. Provide where pipes pass through concrete or masonry.
2. Holes drilled with a rotary drill may be provided in lieu of sleeves in existing walls.
3. Provide a center flange for water stoppage on sleeves in exterior or water-bearing walls.
4. Provide a rubber caulking sealant or a modular mechanical unit to form a watertight seal in the annular space between pipes and sleeves.

3.2 ANCHOR BOLTS

A. Accurately locate and hold anchor bolts in place with templates at the time concrete is placed.
B. Use sleeves for location adjustment and provide two nuts and one washer per bolt of same
material as bolt.
C. Minimum Bolt Size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.3 CONCRETE AND MASONRY ANCHORS

A. Begin installation only after concrete or masonry to receive anchors has attained design strength.

B. Do not install an anchor closer than six times its diameter to an edge of concrete or masonry or closer than twelve diameters to another anchor, unless shown otherwise.

C. Install in accordance with manufacturer's instructions.

D. Use only drill type and diameter recommended by anchor manufacturer. Clean hole of debris and dust with brush and compressed air.

E. Do not install when temperature of concrete is below 40 degrees F or above 100 degrees F.

3.4 ABRASIVE NOSINGS

A. Provide abrasive nosings on concrete steps not being supplied or coated with another type of nosing or nonskid material.

3.5 ACCESS COVERS

A. Install in accordance with manufacturer's instructions.

B. Accurately position prior to placing concrete, such that covers are flush with floor surface.

C. Protect from damage resulting from concrete placement. Thoroughly clean exposed surfaces of concrete spillage to obtain a clean, uniform appearance.

3.6 FASTENER SCHEDULE

A. Provide fasteners as follows:

Service Use and Location	Product	Remarks
Anchor Bolts Cast Into Concrete for Equipment Bases		
Dry Areas	Stainless steel bolts, unless otherwise specified with equipment	
Submerged or Wet Areas	Stainless steel bolts with fusion bond coating unless	

Service Use and Location	Product	Remarks
Otherwise specified with equipment Anchor Bolts Cast Into Concrete for Metal Fabrications and Structural. Components		
Dry or Protected Areas	Zinc-coated Stainless steel bolts	
Exterior, Wet, Washdown, and Chemical Handling Areas	Stainless steel bolts with fusion bond coating	
Anchors for Metal Components to Concrete (e.g., Electrical Panels and Equipment)		
Dry Areas	Zinc-coated or stainless steel wedge or expansion anchors	
Wet and Damp Areas	Adhesive stainless steel anchors	
Submerged or Buried in Earth	Adhesive stainless steel anchors	
Anchors for Grout-Filled Concrete Mansory Units		
Exterior and Interior	High-Strength Zinc Coated Steel Bolts	
Connection for Structural Steel Components		
Exterior and Interior	High-strength zinc- coated steel bolts	
Connections for Steel Fabrications and Wood Components		
Exterior and Interior	Zinc- coated stainless steel bolts	
Connections of Aluminum Components		
Exterior and Interior	Stainless Steel Bolts	

B. Antiseizing Lubricant: Use on all Stainless Steel Threads
C. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

SECTION 05510
METAL STAIRS, LADDERS, AND WALKWAYS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Technical requirements for metal stairs, ladder, and walkways.

1.2 REFERENCES

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

B. ANSI Standards

1. ANSI A14.3 - Safety Requirements for Fixed Ladders

C. ASTM Standards

1. ASTM A36 - Specification for Structural Steel

2. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc- Coated Welded and Seamless

3. ASTM A123 - Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products

4. ASTM A193 - Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

5. ASTM A500 - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

D. AWS Standards

1. AWSD1.l - Welding in Building Construction

1.3 SYSTEM DESCRIPTION

A. Furnish and install metal stairs, ladders, and walkways required to complete work show and specified

B. Furnish and install metal stairs, ladders, and walkways as shown on the Drawings and specified in this Section.

1.4 SUBMITTALS

A. Shop Drawings.

1. Show stair, ladder and walkway fabrication and construction details.

2. Including necessary plans, sections and elevations to show Life Safety features.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements

1. Design, fabrication and construction of stairs, ladders and walkways shall comply with SBC, OSHA and NFPA 101 Life Safety code.

2. Stairs, ladders and walkways for utility facilities shall conform to “Industrial Occupancy” Accessible to the public, unless otherwise indicated on the Drawings

PART 2 – PRODUCTS

2.1 MATERIALS FOR METAL STAIR, LADDERS, AND WALKWAYS

A. Steel

1. Steel bars, plates, shapes, and connections for steel stairs and walkways shall meet the requirements of ASTM A36.

2. Structural steel tubing for steel walkways shall meet the requirements of ASTM A500, Grade B. Wall thickness shall be as shown on the Drawings.

3. Steel pipe for steel walkways shall meet the requirements of ASTM A53, Schedule 40.

4. Steel fabrications shall be galvanized by the hot dip method, after fabrication, in accordance with the requirements of ASTM A1 23.

B. Aluminum

1. Aluminum bars, plates, rods, and shapes for aluminum stairs, ladders, and walkways shall be Alloy 6061 -T6, unless otherwise shown or specified.

2. Aluminum bars, plates, rods, and shapes shall have standard mill finish.

C. Welding Electrodes

1. Welding electrodes for structural steel shall conform to AWS A5.5, E70XX.

2. Use 4043 filler metal for aluminum.

3. Use type E308 electrode where the base metal is type 304 stainless steel and type E309 where the base metal is type 316 stainless steel or where stainless steel is welded to carbon steel.

4. Field welding of galvanized steel shall not be acceptable.

D. Anchor Bolts and Fasteners

1. Anchor bolts and fasteners shall meet the requirements of ASTM A193, Grade B8M.

2. Anchor bolts and fasteners for metal stairs, ladders, and walkways shall be wedge or adhesive anchors, unless otherwise noted. Wedge anchors shall be as manufactured by "HILTI", or approved equal. Adhesive anchors shall consist of a self-

contained vinylester adhesive cartridge and anchor rods. Adhesive anchor shall be AVA adhesive anchoring system as manufactured by "HILTI", or approved equal.

2.2 METAL STAIRS

A. General

1. Fabricate metal stairs to meet the requirements of SBC, OSHA, NFPA 101 and the standard practice for stairs of the National Association of Ornamental Metal Manufacturers.

2. Size of various members and number of parts indicated on the Drawings are minimum, and shall be increased as necessary to meet the requirements of this Section.

3. Stair members shall be constructed to support dead loads and additional live working stresses permitted for materials in Standard Building Code.

B. Aluminum Stairs

1. Aluminum Stairs, General

a. Fabricate aluminum stairway frame of aluminum structural shapes. Frame for each run of aluminum stairway shall be continuous, without joints.

b. Provide aluminum stairways with aluminum treads and aluminum handrail and guard railing.

2. Aluminum Stairway Connections

a. Connections between aluminum stairway members shall be aluminum bars, plates, and shapes or fabricated of AISI 304 or AISI 3 16 stainless steel.

b. Connections between aluminum stairway sections and aluminum fabrications, such as landings, walkways, and platforms, shall be aluminum bars, plates, and shapes or fabricated of AISI 304 or AISI 316 stainless steel.

c. Connections between aluminum stairway and concrete

shall be fabricated of AISI 3 16 stainless steel.

d. Connections between aluminum stairway and steel fabrications, such as landings, walkways, and platforms, shall be fabricated of AISI 3 16 stainless steel.

3. Aluminum Stair Treads

a. Aluminum stair treads shall be same pattern and alloys as aluminum walkway grating.

b. Aluminum stair treads shall be a minimum of 1-1/2 inches thick, unless otherwise indicated on the drawings.

c. Aluminum stair treads shall have 1-1/4-inch wide abrasive nosing.

2.3 METAL LADDERS

A. Metal Ladders, General

1. Ladders and cages shall be designed and fabricated in accordance with Part 19 10 of the Occupational Safety and Health Standards and ANSI A14.3.

2. Provide ladder with safety cage or safety climbing device if ladder height is such that safety cage or safety climbing device is required to meet OSHA requirements. Provide safety cage unless safety-climbing device is specifically shown or noted on the Drawings.

B. Aluminum Ladders, Cages, and Supports

1. Aluminum Ladders

a. Ladder frame, or uprights, shall be 3/8-inch by 2-inch aluminum bars. Ladder uprights shall be spaced 18 inches apart.

b. Ladder rungs shall be aluminum rods. Rungs shall be not less than 1 inch in diameter. Rungs shall be smooth. Rungs shall be spaced 12 inches on centers. Ends of rungs shall be fitted into, and welded to, the uprights.

2. Aluminum Cages: Fabricate aluminum cages of aluminum bars bent to shape.

3. Supports for Aluminum Ladders and Cages

a. Supports shall be 3/8-inch by 2-inch aluminum bars bent to shape.

b. Supports shall be spaced not more than 5 feet apart.

c. Supports shall be welded to uprights.

2.4 METAL WALKWAYS

A. Metal Walkways, General

1. Fabricate metal walkways to meet the requirements of SBC, OSHA, and NFPA 101.

2. Size of various members and number of parts indicated on the Drawings are minimum, and shall be increased as necessary to meet the requirements of this Section.

3. Walkway members shall be constructed to support dead loads and additional live working stresses permitted for materials in Standard Building Code.

B. Aluminum Walkways

1. Aluminum Walkways, General

a. Fabricate aluminum walkway frame of aluminum structural shapes and bars. Frame for each section of walkway between supports shall be continuous, without joints.

b. Provide aluminum walkways with aluminum grating floor plates as indicated on the Drawings. Provide aluminum walkways with aluminum guard railing.

2. Aluminum Walkway Connections

a. Connections between aluminum walkway members shall

be aluminum bars, plates, and shapes or fabricated of AISI 304 or AISI 316 stainless steel.

b. Connections between aluminum walkway sections and aluminum supports shall be aluminum bars, plates, and shapes or fabricated of AISI 304 or AISI 316 stainless steel.

c. Connections between aluminum walkway and concrete shall be fabricated of AISI 316 stainless steel.

d. Connections between aluminum walkway and steel fabrications, such as supports, landings, walkways, and platforms, shall be fabricated of AISI 3 16 stainless steel.

3. Aluminum Walkway Floor

a. Aluminum walkway floor grating shall meet the requirements of Section 05500 Metal Fabrications and Casting. Aluminum walkway floor grating shall be a minimum of 1-1/2 inches thick, unless otherwise indicated on the drawings.

b. Aluminum walkway floor plate shall meet the requirements of Section 05500 Metal Fabrications and Castings. Aluminum walkway floor plate shall be a minimum of 1/4 inch thick, unless otherwise indicated on the drawings.

PART 3 – EXECUTION

3.1 INSPECTION

A. Take field measurements prior to preparation of shop drawings.

B. Inspect structures, members, and surfaces on which stairs, ladders, and walkways are to be mounted. Correct defects prior to installation of metal stairs and walkways.

3.2 PREPARATION

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

B. Supply items required to be cast into concrete with setting templates, to appropriate sections.

3.3 INSTALLATION

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

B. Provide anchors, plates, angles, hangers and struts required for connecting stairs to structure.

C. Ladders shall be installed in accordance with the requirements of ANSI A14.3 and Part 1910 of the Occupational Safety and Health Standards. Ladders shall be rigidly supported not less than 7 inches from adjacent surfaces. Ladders shall be secured to concrete block wall by AISI Type 3 16 stainless steel toggle bolts embedded in the CMU wall. Ladder shall be secured to cast-in-place concrete wall by AISI Type 316 stainless steel anchor bolts and adhesive anchors.

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

E. Field weld components indicated on Drawings. Perform field welding in accordance with AWS D1.l.

F. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws wherever possible.

G. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

H. Obtain Engineer's approval prior to site cutting or making adjustments not scheduled.

I. Fabrication and Erection: Except as otherwise shown, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "manual of Steel Construction".

3.4 PREVENTION OF ELECTROLYSIS

A. Aluminum in contact with dissimilar metals shall be separated with 1/8"

thick layer of neoprene backing pad of full abutting area.

B. Install corrosion barriers between aluminum and concrete.

1. Isolate surface mounted aluminum with one of the following systems:

a. Coat bottom of surface mounted aluminum railing posts and aluminum clip angles.

b. Install vinyl or neoprene barrier pad between bottom of surface mounted aluminum railing post, or angle clip, and concrete. Area of pad shall equal area of aluminum surface.

2. Coat aluminum embedded in concrete or grout.

3.5 WELDING

A. Welding shall be by the metal-arc method or gas-shielded a& method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

B. In assembly and during welding, component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS Code. Upon completion of welding, remove weld splatter, flux, slag and burrs left by attachments. Repair welds to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp comers of material, which is to be painted or coated, shall be ground to a minimum of 1/32 inch on the flat.

3.6 CLEANING

A. Clean paint spatter, concrete slobbers, grease, oil, or any other debris from exterior surfaces of metal stairs, ladders, and walkways.

END OF SECTION

SECTION 07526

MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Modified Bitumen Sheet Roofing
B. Modified Bitumen Flashings
C. Roof Accessories
D. Walkways
E. Surfacing

1.2 RELATED SECTIONS

A. Division 6 Section Carpentry: Wood Nailers.
B. Division 7 Section Flashing and Sheet Metal: Metal Counter Flashings.
C. Division 7 Section Roof Specialties: Roof Hatches, Prefabricated Curbs.
D. Division 7 Section Sealants: Caulks, Sealants.
E. Division 15 Section Drainage and Vent Systems: Roof Drains.

1.3 REFERENCES

A. ASTM - American Society for Testing and Material
B. AWPB - American Wood Preservers' Bureau
C. ASTM D41 - Asphalt Primer Used in Roofing
D. NRCA - National Roofing Contractors Association
E. ASTM D2178 - Asphalt Glass Felt Used in Roofing
F. ASTM D312 - Asphalt Used in Roofing
G. UL - Underwriters Laboratories, Fire Classification
H. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
I. ASTM D1227 - Asphalt Emulsion as a Roof Coating
J. ASTM D1863 - Mineral Aggregate
K. ASTM D2824 - Aluminum Pigmented Asphalt Roof Coating

1.4 REGULATORY REQUIREMENTS

A. UL Classification: Class A
B. Factory Mutual (FM) System Classification: 1-705
C. Additional Test Agencies & Building Code Requirements: As applies

1.5 SUBMITTALS

A. Submit product data for: All components to be used: Primer, Membranes, Coatings, et al
B. When materials are specified or a particular make or trade name is specified, it shall be indicative of a standard required. Bidder proposing substitutes shall

submit the following:

1. Written application with explanation of why it should be considered.
2. Accredited testing laboratory certificate comparing substitute's physical/performance attributes to those specified.
3. Smallest standard package of adhesive, coating, mastic, sealant, ply sheet, fastener(s) and flashing materials.
4. Three job references available for inspection where substitutes were used under similar conditions.

C. Only substitutions approved in writing by Owner prior to scheduled installation will be considered.

1.6 QUALITY ASSURANCE

A. Manufacturer
   1. Shall provide local Technical Sales Representative to make start-up inspection and in-progress site inspections at regular intervals.
   2. Shall provide final inspection of completed roofing system and issuance of the warranty.

B. Contractor
   1. Roofing contractor shall be a registered applicator by the Manufacturer.
   2. Contractor shall retain a workmanship warranty for the specified system within the manufacturer's warranty.
   3. Strict adherence to the manufacturer's most current published specifications are to be followed. Deviations must be approved in writing by the architect and manufacturer prior to installation.

C. Designation of Responsible Personnel

D. Walkover Inspection
   1. Attendance: Representative of Owner/Architect, General Contractor, Roofing Contractor and Manufacturer's Technical Representative.

E. Final Inspection
   1. Will be scheduled by roofing contractor upon job completion.
   2. Attendance: Representative of Owner/Architect, General Contractor, Roofing Contractor and Membrane Manufacturer's Technical Representative.
   3. Minimum agenda:
      a) Walkover inspection.
      b) Identification of problems which may impede issuance of warranty.
      c) Creation of punch list.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials.
   1. Deliver and store materials under provisions of Section 01600.
   2. Deliver materials to job-site in new, dry, unopened and well marked containers showing product and manufacturer's name, production date and/or product code. All materials delivered shall be on pallets.
   3. Deliver materials in sufficient quantity to allow continuity of work.

B. Storage of Materials.
   1. Storage of plies to be protected from water or extreme humidity.

2. Store all roll roof materials on end to prevent their becoming deformed/damaged. Discard rolls which have flattened, creased or otherwise damaged.
3. Place materials on pallets which are at least four (4) inches above the ground. Do not stack pallets.
4. Rooftop Storage: Disperse materials to avoid concentrated loading.
5. Cover top and sides of all exterior stored materials with canvas tarpaulin (not polyethylene). Secure tarpaulin.

C. Material Handling.
1. Handle plies to avoid bending, tearing or other damage during transportation and installation.
2. Material handling equipment shall be selected and operated so as not to damage existing construction or applied roofing. Do not operate or situate material handling equipment in location{s) that will hinder smooth flow of vehicular or pedestrian traffic.

D. Safety Requirements.
1. All application, material handling and associated equipment shall conform to and be in conformance with OSHA safety requirements.
2. Comply with Federal, State, Local and Owner fire safety requirements.
3. Maintain fire extinguishers within easy access whenever power tools, kettles or torches are being used.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during inclement weather.

B. Do not apply roofing membrane to damp or frozen substrates.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during the same day.

D. Product shall have an R-value above 20.

1.9 WARRANTY

A. Manufacturer shall provide: Ten (10) years for Material Only.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Danosa Caribbean, Inc. (www.danosapr.com), Lot 29, C street, Luchetti Industrial Complex Bayamon, PR 00961

B. Approved Substitutions.

2.2 SHEET MATERIALS

2-Ply SBS System:

A. Modified Bitumen Base Sheet: **Glasdan R-36.** 1-Ply SBS Modified Bitumen Membrane base membrane with a fiberglass mat reinforcement, protected with a burn-off film and or silica sand on either side. 3 mm. ASTM-D-6163-98 Type I Grade S

B. Modified Bitumen Membrane:Glasdan **RM-4.**1-Ply SBS Modified Bitumen top membrane with a fiberglass mat reinforcement, finished with ceramic granule as top protection surface area and burn-off film or silica sand on the other side. ASTM-D-6163-98 Type I Grade G 3.6 mm

C. Flashing Membrane: **Glasdan AL-80-4.** {SBS) Modified Bitumen flashing membrane with a fiberglass mat reinforcement, finished with aluminum clad top protection surface area and burn-off film on the other side. ASTM-D-6298-98 3.6 mm

2.3 BITUMINOUS MATERIAL

A.	Asphalt Primer:	ASTM 041, Primer.
B.	Elastomeric Adhesive:	ASTM 03019, Richport Modified Cold Adhesive.
C.	Elastomeric Mastic:	ASTM 04586, Richport Cold Flash Adhesive.
D.	Aluminum Coating:	ASTM 02824, Richport Aluminum Roof Coating.
E.	Asphalt Emulsion:	ASTM 01227, Richport Modified Asphalt Emulsion.

2.4 RELATED MATERIALS

A. Sealant: One-part urethane.

B. Cants: Perlita, ASTM C 728, 4" face.

C. Prefabricated Roof Hatches

D. Traffic Surfacing: approved equal to DAN-0-PAD by Danosa Caribbean, Inc.

E. Lead boots and flashing; ASTM B-29, 4 lb. per square foot.

F. Roof Penetrations protection: approved equal to Chem-Curb by Danosa Caribbean, Inc.

G. Grease Containment: approved equal to Grease Guard by Danosa Caribbean, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Inspection

1. Verify installation conditions as satisfactory to receive work.
2. Do not install new roofing until all unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions.
3. Check projections, curbs and deck for inadequate anchorage, foreign material, moisture, or unevenness that would prevent quality of execution of the new roofing system.

B. General Workmanship

1. Substrate: Free of foreign particles prior to laying roof membrane.
2. Phased application: Not permitted, all plies shall be completed each day.
3. Confine equipment, storage of materials, debris and the operations and movement of workers within the limits agreed upon for the project.
4. Where wheeled or other traffic over partially completed roofing is unavoidable, provide adequate exterior protection to the roof.

5. Wrapper and package materials: Not to be included in roof system.
6. All metal and masonry shall be asphalt primed before fully adhering flashing sheets.
7. Mechanical Fasteners: Seated firmly with fastener heads flush or below surface.
8. Base flashing height is not less than eight (8) inches above finished surface.

C. Protection

1. Contractor shall be responsible for protection of property during course of work. Lawn, shrubbery, paved areas and building shall be protected from damage at no extra cost.
2. Roofing and flashing shall be installed and sealed in a watertight manner on same day of installation or upon the arrival of inclement weather.
3. At the end of each workday, partial installation shall be sealed with water stops along edges to prevent water entry.
4. At the start of each workday, drains within daily work area shall be plugged. Plugs are to be removed at end of each workday or before arrival of inclement weather.
5. Preparation work shall be limited to those areas that can be covered with installed roofing material on same day or before arrival of inclement weather.
6. Arrange work sequence to avoid use of newly constructed roofing for storage, walking surface and equipment movement. Move equipment and ground storage areas as work progresses.

D. Surface Preparation

1. Remove all existing roof membrane, insulation and flashings down to the deck and curbs.
2. Verify structural integrity of the deck. Notify the Architect of any deck or curb deficiency.
3. Remove deteriorated or damaged wood blocking and install new treated wood blocking to match existing. See detail drawings.

3.2 ROOF MEMBRANE APPLICATION

Substrate must be suitable to receive and hold roof system materials. Prime all deck surfaces with asphalt primer at 1 gallon per 100 to 200 square feet and allow to dry. Starting at the low point, install modified bitumen membrane by **Torch.**

A. Work Area Preparation:

1. Adequate ventilation is required; enough ventilation such that personnel exposures to hazardous concentration of airborne contaminants are maintained at or below the allowable levels specified by OSHA or NIOSH.
   a) Special care should be taken when torch welding is done in close or confined spaces due to possible concentration of contaminants and potential oxygen depletion. Appropriate precautions shall be observed. Use of mechanical ventilation to force air movement or use of approved respirators may be required.
2. All roof openings and edges should be protected or guarded in conformity with OSHA standards.
3. In awareness of other personnel in the torch welding area is mandatory, in tight quarters; only one (1) torch should be used.

4. The installer needs to have previously noted the locations of all pipes, curbs, or other roof top projections before working with torch welding.
5. Removal of combustible debris from the application area before the torch welding application begins is mandatory.
6. Appropriate precautions should be taken when torch welding in the proximity of gas pipe joints, HVAC coupling joints, or electrical service lines.
7. A base roofing ply shall cover all flammable materials (e.g. wood walls and wood fiber cant) before the torch welding application begins.
8. No torch welding shall be done unless the surrounding atmosphere is nonflammable and unless combustibles are moved away or properly protected from fire hazards.
9. Combustible materials which are present on a roof. Such as material wrappers, solvents, primers and roof cements shall be moved to a designated safe location.
10. Combustible materials which are present on a roof and are not movable shall be protected from fire hazards.
11. Combustible materials present on adjoining building surfaces (e.g. Shake shingles or wood siding) should be protected by covering with fire retardant blankets or a protective shield. Sufficient fire extinguishing equipment shall be ready for use where torch welding roof work is being done.
12. The fire extinguishing equipment should be portable fire extinguishers (Type ABC). In addition, buckets of sand and pails of water are advisable. Portable fire extinguishers shall be of the size and type required by local codes. A minimum of one 20 lbs. fire extinguisher per torch or torching machine should be on the roof at all times at the torching location. Special care shall be taken to check all fire extinguishers prior to and at the completion of the day's work to make sure they are full and operable.

B. Application:
1. Start at the low point of the roof and progress to the high point. The membrane shall be installed perpendicular to the slope of the roof except when the slope exceeds 3" per foot. At vertical surfaces, abutting the roof, the membrane shall extend to the cant and must be heat welded to the underlying membrane previously installed.
   a) On slopes of more than three inches per foot, the seams should run parallel to the slope of the roof.
2. All overlaps at the membrane seam shall be installed so as to have "up" slope laps over "down" slope laps.
3. Danosa membranes shall never be applied by any method except with a propane torch or electric heat welding devices designed for application modified bitumen.
   a) Flammable and solvent-based material (e.g. plastic cement) should not be exposed to flame.
   b) When re-roofing, wood and fiber cant strips are extremely flammable and should be removed or protected.
   c) Restaurant and food service exhaust vents can contain grease (Grease

Guard grease containment system is recommended for these areas). All intake fans should be shut off during application with special care taken to keep torches away from openings. Exhaust vents for laundromats in condominiums, apartments and other multiple tenant dwellings can contain lint and debris. Open flames should be kept clear of all vents.

4. Membranes must not be applied during adverse weather or without precautionary measures in temperatures below 40° F.
5. The coiled membrane shall be unrolled approximately 15 feet, aligned, then the propane torch flame applied to the exposed outer surface of the coiled membrane until the bitumen reaches the proper application temperature, causing to develop a slight sheen. Care should be taken to avoid overheating which may result in damage to or improper adhesion of the membrane. The flame should be moved from side to side and up the lap edge while the membrane is slowly unrolled and adhered to the underlying surface. Subsequent shift of the roll shall be avoided after heating has begun. When complete, the remaining membrane shall be re-rolled and installed in the same manner. All end laps must be staggered so that no adjacent end laps coincide.
6. The end laps shall be lapped six inches (6"), and the side laps must be lapped four inches (4"). A bitumen bleed-out approximately Y." to Y." must be obtained at all seam areas.
    a) To ensure the proper Y." flow of bitumen at the seam areas, a roller may be used. The man using roller should follow behind the torch man no more than 4 feet nor less than 3 feet to be sure that membrane will be in condition to produce proper bleed-out.
7. The seam can be rolled with a hand roller or troweled with heated trowel. When one end is complete, re-roll the opposite end not yet torched, and install in the same manner.
8. All end laps should be staggered at a minimum of 15feet.
9. All LP-Gas cylinders shall be secured in a cylinder storage area at the end of each workday.
10. All crews shall make a safety check of all equipment and LP-Gas cylinders prior to, and at the completion of the day's work.
11. A fire watch shall be implemented on a daily basis after torch applications are completed. The job foreman or other designated personnel shall walk the area of application at the end of the day, checking for hot spots on the roof. A fire watch shall be conducted for a minimum of one hour after the last torch is shut off for the day.

C. Seaming:
    1. The bleed out of bitumen is troweled to ensure a complete seal and watertight integrity.
    2. Proper troweling is achieved by using a heated trowel. The seam area and trowel should be heated simultaneously.
    3. Use heated trowel to achieve a smooth and watertight seam at all overlaps.

3.3 FLASHINGS

A. Modified Bitumen Flashings:

1. Set perlite can't in elastomeric mastic or mechanically attach.
2. Install new roofing two inches minimum beyond top edge of cant.
3. Prime the wall surface with asphaltic primer.
4. Adhere flashing membrane completely to roofing membrane. Lap sheeting ends six (6) inches. Ensure complete bond without wrinkles or voids.
5. Membrane coverage - Sufficient so that after being installed, membrane will be eight (8) inches minimum up the parapet wall. It will extend at least six (6) inches beyond to edge of the cant onto the roof surface.
6. See detail drawings for individual flashing requirements.

3.4 DAILY WATERSTOP TIE-IN

A. End of day

1. Remove debris from top ply of felt along termination, width eighteen (18) inches.

2. Adhere twelve (12) and eighteen (18) inch wide ply sheets from exposed deck to applied roofing with a continuous 1/16" inch thick application of water cut-off mastic. Extend eighteen (18) inch wide felt three (3) inches on both sides of the twelve (12) inch felt.

B. Beginning of next day's work

1. Remove temporary connection by cutting felts evenly along edge of existing roof system.

3.5 FIELD QUALITY CONTROL

A. Repair of deficiencies

1. Installations or details noted as deficient during Final Inspection must be repaired and corrected by applicator.

3.6 CLEANING

A. Immediately upon job completion, roof membrane and flashing surfaces shall be cleaned of debris.

B. Contractor shall be responsible for the cost of all clean-up procedures.

END OF SECTION

SECTION 07800
EPOXY FLOOR FINISH

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resinous flooring.
2. Integral cover base accessories.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review manufacturer's written instructions for substrate preparation and environmental conditions affecting resinous flooring installation.
2. Review details of integral cover bases.
3. Review manufacturer's written instructions for installing resinous flooring systems.
4. Review protection measures for adjacent construction and installed flooring, floor drainage requirements, curbs, base details, and so forth.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's technical data, installation instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required and for each color and texture specified, 6 inches square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each resinous flooring component.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by the manufacturer.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch square floor area.

a. Include 48-inch length of integral cove base with inside and outside corner.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring installation.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring installation and for 24 hours after installation unless manufacturer recommends a longer period.

1.10 WARRANTY/GUARANTEE

A. All materials, equipment, etc. provided by the contractor shall be warranted and guaranteed to be free from defects in workmanship and materials for a period of two (2) years from date of substantial completion and acceptance of work by UMB. Any defects in workmanship, material, or performance which appear within the guarantee period shall be corrected by the contractor without cost to the Owner, within a reasonable time, to be determined by UMB. In default thereof, the owner may have such work done and charge the cost of same to the Contractor. In addition to the above statement, the Warranty/Guarantee period shall also include all labor costs related to all warranty work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flammability: Self-extinguishing in accordance with ASTM D635.

B. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sherwin-Williams Company, General Polymers. Ceramic Carpet #400, or approved equal.
2. Sika Corporation; Sikafloor 265 Flexible Epoxy Membrane, Sikafloor Quartzite System, Sikafloor 510 topcoat, or approved equal.
3. Durex Coverings, Inc.; Mosaix Floor #190 with DX-470 Chemical Resistant Polyaspartic Top Coat., or approved equal
4. Life Sciences Products Inc. SeamTek Type 4 Epoxy Quartz Flooring, or approved equal.

2.3 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, high-performance - aggregate-filled, resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing

by manufacturer of primary materials.

C. System Characteristics:
   1. Color and Pattern: As selected by Architect from manufacturer's full range.
   2. Wearing Surface: Smooth with slight profile created by broadcast aggregate for slip resistance.
   3. Overall System Thickness: 3/16".

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:

   1. Compressive Strength: 11,500 psi minimum per ASTM C579.
   2. Tensile Strength: 2,500 minimum per ASTM C307.
   3. Flexural Strength: 4,300 minimum per ASTM C580.
   4. Water Absorption: 0.1 percent maximum per ASTM C413.
   5. Indentation: 0 percent maximum per MIL-D-3134.
   6. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134J.
   7. Abrasion Resistance: 90-100 milligrams maximum weight loss per ASTM D4060.
   8. Hardness: 70/65 @ 24 hours, Shore D per ASTM D2240.

E. Body Coats:

   1. Resin: Epoxy.
   2. Formulation Description: 100 percent solids.
   3. Type: Clear.
   4. Installation Method: Self-leveling slurry with broadcast aggregates.
      a. Thickness of Coats: Manufacturer's recommended thickness to attain final specified thickness.
      b. Number of Coats: Two (2) broadcast coats, and grout coat.
   5. Aggregates: Colored quartz (ceramic-coated silica).

F. Topcoats: Sealing or finish coats.

   1. Resin: Chemical Resistant Polyaspartic or Epoxy.
   2. Formulation Description: 100 percent solids epoxy or Chemical Resistant Urethane.
   3. Type: Clear.
   4. Number of Coats: One.
   5. Finish: Gloss.

G. Primer: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.

   1. Formulation Description: 100 percent solids

H. Waterproofing Membrane: Type recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated.

I. Reinforcing Membrane: Flexible resin formulation that is recommended in writing by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
   1. Formulation Description: 100 percent solids.
      a. Provide fiberglass scrim embedded in reinforcing membrane.

J. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended in writing by manufacturer for installation indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates in accordance with resinous flooring manufacturer's written instructions for substrate indicated to ensure adhesion.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

   1. Roughen concrete substrates as follows:

      a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
      b. Diamond grind surfaces where shot-blast is not possible. Use apparatus that
      abrades the concrete surface and contains the dust within the apparatus.
      c. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete
      Surface Profile of 3 or greater in accordance with ICRI Technical Guide line No. 310.2R, unless manufacturer's written instructions are more stringent.

   2. Repair damaged and deteriorated concrete in accordance with resinous flooring manufacturer's written instructions.
   3. Verify that concrete substrates are dry and moisture-vapor emission are within acceptable levels according to manufacturer’s written instructions.

4. Moisture Testing: Perform no fewer than three tests in each installation phase area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
    c. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

5. Alkalinity and Adhesion Testing: Perform tests recommended in writing by resinous flooring manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer,

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates in accordance with manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring in accordance with manufacturer's written instructions.

D. Resinous Materials: Mix components and prepare materials in accordance with resinous flooring manufacturer's written instructions.

3.2 INSTALLATION

A. Apply components of resinous flooring system in accordance with manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness specified.

1. Coordinate installation of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components in accordance with manufacturer's written instructions. Prevent contamination during installation and curing processes.
3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer: Apply primer over prepared substrate at spreading rate recommended in writing by manufacturer.

C. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.

D. Field-Formed Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring coats. Apply in accordance with manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.

1. Integral Cove Base: as per manufacturer integrated with epoxy wall coating system.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness specified for flooring system.

1. Aggregates: Broadcast aggregates at rate recommended in writing by manufacturer. After resin is cured, remove excess aggregates to provide surface texture indicated

F. Grout Coat: Apply grout coat to fill voids in surface of final body coat.

G. Topcoats: Apply topcoats in number indicated for flooring system specified, at spreading rates recommended in writing by manufacturer, and to produce wearing surface specified.

3.3 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 07841
PENETRATION FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

   a. Penetrations in fire-resistance-rated walls.
   b. Penetrations in horizontal assemblies.
   c. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include type of barrier being penetrated (with rating), size and type of penetrating material, UL System Number, and firestop product name.

C. UL System Detail: For each penetrating firestopping system.

1. Where project conditions require modification to a qualified testing and inspecting agency's illustration for a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer as an engineering judgement or equivalent system.

D. Qualification Data: For Installer(s). Provide manufacturer's training certificates for all installers.

E. Installer Qualifications: For firm. Provide certificate of compliance with FM Approval FM Approval 4991, "Approval Standard for Firestop Contractors," or UL "Qualified Firestop Contractor Program Requirements" approval.

F. All project penetrations shall be combined into a single Penetration Firestopping submittal. Partial submittals will be rejected.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installation Responsibility: Assign installation of all firestop in project to a single qualified installer.

B. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. CM/GC to coordinate location and sizing of sleeves, openings, and penetrating items to ensure that penetration firestopping systems can be installed according to the approved firestopping system design.

B. Do not paint or conceal any firestopping system until installation has been approved by the UMB Fire Marshal.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
   1) UL in its "Fire Resistance Directory."
   2) Intertek Group in its "Directory of Listed Building Products."

3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturer's: Subject to compliance with requirements, provide products by one of the following:
   a. 3M Fire Protection Products
   b. Hilti, Inc.
   c. Tremco, Inc.
   or approved equal.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.

3. Collars.

F. Fire and Fire/Smoke Dampers: The annular space around fire and fire/smoke dampers shall be sealed according to the manufacturer's installation instructions. Firestopping may or may not be required, as recommended by the damper manufacturer.

2.3 PENETRATIONS IN HORIZONTAL ASSEMBLIES

A. Pipe sleeves are required for all new penetrations floor penetrations. Sleeve must be black steel and extend at least 1" above finished floor surface. GC is responsible for coordinating the installation of pipe sleeves prior to installing penetrating item.

B. Provide a UL Class 1 W-Rated firestop system for all new and existing floor penetrations.

2.4 PENETRATIONS IN VERTICAL ASSEMBLIES

A. Pipe sleeves are required for all new penetrations in fire rated walls.

B. Pipe sleeves are required at all penetrations in CMU walls (both rated and nonrated).

C. Pipe sleeves installed in walls must be installed flush with both sides of the wall that is penetrated. Sleeves shall be black steel.

D. GC is responsible for coordinating the installation of pipe sleeves prior to installing penetrating item.

2.5 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.6 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "X HOUR FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes. Replace X with 1, 2, or 3 hr fire rating.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 10 feet (4.57 m) from end of wall and at intervals not exceeding 20 feet (9.14 m).
2. In mechanical equipment rooms, electrical rooms, tele data rooms and utility shaft areas without ceilings, wall identification shall occur at 15 ft intervals at a height of 10 ft above finished floor level.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 4 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Firestop contractor's name.
3. UL Design No. of firestop assembly.
4. Date of installation.
5. Manufacturer's name.

6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. University will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping systems are damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

D. Contractor shall be responsible for ensuring all penetrations are correctly firestopped prior to requesting the qualified testing agency inspection. Costs for re-inspections and repeat site visits will be at the contractor's expense.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 08113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow metal hung in hollow metal frames at interior locations.

1.2 RELATED WORK

A. Section 08345, SECURITY DOORS AND FRAMES: Forced Entry and Ballistic Resistant doors.

B. Section 08710, DOOR HARDWARE: Door Hardware:

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standard Institute (ANSI):

A250.8-2014 .....Standard Steel Doors and Frames

C. ASTM International (ASTM):

A240/A240M-15b.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-15.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip

A1008/A1008M-15.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate

B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

D3656/D3656M-13.....Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns

E90-09.....Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

L-S-125B.....Screening, Insect, Nonmetallic

1.4 SUBMITTALS

A. Submittal Procedures: As per PRASA specifications.

B. Submittal Drawings:

1. Show size, configuration, fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Include schedule showing each door and frame requirements fire label.
3. Installation instructions.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Test reports: Certify each product complies with specifications.

1. Sound rated door.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer and installer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for a minimum of five years.

1.6 DELIVERY

A. Fasten temporary steel spreaders across the bottom of each door frame before shipment.

B. Deliver products in manufacturer's original sealed packaging.

C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, conditioned facility.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Manufacturer shall provide a warranty of at least 5 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design hollow metal doors and frames complying with specified performance:

1. Fire Doors and Frames: UL 10C; NFPA 80 labeled.
    a. Fire Ratings: 1 hr.
2. Stair Doors: Temperature rise rated fire doors.
3. Sound Rated Doors and Frames: Minimum 45 sound transmission class (STC) when tested according to ASTM E90.
4. Wind Force Resistance: Door shall be capable of withstanding the effects of wind loads per PRBC 2018, based on testing unit's representatives of those indicated in the Project that pass AAMA/WDMA 101/I.S/NAFS. Doors shall be rated to resist wind loads driven by a design wind speed of 180 mph.
5. Windborne-Debris (missile) Resistance: Door's shall capable of resisting windborne projectiles based on pass/fail criteria determined from testing doors identical to those specified, according to the PRBC 2018 and ASTM E1886-19.

2.2 MATERIALS

A. Stainless Steel: ASTM A240/A240M; // Type 304 // Type 316 //.

B. Sheet Steel: ASTM A1008/A1008M, cold-rolled.

C. Galvanized Sheet Steel: ASTM A653.

D. Insect Screening: ASTM D3656/D3656M, 18 by 18 aluminum wire mesh.

E. Aluminum Sheet: ASTM B209M (ASTM B209).

F. Aluminum Extrusions: ASTM B221M (ASTM B221).

2.3 PRODUCTS - GENERAL

A. Provide hollow metal doors and frames from one manufacturer.

B. Sustainable Construction Requirements

1. Steel Recycled Content: 30 percent total recycled content, minimum.
2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
3. Aluminum Recycled Content: 50 percent total recycled content, minimum.

2.4 HOLLOW METAL DOORS

A. Hollow Metal Doors: ANSI A250.8; 44 mm (1-3/4 inches) thick. /See drawings for sizes and designs.

1. Interior Doors: Level 1 and Physical Performance Level C, standard duty; Model 2, seamless.
2. Interior Doors: Level 2 and Physical Performance Level B, heavy duty; Model 2, seamless.
3. Interior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, seamless at stairs and security, locations.
4. Exterior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, seamless.
5. Exterior Doors: Level 4 and Physical Performance Level A, maximum heavy duty; Model 2, seamless.

B. Door Faces:

1. Interior Doors: Aluminum with rust resistant coating.
2. Exterior Doors: Stainless steel with rust and scratches resistant coating.

C. Door Cores:

1. Interior Doors: vertical steel stiffeners.
2. Exterior Doors: polyurethane.
3. Fire Doors: Manufacturer's standard complying with specified fire rating performance.

2.5 HOLLOW METAL FRAMES

A. Hollow Metal Frames: ANSI A250.8; face welded. See drawings for sizes and designs.

1. Interior Frames:

a. Level 1 Hollow Metal Doors: 1.0 mm (0.042 inch) thick.

b. Level 2 and Level 3 Hollow Metal Doors: 1.3 mm (0.053 inch) thick.

2. Interior Borrowed Light Frames: 1.3 mm (0.051 inch) thick.

3. Interior Frames for Lead Lined Doors:

a. Openings with Structural Steel Subframe: 1.3 mm (0.053 inch) thick.

b. Interior Automatic Operator Door Frames: 1.7 mm (0.067 inch) thick.

c. Interior Detention Door Frames: Minimum 2 mm (0.093 inch) thick.

d. Exterior Frames:

1) Level 3Hollow Metal Doors: 1.3 mm (0.053 inch) thick.

2) Level 4 Hollow Metal Doors: 1.7 mm (0.067 inch) thick.

B. Frame Materials:

1. Interior Frames: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40 coating.

2. Exterior Frames: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40) coating.

2.6 LOUVERS

A. Louver Style: permitting free ventilation. Rated for winds speeds of 180 MPH.

1. Provide insect screen and wire guards at exterior doors.

B. Louver Construction: Sheet metal matching door faces.

1. Interior Door Louvers: 0.8 mm (0.032 inch) thick.

2. Exterior Door Louvers: 1.3 mm (0.053 inch) inch thick.

2.7 FABRICATION

A. Hardware Preparation: ANSI A250.8; for hardware specified in Section 08710, DOOR HARDWARE.

B. Hollow Metal Door Fabrication:

1. Close top edge of exterior doors flush and seal to prevent water intrusion.

2. Fill spaces between vertical steel stiffeners with insulation.

C. Fire Doors:

1. Close top and vertical edges flush.

2. Apply steel astragal to active leaf at pair and double egress doors.

a. Exception: Where vertical rod exit devices are specified for both leaves swinging in same direction.

3. Fire Door Clearances: NFPA 80.

D. Custom Metal Hollow Doors:

1. Provide custom hollow metal doors where nonstandard steel doors are shown on drawings.
   a. Provide door sizes, design, materials, construction, gauges, and finish as specified for standard steel doors.

E. Sound Rated Doors:

1. Seals: Integral spring type automatic door bottom seal.
2. Fabricate vision panel cutouts and frames to receive double glazing as shown on drawings.

F. Detention Doors:

1. Vision panels:
   a. Weld 3 mm (1/8 inch) thick steel channel reinforcements around cut-outs in doors to accommodate vision lights.
   b. Fabricate glazing stops on room side of doors, of 3 mm (1/8 inch) thick steel sheets mitered and welded at corners, and continuously welded both sides into doors.
   c. Fabricate glazing bead for corridor side of doors of 9 mm (3/8 inch) by 19 mm (3/4 inch) steel bar, miter and weld at the corners, and fasten to doors with 6 mm (1/4 inch) countersunk screws near corners and centers of both sides of opening.
      1) Back-up screw holes with 3 mm (1/8 inch) thick reinforcements or weld nuts to back of frames to receive screws.
   d. Size rabbet for safety glass and glazing cushions specified.

G. Transom Panel Fabrication:

1. Fabricate panels as specified for doors.
2. Fabricate bottom edge with rabbet stop where no transom bar occurs.

H. Hollow Metal Frame Fabrication:

1. Fasten mortar guards to back of hardware reinforcements, except on lead-lined frames.

2. Concealed Closers in Head Frame: Provide 1 mm (0.042 inch) thick steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.
3. Terminated Stops: ANSI A250.8.
4. Borrowed Light and Panel Opening:
    a. Provide integral stop on exterior, corridor, or secure side of door.
    b. Design rabbet width and depth to receive glazing material or panel shown on drawings.
5. Two Piece Frames:
    a. One piece unequal leg finished rough buck sub-frames as shown, drilled for anchor bolts.
    b. Unequal leg finished frames formed to fit subframes and secured to subframe legs with countersunk, flat head screws, spaced 300 mm (12 inches) on center at head and jambs on both sides.
    c. Preassemble at factory for alignment.
6. Frame Anchors:
    a. Floor anchors:
        1) Provide extension type floor anchors to compensate for depth of floor fills.
        2) Provide 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive floor fasteners.
        3) Provide 50 mm by 50 mm by 9 mm (2 inch by 2 inch by 3/8 inch) clip angle for lead lined frames, drilled for floor fasteners.
        4) Provide mullion 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.
        5) Provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for floor fasteners and frame anchor screws for sill sections.
            a) Space floor bolts50 mm (24 inches) on center.
    b. Jamb anchors:
        1) Place anchors on jambs:
            a) Near top and bottom of each frame.
            b) At intermediate points at maximum 600 mm (24 inches) spacing.

2) Form jamb anchors from steel minimum 1 mm (0.042 inch) thick.
3) Anchors set in masonry: Provide adjustable anchors designed for friction fit against frame and extended into masonry minimum 250 mm (10 inches). Provide one of following types:
   a) Wire Loop Type: 5 mm (3/16 inch) diameter wire.
   b) T-Shape type.
   c) Strap and stirrup type: Corrugated or perforated sheet steel.
4) Anchors for stud partitions: Provide tabs for securing anchor to sides of studs. Provide one of the following:
   a) Welded type.
   b) Lock-in snap-in type.
5) Anchors for frames set in prepared openings:
   a) Steel pipe spacers 6 mm (1/4 inch) inside diameter, welded to plate reinforcing at jamb stops, or hat shaped formed strap spacers 50 mm (2 inches) wide, welded to jamb near stop.
   b) Drill jambs stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass through frame and spacers.
   c) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
6) Anchors for observation windows and other continuous frames set in stud partitions.
   a) Weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
   b) Space maximum 600 mm (24 inches) on centers.
7) Modify frame anchors to fit special frame and wall construction.
8) Provide special anchors where shown on drawings and where required to suit application.

I. Sound Rated Door Frames:
   1. Seals: Integral continuous gaskets on frames.

J. Louver Fabrication:
   1. Fabricate louvers as complete units.

2. Weld stationary blades to frames.
3. Factory install louvers in door cutouts, welded to door.

K. Louver Screen Fabrication:

1. Fabricate frame to hold wire fabric in channel with retaining bar anchor and to mount on surface of door with screws.
2. Do not lap frame over louver opening.
3. Miter frame corners and join by concealed mechanical fastenings extending about 57 mm (2-1/4 inches) into ends of each member.
4. Drill frame and doors for screw attachment:
5. Space screws 50 mm (2 inches) from end of each leg of frame and maximum 300 mm (12 inches) on center.
6. Insect Screens: Fasten insect screens to interior side of doors with retaining bar against door and not exposed to view.
7. Wire Guards: Fasten wire guard to exterior side of door with retaining bar against door and not exposed to view.

2.8 FINISHES

A. Galvanized Steel: ANSI A250.8; shop primed.

B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.

1. Blend welds to match adjacent finish.

C. Finish exposed surfaces after fabrication.

D. Aluminum Anodized Finish: NAAMM AMP 500.

1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

2.9 ACCESSORIES

A. Primers: ANSI A250.8.

B. Barrier Coating: ASTM D1187/D1187M.

C. Welding Materials: AWS D1.1/D1.1M, type to suit application.

D. Clips Connecting Members and Sleeves: Match door faces.

E. Fasteners: stainless steel.

1. Metal Framing: Steel drill screws.
2. Masonry and Concrete: Expansion bolts.

F. Anchors: stainless steel.

G. Galvanizing Repair Paint: MPI No. 18.

H. Insulation: Unfaced mineral wool.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Apply barrier coating to metal surfaces in contact with cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
2. Install fire doors and frames according to NFPA 80.
3. Install smoke control doors and frames according to NFPA 105.

3.3 FRAME INSTALLATION

A. Apply barrier coating to concealed surfaces of frames built into masonry.

B. Plumb, align, and brace frames until permanent anchors are set.

1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
2. Use wood spreaders at bottom of frame when shipping spreader is removed.
3. Where construction permits concealment, leave shipping spreaders in place after installation, otherwise remove spreaders when frames are set and anchored.
4. Remove wood spreaders and braces when walls are built, and jamb anchors are secured.

C. Floor Anchors:

1. Anchor frame jambs to floor with two expansion bolts.
    a. Lead Lined Frames: Use 9 mm (3/8 inch) diameter bolts.
    b. Other Frames: Use 6 mm (1/4 inch) diameter bolts.
2. Power actuated drive pins are acceptable to secure frame anchors to concrete floors.

D. Jamb Anchors:
1. Masonry Walls:
    a. Embed anchors in mortar.
    b. Fill space between frame and masonry with grout or mortar as walls are built.
2. Metal Framed Walls: Secure anchors to sides of studs with two fasteners through anchor tabs.
3. Prepared Masonry and Concrete Openings:
    a. Direct Securement: 6 mm (1/4 inch) diameter expansion bolts through spacers.
    b. Subframe or Rough Buck Securement:
        1) 6 mm (1/4 inch) diameter expansion bolts on 600 mm (24 inch) centers.
        2) Power activated drive pins on 600 mm (24 inches) centers.
    c. Secure two-piece frames to subframe or rough buck with machine screws on both faces.

E. Frames for Sound Rated Doors: Fill frames with insulation.

F. Lead Lined Frames:
1. Extend jambs and anchor with clip angles to structure above.
    a. Fasteners to Concrete: Minimum two, 9 mm (3/8 inch) diameter expansion bolts.
    b. Connection to Structural Steel: Welded.

G. Touch up damaged factory finishes.
1. Repair galvanized surfaces with galvanized repair paint.
2. Repair painted surfaces with touch up primer.

3.4 DOOR INSTALLATION

A. Install doors plumb and level.

B. Adjust doors for smooth operation.

C. Touch up damaged factory finishes.
1. Repair galvanized surfaces with galvanized repair paint.
2. Repair painted surfaces with touch up primer.

3.5 CLEANING

A. Clean exposed door and frame surfaces. Remove contaminants and stains.

3.6 PROTECTION

A. Protect doors and frames from traffic and construction operations.

B. Remove protective materials immediately before acceptance.

C. Repair damage.

END OF SECTION

SECTION 08345

SECURITY DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The extent of forced-entry resistant (FE) and ballistic resistant (BR) door assemblies required for the Project is indicated on Contract Drawings, and in Door/Frame/Hardware schedules, including construction, profiles, swing, sizes, hardware, accessories, devices, and locations.

1.2 RELATED WORK

A. Section 08113, HOLLOW METAL DOORS AND FRAMES: Doors and frames not designated for special security performances.

B. Section 08710, DOOR HARDWARE: Door Hardware.

1.3 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. ASTM International (ASTM):

A153/A153M-16a.....Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A240/A240M-20.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications

A653/A653M-20.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A1008/A1008M-20.....Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

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

D1044-19 Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.

ASTM E1886-19 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

C. American National Standards Institute (ANSI):

ANSI A156.115 (2014).....Hardware Preparation in Steel Doors and Steel Frames

ANSI A156.115W (2006) .....Hardware Preparation in Wood Doors with Wood or Steel Frames

ANSI/SDI A250.8 (2014) .....Specifications for Standard Steel Doors and Frames

ANSI/SDI A250.11 (2012) ....Recommended Erection Instructions for Steel Frames.

D. American Welding Society (AWS):

D1.1/D1.1M (2010) .....Structural Welding Code - Steel

E. National Fire Protection Association (NFPA):

NFPA 80 (2013)..... .....Standard for Fire Doors and Other Opening Protectives

NFPA 252(2013) .....Standard Methods of Fire Tests of Door Assemblies

F. Society for Protective Coatings (SSPC):

SSPC-SP 2 - 2004.....Hand Tool Cleaning

SSPC-SP 3 - 2004.....Power Tool Cleaning

G. Underwriters Laboratories, Inc. (UL):

UL 752-2005.....Bullet Resisting Equipment

1.4 PERFORMANCE REQUIREMENTS

A. General: Fabricate and install FE/BR door assemblies to achieve indicated levels of resistance. Extend resistance to include anchorages, interfaces with adjoining substrates, and hardware. Security attacks shall be unable to penetrate through closed/locked security door assemblies in manner described; it is recognized that such attacks may damage units beyond repair and reuse, requiring replacement of work by Government:

1. Fire-rated assemblies: Where indicated for fire resistance, provide flush steel doors-and-frame units; comply with NFPA 80. Provide units that have been tested by recognized testing agency in accordance with NFPA No. 252

2. Forced-Entry (FE) resistant assemblies: Where door assembly is shown or scheduled as FE, provide door manufacturer's material and fabrication for panels, inserts, hardware, devices, and framing of units. Provide rated units where shown or scheduled:

3. Door shall provide resistance of 15 minutes for forced entry, using basic hand tools.

4. Wind Force Resistance: Door shall be capable of withstanding the effects of wind loads per PRBC 2018, based on testing unit’s representatives of those indicated in the Project that pass AAMA/WDMA 101/I.S/NAFS. Doors shall be rated to resist wind loads driven by a design wind speed of 180 mph.

5. Windborne-Debris (missile) Resistance: Door shall capable of resisting windborne projectiles based on pass/fail criteria determined from testing doors identical to those specified, according to the PRBC 2018 and ASTM E1886-19.

1.5 SUBMITTALS

A. General: For each security door assembly, submit the following in accordance with PRASA standards.

1. Product data for each element of work, whether purchased from other manufacturers or provided as door Fabricator's standard production. Include data substantiating that products comply with requirements of these specifications.
2. Manufacturer's standard color chart. As Per PRASA specifications.
3. Certificates: Letter from manufacturer indicating the products have been certified to meet the specified ratings.
4. Shop drawings showing each dimensioned details of each door assembly, including performance rating, swing, hardware set, and adjacent construction. Provide drawings on B-size 11 in x 17 inch (300 mm x 430 mm) sheets. Show typical door exterior elevations at not less than ¼ inch = 1 foot (1:50) scale. After final modifications and corrections have been incorporated into the drawings, submit drawings as AutoCAD files with DWG extension. Show the following:
    a. Unit information:
        1) Model Number.
        2) Ballistic resistant rating.
        3) Marks (window no.).
        4) Door/frame finish.
        5) Door type.
    b. Elevation Drawings:
        1) Rough opening.
        2) Door opening.
        3) Frame opening.
        4) Vision opening.
        5) Finished floor.
        6) Sill condition.

7) Undercut for carpet.

8) Weather-stripping.

9) Reference numbers for primer and finish paint, including number of coats applies.

10) Door class rating: rated or non-rated.

11) Door and frame gauge thickness.

c. Plan drawings:

1) Relate to elevation on drawing.

2) Identify “Attack” and “Protected” sides.

3) Identify door swing (i.e., RH, LH, RHRB, LHRB).

4) Provide key on drawings.

5) Indicate room space numbers taken from Contract Drawings.

d. Details: Show section at not less than ¾ inch = 1 ft (1:20) scale of members indicating construction, size, and thickness of components, frame profile, location of conduit entry, threshold configuration, vision panel together with connections, fastenings, and means of separating dissimilar metals.

e. Breakdown of Product Line Items:

1) If Manufacturer produces one contract line item as several parts (door with transom and sidelights), they shall breakout items on drawings. Each item shall be a subdivision of that product line item number.

2) Installation instructions shall cite all anchorage components, including complete description of expansion anchor as well as installation criteria such as torque requirements, minimum embedment, and minimum edge distance, and shall include alert to installers to avoid cutting of rebar during concrete anchor installation.

1.6 QUALITY ASSURANCE

A. Testing Laboratory Qualifications: For compliance with non-security performance requirements (such as fire ratings, resistance to deterioration from moisture, accessibility to persons with disabilities, or sound attenuation) on security door assemblies of this Section, use only those testing laboratories which have successfully demonstrated to Project Manager that they have experience and capabilities needed to satisfactorily conduct required tests.

1.7 IDENTIFICATION SYSTEMS

A. Identify each assembly to provide ready reference to original manufacturer to facilitate reorders, replacement parts, service, resolution of complaints, and inventory. The label shall be typically embossed/printed metal plate or metallic foil with adhesive backing for permanent identification. Locate label so that it is readily visible and convenient for identification by Project Manager after installation of assembly. The label shall be approximately 1½ inch x 3 inch (40 x 75 mm) and shall cite:

1. Manufacturer's name/city/state.
2. Contract number.
3. Month/Year of manufacture.
4. Mark number and Ballistic resistant rating.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver each assembly project site with fabrication, finishing, and assembly of primary panels, inserts, and frames completed and prepared for installation and connection with security systems. Disassemble hardware for shipping only to extent hardware interferes with shipping.

B. Refer to Division One for shipping requirements.

C. Provide removable spreader bar between jambs during fabrication, delivery, and installation and to include mullions of each frame assembly, except where integral

threshold is required and serves same purpose. Do not mar finishes of assembly with installation or removal of spreader bars.

D. Provide protection of pre-finished units, such as pre-finished with baked enamel or stainless steel, using self-adhesive paper.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Certified units: provide units, including frames and sub-frames which are produced by manufacturer who has previously produced, within last 10 years, units of similar security attack resistance of equivalent size and resistance ratings.

2.2 MATERIALS, GENERAL

A. Hot-Rolled Steel Sheets and Strips: ASTM A1011, commercial quality, pickled and oiled, except as otherwise indicated.

B. Cold-Rolled Steel Sheets: ASTM A1008, commercial quality, except as otherwise indicated.

C. Galvanized Steel Sheets: ASTM A653 with G90 zinc coating, mill phosphatized; commercial quality, except as otherwise indicated.

D. Stainless Steel Sheets: AISI Type 302/304, complying with ASTM A240; commercial quality, No. 4 directional polish.

E. Supports and Anchors: Fabricate to endure required performances, but of not less than 1/16 inch (1.5 mm) sheet steel. For exterior wall assemblies, hot-dip zinc coat support/anchor units after fabrication in compliance with ASTM A 153, Class B.

F. Inserts, Bolts, Fasteners: Standard units of strengths required to endure performances; hot-dip zinc coated where used in exterior wall assemblies in compliance with ASTM A 153, Class C/D.

G. Vision Lights General: Fabricate vision lights of sizes shown and scheduled with same performance capabilities as specified/shown for door assembly where installed. Where applicable, achieve performances and combined performances through lamination of transparent sheets, films, and screens of standard manufactured/tested products.

1. Forced-Entry (FE) Resistance: Where assembly is indicated for forced-entry resistance rating (FE), provide light of size shown or scheduled in accordance with certification.

2. Ballistic Resistance (BR): Where assembly is indicated for ballistic-resistance rating (BR), provide light of size shown or scheduled in accordance with certification.

3. Vision light faces general: Except as otherwise shown, where forced-entry or ballistic resistance is required, provide face of light exposed on exterior (to the "attack") as glass surface, and where unit is of laminated construction, provide face exposed on interior ("safe") as polycarbonate surface. Provide exposed polycarbonate surfaces to include an abrasion-resistant coating for 3 percent maximum haze increase for 100 revolutions on 500g Taber abraser, ASTM D1044.

2.3 HARDWARE

A. General: Provide special units of door hardware to achieve performances, and as shown and scheduled. Standard units for each security door assembly are specified to be furnished as work of Section 08710, DOOR HARDWARE; see Project "Finish Hardware Schedule" and "Data Sheets," and provisions of this Section, as well as notes on door-and-frame schedule.

2.4 FABRICATION AND ASSEMBLY

A. General: Fabricate, test, and preassemble security door assemblies with hardware at factory; disassemble hardware only to extent necessary for handling, packaging, shipment, and installation at Project. Fabricate metal work to comply with performance requirements. Fabrications shall be rigid, neat, and free from warp/buckle/similar defects, with eased edges and continuously-welded joints, ground where exposed, to produce

smooth, flush, invisible joints. Weld in accordance with AWS D1.1, Structural Welding Code for Steel:

1. Prepare panels and frames of each assembly to receive hardware, devices, and accessory units as shown and scheduled. Reinforce work for hardware and devices, and cut work for mortised or concealed units; comply with ANSI A156.115, working from templates supplied by unit manufacturers and suppliers:

    a. Locate hardware, devices, and accessories as required by 08710, DOOR HARDWARE.

    b. Locate hardware, devices, and accessories as shown and scheduled (including on approved shop drawings) or, if not otherwise indicated: 1) in accordance with ANSI A156.115 and A156.115W Recommended Locations for Builder's Hardware or, 2) in accordance with security device manufacturer's recommendation for optimum responses, but 3) in any case, as required to achieve required assembly performances.

    c. Except where assembly is equipped with door-seal stripping at jambs and head, provide neoprene door silencers on stops; three at strike jamb for single door, and four at head for double door.

    d. Except as otherwise indicated, pre-fabricate and preassemble security door assemblies to include full extent of required conduit-protected electrical/electronic power-and-control wiring placed and supported to avoid conflicts with other elements and subsequent drilling/cutting-in of work during installation of units. Provide access ports as required to support 1 inch (25 mm) conduit.

    e. Clearances: Not more than 1/8 inch (3 mm) at jambs and heads, except not more than 1/4 inch (6 mm) between fire-rated pair of doors. Nor more than 1/4 inch (6 mm) at bottom. Undercut for carpets are not permitted where doors are used in corridors. Fabricate frames with horizontally slotted bolt holes.

2. Provide removable glazing stops and similar moldings on interior or “safe” side of assemblies. Glazing shall be removable without removing door from frame.

3. Shop Painting: Provide base-coat, factory-applied painting of ferrous metal elements of assemblies excluding other specified exposed-finish surfaces of stainless steel, aluminum, bronze, and similar metals not intended for painting.

    a. Clean steel and zinc-coated steel surfaces of mill scale, rust, oil, grease, dirt and other substances, immediately before finish application.

    b. Apply pretreatment of cold phosphate solution (SSPC-SP 2) or basic zinc chromate/vinyl-butyl solution (SSPC-SP 3).

    c. Apply paint coat specified for shop application, and bake on within time limits recommended by manufacturer of pretreatment. Apply in a uniform, smooth coat to result in dry film thickness of not less than 0.002 inch (0.05 mm).

4. Vision panels:

    a. The transparencies shall be enclosed and cushioned within core of door for continuous perimeter bite of not less than ¾ inch (20 mm) on each side and 1/4 inch (6 mm) cushion clearance to fixed metal stop on glazing edges. Glazing shall be installed by manufacturer with no raw metal edges evident or in contact with glass in door vision openings. Vision opening edges shall be cushioned and trimmed neatly to provide acceptable appearance.

    b. If external frames are used to either side or to both faces of door, frame(s) shall not exceed 1-9/16 inch (40 mm) in width and shall be configured internally to cushion all perimeter edges and faces of glazing and provide minimum bite of 3/4 inch (20 mm) and 1/4 inch (6 mm) cushion clearance to fixed metal stop on glazing edges. Frame shall not produce pinch point with hardware. All external bolts to attach frame shall be flush mounted. Alternatively, protruding bolt heads shall be covered with additional trim frame and flush mounted screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install security door assemblies in accordance with approved shop drawings, manufacturer's data and instructions, and requirements of these specifications. Install as required to achieve specified performances, and to comply with recommendations of related industry association or testing agency sponsoring standards for required non-security performances. Install door assemblies plumb and level:

1. Install assemblies in compliance with recommendations and instructions of ANSI A250.8 and ANSI A250.11.

2. At fire-rated door openings, comply with NFPA Standard No. 80.

3. Properly hang and align FE/BR doors so that pull open exertion does not exceed 12 lbs (5.4 kg.).

4. Installer shall not grind any portion of door, frame or locking device strikes.

5. Locking device strikes shall engage strike plate without binding.

B. Anchorage: The door manufacturer shall provide anchors appropriate for substrate to which door frame is to be fastened. Structural frames shall have pre-drilled bolt hole patterns not to exceed 12 inches (300 mm) on center. The manufacturer shall verify substrates involved, and supply any special fastening tools (e.g., special drill or bit) required by anchoring system. The anchor shall be acceptable for shock/short duration loading, and have potential for removal during life of building. The anchor shall also meet the following requirements:

1. Anchor diameter: 3/8 inch (10 mm) minimum.

2. Embedment and edge distances shall be as indicated on Contract Drawings and as appropriate for anchor and substrate, but not less than the following:

   a. Embedment in concrete: 3 1/2 inches (90 mm).

   b. Embedment in solid masonry: 6 inches (150 mm).

c. Edge distance: 3 inches (75 mm).

3. The minimum anchor strengths shall be:

   a. Yield Strength: 135,000 psi (900 MPa)

   b. Tensile Strength: 186,000 psi (1240 MPa)

4. Avoid cutting of rebar during concrete anchor installation. Shims provided for rough opening (RO) frame clearance should not exceed1/4 inch (6 mm). Cap plugs used in frame shall match frame finish.

3.2 ADJUST AND CLEAN

A. General: Upon request of Project Manager, remove protective coverings and clean exposed surfaces. Repair damaged elements, restore abraded surfaces, touch-up base-coat paint finish with air-drying primer, and remove imperfections from exposed natural metal finishes.

B. Check and readjust hardware, devices, and accessories with door-to-frame-and-sill/threshold clearances set for proper operation of locks, door seals, and other operational units. Do not remove permanently applied performance labels.

C. Comply with "Door Hardware" section requirements for protection and handling of keys and locking devices, and associated information.

D. Exercise extreme care in the cleaning of exposed surfaces of polycarbonate; comply with manufacturer’s directions.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Standard Code	Year	Title / Description
ASTM INTERNATIONAL (ASTM)		
ASTM E283	2019	Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F883	2013; R 2022	Standard Performance Specification for Padlocks
BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)		
ANSI/BHMA A156.1	2021	Butts and Hinges
ANSI/BHMA A156.2	2022	Latches; Bored and Preassembled Locks
ANSI/BHMA A156.3	2020	Exit Devices
ANSI/BHMA A156.4	2013	Door Controls – Closers
ANSI/BHMA A156.5	2020	Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	2021	Architectural Door Trim
ANSI/BHMA A156.7	2016	Template Hinge Dimensions
ANSI/BHMA A156.8	2021	Door Controls – Overhead Stops and Holder
ANSI/BHMA A156.10	2017	Power Operated Pedestrian Doors
ANSI/BHMA A156.12	2022	Interconnected Locks & Latches
ANSI/BHMA A156.13	2022	Mortise Locks & Latches Series 1000
ANSI/BHMA	2013	Sliding and Folding Door Hardware

A156.14		
ANSI/BHMA A156.15	2021	Release Devices, Closer Holder, Electromagnetic and Electromechanical
ANSI/BHMA A156.16	2018	Auxiliary Hardware
ANSI/BHMA A156.17	2019	Self Closing Hinges & Pivots
ANSI/BHMA A156.18	2020	Materials and Finishes
ANSI/BHMA A156.19	2013	Power Assist & Low Energy Power Operated Doors
ANSI/BHMA A156.21	2019	Thresholds
ANSI/BHMA A156.22	2021	Gasketing
ANSI/BHMA A156.23	2010	Electromagnetic Locks
ANSI/BHMA A156.24	2012	Delayed Egress Locking Systems
ANSI/BHMA A156.25	2013	Electrified Locking Devices
ANSI/BHMA A156.26	2012	Continuous Hinges
ANSI/BHMA A156.27	2011	Power and Manual Operated Revolving Pedestrian Doors
ANSI/BHMA A156.29	2012	Exit Locks, Exit Alarms, Alarms for Exit Devices
ANSI/BHMA A156.30	2014	High Security Cylinders
ANSI/BHMA A156.31	2013	Electric Strikes and Frame Mounted Actuators
ANSI/BHMA A156.36	2010	Auxiliary Locks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	2023	National Electrical Code
NFPA 72	2022; ERTA 22-1	National Fire Alarm and Signaling Code
NFPA 80	2022	Standard for Fire Doors and Other Opening Protectives

NFPA 101	2021; TIA 21-1	Life Safety Code
NFPA 252	2022	Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	2017	Specifications for Standard Steel Doors and Frames

1.2 SUBMITTALS

A. Shop Drawings

Manufacturer's Detail Drawings;

Verification of Existing Conditions

Hardware Schedule

Keying System

B. Product Data

Hardware Items

C. Manufacturer's Instructions Installation

D. Operation and Maintenance Data

Hardware Schedule Items
Data Package

E. Closeout Submittals Key Bitting

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

1.5 HARDWARE SCHEDULE

Provide Hardware Item List and Hardware Schedule containing the following information, and additional information as needed to identify the complete make up of each hardware set

and its application to each opening:

1.5.1 Hardware Item List:

a. Hardware Type

b. Item Number

c. Quantity

d. Size(s)

e. Reference Publication / Type Number

f. Manufacturer's Name / Catalog Number

g. Key Control Symbols

h. UL Mark (If fire rated and listed)

i. BHMA Finish(es)

j. Remarks

1.5.2 Hardware Schedule

a. Hardware Set Number

b. Opening Number(s)

c. Opening Description (single/double leaf, hand, size, door/frame material)

d. Fire Rating

e. Sound Rating

f. Hardware Items

g. Quantity

h. Size

i. BHMA Finish

j. Remarks

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys (e.g. AA1 and AA2).

b. Complete listing of all key cuts (AA1-123456, AA2-123458).

c. Tabulation showing which key fits which door.

d. Copy of floor plan showing doors and door numbers.

e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Door locks shall be storeroom standard (always lock outside and lever operator inside).

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 114 by 114 mm 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

Hinge Sizes Chart		
Thickness of Doors in inches	Width of Doors in inches	Height of Hinges (Length of Joint) in inches
7/8 to 1-1/8 screen	To 36	3

Hinge Sizes Chart		
Thickness of Doors in mm	Width of Doors in mm	Height of Hinges (Length of Joint) in mm
22 to 29 screen	To 915	76
35	To 815	89
35	Over 815 to 940	102
44	To 915	114
44	Over 915 to 1220	127 Heavy Weight
44	Over 1220	152 Heavy Weight
51, 57, and 64	To 1065	127 Heavy Weight
51, 57, and 64	Over 1065	152 Heavy Weight

Hinge Sizes Chart		
Thickness of Doors in inches	Width of Doors in inches	Height of Hinges (Length of Joint) in inches
1-3/8	To 32	3-1/2
1-3/8	Over 32 to 37	4
1-3/4	To 36	4-1/2

1-3/4	Over 36 to 48	5 Heavy Weight
1-3/4	Over 48	6 Heavy Weight
2, 2-1/4 and 2-1/2	To 42	5 Heavy Weight
2, 2-1/4 and 2-1/2	Over 42	6 Heavy Weight

2.3.1.1 Protection Devices

Provide full height hand and finger protection device at the hinge-side area opening of doors and gates. Provide hinge-side protection devices on both sides of doors and gates, covering hinges and space between door and frame when doors are in the open position. The installed device must push hand and fingers out of the opening and away from a crushing hazard.

Provide in accordance with ANSI/BHMA A156.17.

2.3.3 Spring Hinges

Provide in accordance with ANSI/BHMA A156.17.

2.3.4 Locks and Latches

a. At exterior locations provides locksets of full stainless steel type 302 or 304 construction including fronts, strike, escutcheons, knobs, bolts and all interior working parts. Marine Grade I, fully non-ferrous.
b. In non-air-conditioned interior environments or humid interior environments, provide interior locksets on the same Marine Grade I, fully non-ferrous as exterior locksets.

2.3.5 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Use stainless steel or bronze base metal with plated finishes. Also include stainless steel fasteners and screws.

2.3.6 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and knobs of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.7 Tamper Resistance

Provide lock mechanism encased in hardened guard barriers to deter forced entry.

2.3.8 Keying System

Provide a construction master keying system and construction interchangeable cores. Provide key cabinet as specified by PRASA.

2.3.9 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.9.1 Knobs and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for knobs, roses, and escutcheons. For unreinforced knobs, roses, and escutcheons, provide a 1.25 mm 0.050 inch thickness. For reinforced knobs, roses, and escutcheons, provide an outer shell thickness of 0.89 mm 0.035 inch and a combined total thickness of 1.78 mm 0.070 inch, except at knob shanks. Provide knob shanks 1.52 mm 0.060 inch thick.

2.3.9.2 Lever Handles

Provide lever handles in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 13 mm 1/2 inch of the door face.

2.3.10 Keys

Provide one file key, one duplicate key, and one working key for each key change and for each master keying system. Provide one additional working key for each lock of each keyed-alike group.

2.3.11 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide brackets, arms, mounting devices, fasteners, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty. Use stainless steel inside bracketed or door mounted closers on exterior doors. Non-ferrous closers, such as aluminum or cast bronze, are permissible where door utilization is minimal. On interior doors use closers of 302 or 304 stainless steel or non-ferrous materials. On surface-mounted closers use or apply rust inhibiting finish on all ferrous parts. Also apply this finish on concealed closers.

2.3.12 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.13 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 2.03 mm 0.08 inch thick, factory painted finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection. Provide rain drips with a 102 mm 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.13.1 Overhead Rain Drips

Approximately 38 mm high by 64 mm 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except aluminum paint finish for surface door closers, and except for steel hinges.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 225 mm 9 inch on center after doors and frames have been finish painted.

3.1.1.2 Interlocking Type Weatherstripping

Provide interlocking, self adjusting type on heads and jambs and flexible hook type at sills.

Nail weatherstripping to door 25 mm 1 inch on center and to heads and jambs at 100 mm 4 inch on center.

3.1.1.3 Spring Tension Type Weatherstripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze. Provide stainless steel nails with stainless steel. Space nails not more than 38 mm 1-1/2 inch on center.

3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.4 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

END OF SECTION

SECTION 08900
LOUVERS AND VENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK

A. Section 08113, HOLLOW METAL DOORS AND FRAMES: Louvers in Steel Doors.

1.3 SUBMITTALS

A. Submit in accordance with PRASA standards.

B. Shop Drawings:

a) Each type, showing material, finish, size of members, operating devices, method of assembly, and installation and anchorage details.

C. Manufacturer's Literature and Data:

1. Each type of louver and vent.

1.4 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. The Master Painters Institute (MPI): Approved Product List – Updated Monthly

C. ASTM International (ASTM):

A240/A240M-20 .....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-20 .....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A1008/A1008M-20….Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability

B209-14.....Aluminum and Aluminum Alloy, Sheet and Plate

B209M-14 .....Aluminum and Aluminum Alloy, Sheet and Plate (Metric)

B221-14.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-13 .....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

ASTM E1886-19…..Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

D1187/D1187M-97(2018)....Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 50006.....Metal Finishes Manual

E. National Fire Protection Association (NFPA):
90A-15.....Installation of Air Conditioning and Ventilating Systems

F. American Architectural Manufacturers Association (AAMA):
2605-13 .....High Performance Organic Coatings on Architectural Extrusions and Panels

H. Protective Design Center
PDC-TR-08 Single Degree of Freedom Structural Response Limits for Antiterrorism Design

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum, Extruded: ASTM B221M (B221).

B. Stainless Steel: ASTM A240/A240M, Type 302B.

C. Galvanized Steel Sheet: ASTM A653/A653M; G90 min.

D. Carbon Steel and Sheet: ASTM A1008/A1008M (interior use louvers only).

E. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.

F. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or expansion bolts of size and type as required for each specific type of installation and service condition.
1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum with same finish as louvers.
3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

G. Inorganic Zinc Primer: MPI No. 19.

H. Bituminous Coating: ASTM D1187/D1187M; cold applied asphalt mastic emulsion.

2.2 EXTERIOR WALL LOUVERS:

A. General:
1. Provide fixed type louvers of size and design shown.
2. Heads, sills and jamb sections are to have formed caulking slots or be designed to retain caulking. Head sections are to have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame is to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics:

1. Weather louvers are to have a minimum of 45 percent free area and to pass 1250 free area velocity at a pressure drop not exceeding 0.157 inch water gauge and water penetration effectiveness of 95%.
2. Louvers are to bear AMCA certified rating seals for air performance and water penetration ratings.
3. Wind Force Resistance: Window/Louvers shall be capable of withstanding the effects of wind loads per PRBC 2018, based on testing unit's representatives of those indicated in the Project that pass AAMA/WDMA 101/I.S/NAFS. Window/Louvers shall be rated to resist wind loads driven by a design wind speed of 180 mph.
4. Windborne-Debris (missile) Resistance: Window/Louvers shall capable of resisting windborne projectiles based on pass/fail criteria determined from testing Window/Louvers identical to those specified, according to the PRBC 2018 and ASTM E1886-19.

C. Aluminum Louvers:

1. General: Frames, blades, sliding interlocking type; 2 mm (0.078-inch) thick extruded 6063-T5 or –T52 aluminum. Blades to be drainable type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames are not to exceed 1676 mm (66 inches) wide. When openings exceed 1676 mm (66 inches), provide twin louvers separated by mullion members.
3. Louvers are to withstand the effects or gravity loads and the following wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors.

D. Stainless Steel Louvers: Form stainless steel louvers using 1.6 mm (0.063-inch) thick sheet for frames, blades, sills and mullions.

1. Provide louver with fixed 45 degree drainable blades with water baffle. Make overall frame size 13 mm (1/2-inch) less than opening, unless otherwise indicated in construction documents.
2. Single louver sections are not to exceed 1676 mm (66 inches) in width. For openings larger than 1676 mm (66 inches) wide, provide multiple sections not larger than 1676 mm (66 inches) wide separated by mullions.

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

A. Fabricate from 2 mm (0.078-inch) thick stainless steel or aluminum.

B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.

C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.

B. Fabricate frames from 2 mm (0.078-inch) thick extruded or sheet aluminum designed to retain wire mesh.

C. Wire mesh to be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire in 13 mm (1/2- inch) square mesh.

D. Miter corners and join by concealed corner clips or locks extending not less than 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over 1219 mm (4 feet) in height with a mid-rail constructed as specified for frame components.

E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 BLANK-OFF PANELS:

A. Uninsulated panels attached with clips or screws as follows: Panel finish is to be same finish applied to louvers.

1. Aluminum sheet for aluminum louvers, 1.27 mm (0.050 inch) minimum thickness.

2. Stainless-steel sheet for stainless-steel louvers, not less than 0.95 mm (0.038 inch) minimum.

B. Insulated laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver with clips on screws and gasket or sealant sealed perimeter. Panel finish is to be same finish applied to louvers.

1. Thickness: 25 mm (1 inch).

2. Aluminum sheet for aluminum louver 0.81 mm (0.032 inch) minimum.

3. Stainless-steel sheet for stainless-steel louvers 0.79 mm (0.031 inch) minimum.

4. Insulating Core: extruded-polystyrene foam.

2.6 EXTERIOR DOOR LOUVERS:

A. Fabricate of 1.6 mm (0.063-inch) thick extruded aluminum. Miter frames at corners and join by concealed corner brackets. Louvers are to be weather resistant type.

B. Equip louvers on outside with wire guards, except omit wire guards for louvers in doors located completely below enclosed areaways.

2.7 INTERIOR DOOR LOUVERS:

A. Fabricate louvers for interior doors and partitions of 1.6 mm (0.063-inch) thick extruded aluminum.

B. Make louvers sight-proof type with stationary blades.

2.8 WALL VENTS:

A. Fabricate exterior wall vents from either 4.7 mm (0.185-inch) thick aluminum plate or 6 mm (1/4-inch) thick cast iron, perforated in diamond lattice pattern, with not over 19 mm (3/4-inch) openings.

B. Vents are to have aluminum screen frame with aluminum alloy insect screening mounted on back of vent by means of 19 mm x 5 mm (3/4-inch by 3/16-inch) top and bottom bars screwed to grille.

C. Vent Frames in Masonry: Fabricate of 45 mm x 30 mm x 5 mm (1-3/4 inch by 1-1/4 inch by 3/16-inch) steel angles bolted with 6 mm (1/4-inch) diameter expansion bolts at jambs.

2.9 AIR INTAKE VENTS:

A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221M (B221). Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.

B. Provide 0.8 mm (0.032-inch) thick aluminum sleeves.

2.10 FINISH:

A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505

B. Aluminum Louvers Wire Guards:

1. Anodized finish

a) AA-M1X, Mill finish, as fabricated.

2. Organic Finish: AAMA 2605 (Fluorocarbon coating) with total dry film thickness of not less than 0.03 mm (1.2 mil), color as per PRASA finish.

a) Aluminum: Sand blasted satin finish.
b) Stainless Steel: Mechanical finish No. 4 in accordance with NAAMM Metal Finishes Manual.
c) Galvanized Sheet Steel: Two-coat baked-enamel or powder-coat finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 0.05 mm (2 mils).
    1) Paint interior surfaces of lightproof louvers with two (2) additional finish shop coats of baked-on flat black enamel.
d) Steel: Surfaces of steel work, for which no other finish is specified, are to be cleaned free from scale, rust, oil and grease, and then given a light colored prime paint after fabrication, except ferrous metals concealed in finished work. Paint all contact surfaces of assembled work (except welded contact surfaces) with an additional shop coat of similar paint.

2.11 PROTECTION:

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.

B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.

C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work strippable plastic coating or colored anodized.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set work accurately, in alignment and where indicated in construction documents. Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.

C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed, or substrate damaged by their use.

D. Set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING:

A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer Representative (COR) damaged units and replace with new units.

END OF SECTION

SECTION 11212
VERTICAL TURBINE PUMPS

PART 1- GENERAL

1.01 SCOPE

A. Pumps that are supplied under this specification shall be vertical turbine **enclosed** lineshaft design with **water flush**, including a bowl assembly, column assembly, discharge head and driver. The discharge head shall be designed to carry the entire weight of the bowl and column assembly along with the specified driver without excessive vibration or noise. All the supplied equipment shall conform to this specification.

B. The required units shall be Gould's Water Technology Model **VIT-DITM 9RCHC** with **8 stages**, or an approved equal.

1.02 QUALITY ASSURANCES

A. Warranty

The manufacturer shall warrant their pumps to be free of defects for a period of one year after the product is put into operation or eighteen months from the shipment date, whichever occurs first.

B. Certifications

1. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.
2. The manufacturer shall be capable of producing vertical turbine pumps certified to NSF/ANSI 61 & 372.
3. Pressure containing fabrications shall be welded only by those whom are qualified on ASME code section IX. Welder certification shall be provided with the submittal package.

C. Foundry

The manufacturer shall own and operate its own U.S. based foundry producing vertical turbine components.

D. Testing Standards

All vertical turbine pumps shall conform to ANSI/AWWA E101-88 and to the most current edition of Hydraulic Institute Standards.

1.03 SUBMITTALS

A. With the proposal, the contractor shall submit complete fabrication and assembly drawings together with detailed specifications covering materials, parts, devices, and

accessories. The data and specifications for each pumping unit shall include, but not be limited to the following:

1. Name of Manufacturer
2. Type and Model
3. Design Rotational Speed
4. Number of Stages
5. Type of Bowl Bearings
6. Type of line shaft bearings
7. Size of Shafting
8. Size of Pump Column
9. Size of Discharge Outlet
10. OD of Pump Bowls
11. Weight
12. Type of Finish
13. Total Weight
14. Total Pump Length
15. Complete performance curves showing capacity versus head, NPSH required, efficiency, and BHP plotted scales consistent with performance requirements

PART 2 – PRODUCT SELECTION

2.01 MANUFACTURER

A. The equipment covered by this specification shall be standard products manufactured by a company having a minimum of 20 years' experience in the production of such equipment. All pumps and pump components specified in this specification shall be supplied by a single pump manufacturer. The pump manufacturer shall be required to supply the pumps and drivers and shall be responsible for their compatibility.

B. A factory authorized service facility shall have trained service technicians and be able to show evidence of parts inventory for routine maintenance items such as bearings, gaskets, shafts, and sleeves.

2.02 OPERATION SELECTION

A. Stated total dynamic head (TDH) includes lift and all system pressure. Pump manufacturers shall include pump's internal losses.

1. Number of required units: **2**
2. Design Point Capacity, GPM: **500**
3. TDH, head in feet: **355**
4. Driver horsepower: **60 hp**
5. Minimum bowl efficiency, Percent (design point): **81.5%**
6. Maximum pump operating speed: **1,800 rpm**
7. Minimum column and discharge diameter, inches: **8 inches**

8. NPSHR not to exceed: **7.5 ft**

B. Design point will be used for any performance evaluation in accordance with the **2B** grade standards of the Hydraulic Institute.

C. The pump horsepower requirements for any point on the curve shall not utilize the service factor nor exceed the motor nameplate horsepower rating.

2.03 SERVICE CONDITIONS

1. Liquid to be pumped: raw water
2. Pumping temperature (PT): 70ºF
3. Specific gravity at PT: 1.00
4. Viscosity at PT: 1.076×10^{-5} ft²/s
5. Vapor pressure at PT/max temp: 0.36 lb/in^2
6. Pumping Liquid pH: 7
7. Suction pressure: 2 psi
8. Available liquid level from sump floor: **4 ft**
9. Site elevation: **1,800 ft**
10. Distance from bottom of **Sub base** to the bottom of sump: **Refer to Construction Drawings**
11. Solid Size: 0.20”

2.04 MATERIALS AND CONSTRUCTION

A. The vertical turbine lineshaft **sump** pump shall conform to the materials of construction for **enclosed lineshaft with water flush** design.

DISCHARGE HEAD ASSEMBLY			
Description	**MC**	**Material Description**	**ASTM**
Headshaft	2227	SST 416	A582 S41600
Adjusting Nut	2130	Brass	B16C36000
Gib Key	2242	Steel 1018	A108 G10180
Slinger	5121	Rubber	3CA715A25 B14
Discharge Head	1003 or 1018	Cast Iron or Ductile iron	A48 CL30 or A536 Grade 65-45-12
Stuffing Box Bearing	1109	Bronze	B584 C90300

DISCHARGE HEAD ASSEMBLY			
Description	**MC**	**Material Description**	**ASTM**
Stuffing Box	1003	Cast Iron	A48 CL30
Stuffing Box Gasket	5136	Acrylic Gasket	Garlock Blue Guard
Split Gland	1203	SST 316	A744 GR. CF-8M
Gland Adjusting Screw	2229	SST 316	A276 S31600
Packing	5026	Acrylic Yarn	Packmaster 2
Column Flange (CA only)	1003	Cast Iron	A48 CL30
COLUMN AND LINESHAFT ASSEMBLY			
Column Coupling	6501	Black Pipe	A53
Column Pipe	6501	Black Pipe	A53
Lineshaft	2227	SST 416	A582 S41600
Bearing Retainer	2321	SST 304	A320
Lineshaft Bearing	5121	Rubber	3CA715A25 B14
Lineshaft Coupling	2265	SST 416	A582 S41600
BOWL ASSEMBLY			
Bowl Shaft	2227	SST 416	A582 S41600
Discharge Bowl	1003	Cast Iron	A48 CL30
Discharge Bearing	1109	Bronze	B584 C90300
Intermediate Bowl	6911	Coated Cast Iron	A48 CL30
Inter Bowl Bearing	1109	Bronze	B584 C90300

DISCHARGE HEAD ASSEMBLY			
Description	**MC**	**Material Description**	**ASTM**
Impeller	1398	23% - 28% Chrome 14% - 25% Nickel-Iron Alloy	A532 A43+
Impeller Taper Lock	2242	Steel 1018	A108 G10180
Wear Rings (optional)	1128	Bronze	B148 C95200
Hex Bolt	2298	Grade 8	SAE J429 GR8
Sand Collar	1205	SST 304	A744 S30400
Suction Bowl / Bell	1003	Cast Iron	A48 CL30
Suction Bearing	1109	Bronze	B584 C90300
Suction Strainer	6952	Galvanized Steel	A108 G10180
Plug	1046	Mal Iron	A197

B. Bowl Assembly

1. The suction **bell** shall be designed to provide conservative entrance velocities and direct the flow to the first stage impeller. The inner surface of the suction bell shall be smooth and free of sharp projections which could cause turbulence or cavitation. The suction casing shall be designed to house the suction bell bearing by means of four vanes.
2. The bowls shall be smooth and free of sharp projections and shall have register fits for alignment and be connected by flanged and bolted construction. Bowl sizes 6" to 15" shall be porcelain enameled on the bowl interior. Bowl sizes 16" and larger shall be epoxy-lined.
3. The impellers shall be machined and finished smooth to insure proper performance. They are to be balanced prior to assembly. The impellers shall be connected to the bowl shaft by means of **collet design.**

C. Column Assembly

1. The column shall include **flanged** connections and shall be of **open** design with **water flush**.
2. The bearing spacing shall be selected to insure operation at a minimum of 25% above or below the first critical speed. Bearing spacing shall not exceed 5 feet.

3. The lineshaft shall be of adequate size to transmit the full power of the pump without slip, excessive vibration or elongation, and shall have **threaded** joints. Lineshaft lengths shall not exceed 10 feet. The lineshaft shall have left hand threads that tighten during pump operation.

D. Discharge Head Assembly
   1. For above ground service, the discharge head shall be fitted with a flanged discharge connection. The flange shall be a 250 LB F.F. ANSI flange for cast heads. The discharge head shall be designed to carry the entire weight of the complete pump and driver without distortion when spanning an opening of sufficient size to permit removal of the complete pump assembly. The discharge head shall be provided with a coupling guard. Lifting lugs shall be provided as standard.
   2. A tube tension assembly shall be provided for units that will be enclosed lineshaft fresh water flush. A connection on the packing nut will be provided for the injection of the flush water. A packing gland will be installed with non-corrosive studs and nuts to compress upper packing.

E. Driver
   The driver will be **a VHS electric motor**. The driver and any related equipment will ship unmounted from the pump to ship.

2.05 Vertical Pump Base Construction

A. The vertical pump shall be provided with a heavy-duty pump base (often integrated with the discharge head) designed to support the entire weight of the pump assembly, motor, column piping, and the dynamic loads resulting from pump operation.

B. The pump base shall be constructed of cast iron conforming to ASTM A48 (Class 30 minimum) or fabricated structural carbon steel conforming to ASTM A36.

C. All welding shall be continuous and performed in accordance with American Welding Society (AWS) D1.1 standards. Following welding, the fabricated steel base shall be thermally stress-relieved prior to machining to prevent distortion.

D. The bottom mounting surface of the pump base (which interfaces with the sole plate) and the top motor mounting surface shall be machined flat, parallel, and smooth. Machined surfaces shall have a flatness tolerance not exceeding 0.002 inches per foot in all directions.

E. Design Features:
   1. The base shall be equipped with sufficiently sized lifting lugs or lifting holes designed to safely hoist the entire assembled pump and motor.
   2. Jacking screws or positioning dowels shall be provided to assist with lateral alignment on the sole plate prior to final torquing.

3. All necessary hardware (studs, nuts, washers) required to bolt the pump base to the sole plate shall be provided by the pump manufacturer and shall be Type 316 Stainless Steel unless otherwise specified.

2.06 COATING

A. The bowl assembly exterior shall be coated with **Goulds Water Technology Standard Blue Enamel**, or Approved Equal.

B. The column assembly **exterior** shall be coated with **Goulds Water Technology Standard Blue Enamel**, or Approved Equal.

C. The head assembly **interior and exterior** shall be coated with **Goulds Water Technology Standard Blue Enamel**, or Approved Equal.

D. For **water flush** configuration, tube assembly exterior shall be coated with **Goulds Water Technology Standard Blue Enamel** or Approved Equal.

2.07 TESTING

A. All factory testing shall conform to the most current edition of the Hydraulic Institute Standards. All pump performance testing shall be performed at the manufacturer's facility.

B. Performance testing shall be non-witnessed and performed on the bowl assembly only with lab motor. The test shall cover seven points including the design point (HI 14.6). The design point shall be used for any performance evaluation.

C. Hydrostatic testing shall be non-witnessed in compliance with HI14.6. Hydro testing is to be performed on the pressure containing components. Certified test results shall be provided prior to shipment.

D. A standard 10 business days' notice shall be given to the engineer before starting any witness testing. The manufacturer shall not be responsible for expenses including, but not limited to travel, food, and lodging to observe all witness testing.

E. A written approval for all witness testing is required prior to release for shipment. All non-witness testing shall require no written approval prior to release for shipment.

F. Field/functional testing will be performed by the contractor to insure proper mechanical operation at the jobsite. All testing data to be used for evaluation shall be performed at the pump manufacturer's facility.

G. Motor tests and test reports shall be provided as required in accordance with the motor specification.

2.08 WARRANTY

A. Manufacturer warranty shall cover, at minimum, the following items
    1. Defects in materials
    2. Defects in workmanship
    3. Replacement part supplied at no cost (contractor shall be responsible for labor)
    4. Engineering review if performance does not match the certified pump curve

B. Warranty period shall be for one (1) year substantial completion.

PART 3 - EXECUTION

3.01 SHIPPING

Pumps that are less than 30 feet in length shall be shipped fully assembled with the driver and shaft seal unmounted. The discharge flange shall be protected with a wooden flange cover.

3.02 STORAGE, HANDLING, AND INSTALLATION

The skidded pump and related equipment shall be unloaded, stored, and installed in agreement with the Manufacturer's operation and installation manuals. If storage is planned to be longer than six months or in harsh environment, long term storage practices should be followed per the Manufacturer's operation and installation manuals.

3.03 START-UP FIELD SERVICES

A. Pre-Startup Preparations

1. Documentation & Verification
    a. Review pump submittals, drawings, and installation & operation manuals.
    b. Confirm model, bowl assembly, impeller material, and shaft configuration.
    c. Verify nameplate data (HP, RPM, voltage, phase, service factor).
    d. Check alignment tolerances per manufacturer or API/ANSI requirements.
2. Safety
    a. Lockout/tagout (LOTO) of electrical supply before inspection.
    b. Confirm confined space requirements (especially wells).
    c. Inspect site for hazards, ensure lift rigging is rated for pump weight.

B. Mechanical Inspection

1. Pump Assembly
    a. Inspect the pump's column, line shaft, and bowl assembly prior to startup.
    b. Verify correct shaft rotation by hand ("bump test" later confirms electrically).
    c. Check shaft straightness (TIR) if required by spec.
    d. Confirm proper installation of line-shaft bearings (open or enclosed).

e. Check impeller setting (lift, clearance) per manufacturer.

2. Coupling
   a. Verify the motor-to-pump coupling gap and engagement.
   b. Ensure the coupling bolts are torqued to specification.
   c. Confirm proper lubrication of the thrust bearing (if external).
3. Plumbing
   a. Inspect discharge piping, isolation valves, and check valves for correct installation.
   b. Confirm air-release and pressure relief valves are in place and functional.
   c. Verify pressure gauges, flow meters, and transducers are installed correctly.
4. Base
   a. The pump base/discharge head assembly shall be lowered carefully onto the pre-leveled sole plate using the manufacturer-provided lifting points. Care shall be taken not to damage the machined mounting surfaces or the mounting studs.
   b. Because the sole plate is pre-leveled, no shims shall be used between the machined face of the pump base and the machined face of the sole plate unless explicitly directed by the pump manufacturer. The two machined surfaces shall achieve direct metal-to-metal contact.
   c. The verticality of the pump column and shaft shall be verified. The pump shaft shall be plumb within 0.005 inches per foot of length.
   d. Once alignment and plumbness are confirmed, the hold-down nuts securing the pump base to the sole plate shall be tightened evenly in a crisscross pattern to the manufacturer's specified torque value.
   e. Flanged pipe connections to the pump base/discharge head shall be made only after the base is fully torqued to the sole plate. Piping shall be independently supported to ensure no piping strain or stress is transmitted to the pump base.

C. Electrical & Controls Verification

1. Test insulation resistance (megger test) on motor windings.
2. Verify proper voltage, phase rotation, and starter configuration.
3. Conduct control panel checks:
   a. Overload settings
   b. VFD programming (if applicable)
   c. Soft starter parameters
   d. Pump protection features (low water, overtemp, vibration sensors)
4. Verify grounding and bonding per NEC.

D. Pump Priming & Well/Source Checks

1. Confirm pump column and shaft lubrication type (water/oil) and fill as required.
2. Ensure source water level is adequate for pump NPSH requirements.
3. Check for obstructions or debris in the well casing.
4. Verify foot valve or check valve orientation.

E. Initial Startup (No Load / Bump Test)

1. Perform momentary jog (bump) to verify:
    a. Correct rotation (MUST MATCH PUMP ARROW)
    b. No abnormal noises
    c. Proper coupling integrity
2. If wrong rotation: swap phases and re-test.

F. Full Startup & Operational Testing

1. Startup Sequence
    a. Open discharge valve partially (depending on manufacturer guidelines).
    b. Energize pump and slowly ramp to full speed or operating frequency.
    c. Open discharge valve to required flow.
2. Record Operating Parameters
    a. Discharge pressure
    b. Suction level (static & pumping level)
    c. Flow rate (gpm or L/s)
    d. Motor amps at various loads
    e. Motor voltage
    f. Vibration readings
    g. Bearing/lube oil temperature (if enclosed shaft)
3. Pump Performance Verification
    a. Compare recorded data with:
        1) Pump performance curve (head vs. flow)
        2) Motor load curve
        3) Design conditions
    b. Confirm the pump is operating at the intended duty point.

G. Mechanical & Structural Checks (During Operation)

1. Inspect for abnormal vibration or noise.
2. Check for leaks at the discharge head, gland, or mechanical seal.
3. Confirm thrust bearing temperatures remain within manufacturer limits.
4. Verify no excessive shaft movement or coupling misalignment.
5. Inspect discharge piping for movement, water hammer, or resonance.

H. Controls & Protection Testing

1. Low-water level shutdown test
2. Vibration shutdown test (if sensor-equipped)
3. Motor overload protection test
4. Emergency stop functionality
5. VFD ramp-up/ramp-down verification
6. Pressure/flow control PID tuning (if automated)

I. Shutdown Procedure

1. Slowly close discharge valve to normal shutdown position.
2. De-energize motor and allow pump to coast down.
3. Inspect pump and motor for temperature rise, leaks, or vibration issues post-run.

J. Final Documentation & Turnover

1. Provide startup log including:
   a. Flow, head, power consumption
   b. Vibration data
   c. Water level readings
   d. All control settings
2. Note any deficiencies or corrective actions.
3. Provide recommendations for ongoing operation & maintenance

The pump manufacturer shall include two days of start-up field services with the proposal for the purpose of supervising the start-up and instructions of proper maintenance and operations.

Service Provided By Factory Representative	Time on Site
Inspect and Approve Installation	½ Day
Supervise Initial Adjustment	½ Day
Supervise Field Run Test	½ Day
Instruct Owner in Proper Start-Up and O&M	½ Day
O&M	0 Day

The contractor shall be responsible for any additional time on site for improper functioning or retesting.

END OF SECTION

SECTION 11306
LUBRICATION PUMPS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. National Fire Protection Association (NFPA):
   a. 70, National Electric Code, Article 500.
   b. 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

2. American Society for Testing and Materials (ASTM) International:
   a. A 48: Standard Specification for Gray Iron Castings.
   b. A240/A240M: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
3. Hydraulic Institute: Current Standards.
   a. HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.

1.2 DEFINITIONS

A. Terminology about pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.3 SUBMITTALS

A. Shop Drawings:

1. Make, model, weight, and horsepower of each equipment assembly.
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
3. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and net positive suction head required (NPSHr) at the guarantee point.

4. Power and control wiring diagrams, including terminals and numbers.
5. Manufacturer's data sheets for the pump-mounted vibration and temperature monitoring device specified in Article 2.2, including measuring ranges, output signal specifications, and PLC wiring diagrams.
6. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
7. Factory finish system.
8. Pump Outline Drawing.
9. Station Drawing for Accessories.
10. Electrical Motor Data.
11. Typical Installation Guides.
12. Technical Manuals and Parts List.
13. Printed Warranty.
14. Management system certificate ISO 9001.
15. Manufacturer's Equipment Storage Recommendations.
16. Manufacturer's Standard Recommended Start-Up Report Form.

B. Quality Control Submittals:

1. Factory Functional and Performance Test Reports and Log.
2. Manufacturer's Certification of Compliance that the factory finish system is identical to the requirements specified herein.
3. Special shipping, storage, protection, and handling instructions.
4. Manufacturer's printed installation instructions.
5. Manufacturer's Certificate of Proper Installation.
6. Suggested spare parts list to maintain the equipment in service for a period of 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
7. List special tools, materials, and supplies furnished with equipment for use before and during startup and for future maintenance.
8. Operation and maintenance manual.

1.4 EXTRA MATERIALS

A. Furnish for each set of pumps:

1. One (1) mechanical seal for each pump.

2. One complete set of any special tools required to dismantle the pump.
3. One (1) basic repair kit for each pump.
4. One (1) bearing set for each pump.
5. One (1) complete impeller stack (all stages) for one pump.

PART 2 PRODUCTS

2.1 GENERAL

A. The station shall be equipped with 2 lubrication pumps:

1. Two (2) Goulds 1SV13GD4F60N pumps equipped with a 1.5 HP motor, capable of operating on a 460 volts, 3-phase, 60 hertz voltage supply, 3500 RPM or approved equal.
   a. Each pump shall be capable of delivering 4 US gpm at a total dynamic head of 380 feet.
   b. The pump shall feature round flanges (AISI 304/Cast Iron Class 250/300).

B. Pump Body Material shall be Cast Iron (ASTM A48 Class 35B or 40B) and Impeller Material shall be Stainless Steel (AISI 304).

C. Pump and Electrical Driver: Meet requirements for class, group, and division location in accordance with NFPA 70.

D. The pump shall be capable of operating without any limitation between 50% and 125% of the Best Efficiency Point (B.E.P) of the performance curve.

E. The pump shall utilize a mechanical seal with a Carbon rotating face, Silicon Carbide Graphite Filled stationary face, and Viton elastomers.

2.2 PROTECTIONS

A. Pump-Mounted Condition Monitor: Each pump shall be furnished with a vibration and temperature monitoring device mounted directly on the pump/motor unit, compatible with the pump model furnished (Xylem e-SV monitoring system or approved equal), with the following minimum characteristics:

   a. Vibration: Overall velocity, 0 to 1.0 inches per second (in/sec) RMS, frequency response 10 Hz to 1,000 Hz.

   b. Temperature: Pump/motor bearing housing surface temperature, measuring

range 32 to 212 degrees F (0 to 100 degrees C) minimum.

c. Outputs: Isolated 4-20 mA DC signals for vibration and for temperature, wired to the PLC, plus high-vibration and high-temperature alarm contacts with field-adjustable setpoints.

d. Enclosure: NEMA 4X, suitable for the area classification indicated.

B. Standard Control Panel: The three-phase motor shall be provided with a magnetic starter with properly sized thermal overloads in all three legs, phase-loss and phase-unbalance protection, and dry-run protection. Variable speed operation is not required.

2.3 ACCESSORIES

A. Lifting Lugs: Equipment weighing over 100 pounds.

B. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests and Adjustments: Test all equipment and control panels identical to that furnished.

B. Factory Test Report: Include test data sheets, curve test results, and performance test logs, certified correct by a registered professional engineer.

C. Functional Test: Run each pump for 30 minutes at pumping conditions corresponding to maximum motor load.

D. Performance Test:

1. Conduct on each pump.
2. Perform under actual or approved simulated operating conditions.
3. Test for a continuous period at intervals of 15 min: 3-hour period without malfunction.
4. Test Log: Record the following:
   a. Total head.
   b. Capacity.
   c. Horsepower requirements.
   d. Driving motor voltage and amperage measured for each phase.
5. Throttle discharge valve to obtain pump data points on the curve at 2/3, 1/3, and shutoff conditions.

PART 3 EXECUTION

3.1 INSTALLATION

A. Installation in accordance with the manufacturer's printed instructions.

B. Connect suction and discharge piping without imposing strain on pump flanges.

C. Anchor Bolts: Accurately place using equipment templates.

3.2 FIELD QUALITY CONTROL

A. Functional Test: Conduct on each pump.

1. Alignment: Test complete assemblies for correct rotation, proper alignment, and quiet operation.
2. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.

B. Performance Test: In accordance with Hydraulic Institute Standards.

3.3 MANUFACTURER'S SERVICES

A. After installation, a pump station start-up shall be performed by the installing contractor under the supervision of the manufacturer's authorized representative. 4 hours of field service shall be provided by an authorized, factory-trained representative of the pump manufacturer. Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing, and activation of the Pump Manufacturer's Warranty. Test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

B. See Section 01640, MANUFACTURERS' SERVICES and Section 01650, FACILITY STARTUP.

END OF SECTION

SECTION 13300
I&C – GENERAL PROVISIONS

PART 1 GENERAL

1.01 DEFINITIONS

A. The Puerto Rico Aqueduct and Sewer Authority (PRASA) is a public corporation and instrumentality of the Government that owns and operates Puerto Rico's public water supply and wastewater systems.

B. Applications Engineering System Supplier (AESS): The entity that provides all programming, configuration, and related services for the control system equipment supplied by the PCSS.

C. Automation Engineer: An automation engineer is an individual who improves the efficiency of various manufacturing and computer systems by automating certain parts of the systems to do work on their own.

D. Contractor: Refer to General Conditions definitions.

E. Human Machine Interface (HMI): A software-based user interface with supervisory-level control and machine-level equipment.

F. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

G. ISA CCST: Certified Control Systems Technician granted by the International Society of Automation.

H. Leadership in Energy and Environmental Design (LEED): A green building certification indicating that a building was designed and constructed to be environmentally responsible and use resources efficiently.

I. LCP: Local control Panel located near the equipment to be controlled. LCP functions can be something being done at:

   1. VFD: Variable Frequency Speed Driver.

   2. MCC: Motor Control Center.

   3. Equipment Console: Panel to locally operate equipment with multiple control devices.

J. Maintenance of Plant Operations (MOPO): A construction plan that prevents or limits process disruptions during construction.

K. Operator Interface Terminal (OIT): A hardware component of the SCADA system used for device-level control and monitoring.

L. Operator Workstation (OWS): A hardware component of the SCADA system used for supervisory level control and monitoring.

M. Original Equipment Manufacturer (OEM): An original equipment manufacturer is a company whose goods are used as components in another company's products, then sells the finished item to users.

N. Owner's Representative: Refer to General Conditions definitions.

O. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

P. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

Q. Supervisor Control and Data Acquisition (SCADA): Hardware and software components used for high-level supervisory monitoring of industrial processes. Typical devices in the SCADA network include computers (OWS), PLCs, Ethernet switches, OITs, and HMIs.

R. Section 1334X “Sections for Instruments Hardware”: The X in the number indicates all spec sections starting with the first four numbers (indicating a category described in the accompanying text) are included in the reference.

1.02 SCOPE OF WORK

A. Section includes the services of a Process Control System Supplier (PCSS) to provide all materials, equipment, labor, and services required to achieve a fully integrated and operational system as specified herein in “Related Requirements” under this Article, and in related drawings, except for those services and materials expressly noted.

B. Under this contract, the Process Control System Supplier (PCSS) services will be provided by the Contractor.

C. Application Engineering Systems Provider (AESS) programming services may be performed by PCSS programming staff or, alternatively, PCSS may engage an approved qualified third party; both must comply with section 1.05.A.4 of this specification.

D. Effective coordination of PCSS work with AESS work during construction is required to successfully integrate control equipment. Both must reserve the time necessary to coordinate the project schedule as specified throughout Division 13.

E. Related Requirements:

Section No	Title
13302	I&C – Testing
13303	I&C – Training
13305	I&C – Control Descriptions
13306	I&C – General Applications Engineering Services
13311	I&C – PLC Hardware and Software
13315	I&C – HMI System Software
13320	I&C – Control and Data Network Equipment
13325	I&C – Antenna Support Structures and Lightning Protection
13330	I&C – Control Panels and Panel-Mounted Equipment
13332	I&C – Surge Suppressors
13335	I&C – Uninterruptible Power Supply (Single-Phase and DC-DC)
13340	I&C – Instruments
13341	I&C – Flow Devices
13342	I&C – Level Devices
13343	I&C – Pressure Devices
13344	I&C – Temperature Devices
13350	I&C – Vendor Package System Controls Integration

F. Items expressly excluded from the scope include the following:

1. Generator Startup.

G. I&C Scope.

1. Furnishing and installation of the instruments and analyzers shown in the construction drawings.

2. Furnishing and installation of wiring and conduits shown in the construction drawings.

3. Retrofitting or upgrading control panels shown in construction drawings.

4. Furnishing and installation of new control panels or remote input/output panels shown in the construction drawings.

5. Provide the required integration to the new plant control panels.

6. Provide the required network patch cord (Fiber or Cooper) to the new plant control panels systems.

7. Prepare a Detailed Design System Specification to be used as the basis of design for system integration.

H. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, shall be included whether they are shown on the Drawings or not.

I. All equipment and installations shall satisfy applicable Federal and local codes.

J. Use the equipment, instrument, and loop numbering scheme shown on the Drawings and specifications to develop the submittals. Only deviate from or modify the numbering scheme with the Engineer's approval.

1.03 RELATED WORK

A. I&C conduit systems are specified in Electrical Drawings.

1.04 SUBMITTALS

A. General Requirements:

1. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.

2. Submittals shall be complete, giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.

3. Substitutions on specified functions or equipment types shall not be accepted unless specifically noted.

4. Separate submittals shall be made for each submittal listed below.

B. Qualifications Submittal

1. Submit, within 90 days, detailed information on staff and organization to show compliance with the Quality Assurance requirements of this Section. The Qualifications submittal shall be submitted and approved before further submittals are accepted. Failure to meet the minimum requirements shall be grounds for rejection as a PCSS. The Qualifications Submittal shall, as a minimum, contain the following:
   a. Copies of ISA CCST Level 1 certificate for all field technicians or resumes demonstrating field experience or Combination of education, certification, and experience. PE license in Control Systems or PE with 5 or more years working with Control Systems.
   b. Notarized statements from the firm’s financial institution demonstrating the ability of the firm to meet the obligations necessary for the performance of the work.

c. Copy of UL-508A certificate for panel fabrication facilities. Confirmation of pursue UL label via UL Field evaluation Services.
d. Project references for municipal water industry as defined in the Quality Assurance paragraphs.
e. Documentation to demonstrate the ability to complete this project, including resumes of key staff, details on engineering, design, fabrication, and field service capacity, and location of staff responsible for responding to the site within four hours to resolve startup issues.

C. Project Plan, Deviation List, and Schedule Submittal

1. Submit a Project schedule plan after the Notice to Proceed. The Project Plan shall be submitted and approved before further submittals shall be accepted. The Project Plan shall, at a minimum, contain the following:
   a. Overview of the proposed control system describing the understanding of the project work, a preliminary architecture drawing, interfaces to other systems, schedule, startup, and coordination. A discussion of a startup, replacement of existing equipment with new, switchover (Maintaining Plant Operations during system transition), approach to testing and training, and other tasks as required by these specifications shall be included as applicable.
   b. Preliminary list of HMI software, PLC software, and PLC hardware, including version numbers, solely to determine compliance with the Contract Documents requirements before beginning system programming development. Reviewing and approving software and hardware systems as part of this Project Plan stage shall not relieve the PCSS of meeting all the functional and performance requirements of the system as specified herein.
   c. Substitution of the manufacturer or model of these systems after the submittal is approved is not allowed without Engineer approval.
   d. Project personnel and organization include the PCSS project manager, project engineer, and lead technicians. Include the resumes of each of these individuals and specify in writing their commitment to this project. These do not need to be submitted only if already submitted in the Qualification submittal.
   e. Sample formats of the shop drawings to be submitted conforming with the requirements of the Specifications. At a minimum, include samples of panel fabrication drawings, loop, and I/O wiring diagrams.
   f. PCSS acknowledges the requirement to use the PRASA Automation standards.

2. A Deviation List shall clearly define Exceptions to the Specifications or Drawings. The Deviation List shall consist of a paragraph-by-paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for the exception, the exact nature of the exception, and the proposed substitution so that the Engineer may make an evaluation. If no exceptions are taken to the specifications or drawings, the PCSS shall make a statement as such. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.

3. Project schedule shall be prepared in Gantt chart format, clearly showing task linkages for all tasks, and identifying critical path elements. The PCSS schedule

must be based on the Contractor schedule. The project schedule must cover all field installation, testing, and start-up milestones tasks. The project schedule shall illustrate I&C-related major project milestones, including the following:

a. Schedule for all subsequent project submittals. Include the time required for Contractor submittal preparation, the Engineer's review time, and at least two complete review cycles.
b. Proposed dates for all project coordination meetings.
c. Hardware purchasing, fabrication, and assembly (following approval of related submittals).
d. Software purchasing and configuration (following approval of related submittals).
e. Shipment of instruments and control system equipment.
f. Installation of instrument and control system equipment.
g. Testing: Schedule for all testing.
h. Schedule for system cutover, startup, and going online for each major system. At a minimum, include the schedule for each process controller and HMI server/workstation provided under this Contract.
i. Schedule for all training, including submittal and approval of O&M manuals, factory training, and site training.
j. Progress schedules shall represent a practical plan to complete the Work within the Contract Time and shall convey the Contractor's intent as to the manner of prosecuting the progress of the Work.
    1) The scheduling and execution of construction in accordance with the Contract Documents are the responsibility of the Contractor. The Contractor shall involve and coordinate all Subcontractors and Suppliers in the development and updating of progress schedules.
    2) The submittal of progress schedules shall be understood to be the Contractor's representation that the progress schedule meets the requirements of the Contract Documents and that the Work is expected to be executed in the sequence and duration indicated in the progress schedule.
    3) The Project Schedule shall be computer produced using the Critical Path Method ("CPM") format. The schedule shall be computer generated utilizing an Owner approved project scheduling software, as indicated in the Contract Documents, such as Primavera, Microsoft Project.
k. The Project Schedule shall be updated monthly and submitted.
l. The Progress Schedule will be acceptable to Owner's Representative if in accordance with the Agreement it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Time.
m. Four-week work plan. - A schedule in calendar time-scaled bar chart format depicting the Contractor's intended work activities for the upcoming four (4) week period shall be submitted on a monthly basis and shall be due on the day of the project's weekly meeting. Each activity of one (1) day or more in duration shall be indicated.

D. Input/Output (I/O) List Submittal

1. Submit after the Notice to Proceed, a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.

2. I/O list shall be based on the P&IDs, the Drawings, the design I/O list, and requirements in the Specifications.

3. The I/O list shall be submitted in a Microsoft Excel readable electronic file format and an 8-1/2 inch by 11-inch hard copy.

4. The I/O list shall reflect all active and spare I/O points. Add points to accommodate spare I/O as required in the specifications.

5. The I/O list shall be arranged such that each control panel has a dedicated worksheet. At a minimum, the I/O worksheet shall include the following information:
   a. TAG NUMBER(S): As indicated on the drawings, the identifier is assigned to a device that performs a function in the control system. As part of this information, the loop number of the tag shall be broken out to allow for sorting by the loop.
   b. DESCRIPTION: A description of the device's function (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.
   c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.
   d. Physical POINT ADDRESS: Rack, Slot, and Point (or Channel) assignment for each I/O point.
   e. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI - Analog Input, PI - Pulse Input, or PO – Pulse Output.
   f. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or the state at which the value of the discrete points is "1."
   g. ENGINEERING UNITS: The engineering units associated with the Analog I/O.
   h. ALARM LIMITS: Include alarm limits based on the control descriptions and the Drawings.
   i. Delay: Include time delay for alarm triggering
   j. Deadband: Include deadband for setpoint and alarm limits.
   k. P&ID – the P&ID or drawing where the I/O point appears. Mark as "NA" (Not Applicable) if the I/O point is derived from a specification requirement and is not on the P&IDs.

6. The I/O list shall be sorted in order by:
   a. Physical location
   b. I/O Type
   c. Loop Number
   d. Device Tag

7. Once the I/O list is approved, the PLC I/O addresses shall only be modified with approval by the Engineer.

8. For I/O layout requirements, see the PLC Hardware and Software Section 13311.

E. Communication Map Submittal List

1. Submit after the Notice to Proceed, a complete list of data interchange or memory maps for all PLC and Devices connected to the Plant PLC as shown in the system Architecture.

2. Submit PLC to PLC communication memory map including as a minimum, the following:
   a. Tag Name
   b. Description
   c. Producer or consumer of data

3. Submit Ethernet or Fieldbus Device to PLC communication memory map, including, as a minimum, the following:
   a. Tag Name
   b. Description
   c. Producer or consumer of data

F. Field Instruments Submittal

1. Field instrumentation submittal must be provided separately from other submittals.

2. Refer to the Instruments Sections for submittal requirements.

G. Hardware and Software Packages Submittal

1. Refer to the sections below for specific Hardware and Software Packages submittal requirements.
   a. 13311 I&C – PLC Hardware and Software
   b. 13315 I&C – HMI System Software
   c. 13320 I&C – Control and Data Network Equipment
   d. 13325 I&C – Antenna Support Structures And Lightning Protection
   e. 13330 I&C – Control Panels and Panel-Mounted Equipment
   f. 13332 I&C – Surge Suppressors
   g. 13335 I&C – Uninterruptible Power Supply (Single-Phase And DC-DC)
   h. 13340 I&C – Instruments
   i. 13341 I&C – Flow Devices
   j. 13342 I&C – Level Devices
   k. 13343 I&C – Pressure Devices

2. I&C - For each hardware and software package component specified in the sections above, submit a cover page that lists, at a minimum, the date,

specification number, product name, manufacturer, model number, Location(s), and power required. The preferred format for the cover page is ISA-TR20.00.01-2007, an equivalent data sheet in other formats will be accepted if provided with all the required information.

H. Panel Layout Drawings and Wiring Diagrams Submittal

1. Control Panels submittal must be provided separately from other submittals.

2. Refer to Section 13330 Control Panels and Panel-Mounted Equipment for submittal requirements.

I. Testing Plan Submittals

1. Refer to Section 13302 Testing for specific testing submittal requirements.

J. Training Plan Submittals

1. Refer to Section 13303 Training for specific training requirements.

K. Spares, expendables, and test equipment Lists Submittal

1. Submit a list of descriptive literature for spares, expendables, and test equipment.

2. Submit a list of descriptive literature for additional spares, expendables, and test equipment the manufacturer recommends.

3. Submit unit and total costs for the additional spare items specified or recommended for each subsystem.

L. Operations and Maintenance (O&M) Manuals

1. Furnish O&M manuals as specified herein. If the PCSS performs the AE work, provide AE Manuals as Section 13306 “General Application Engineering Services” specified.

2. The operations and maintenance manuals shall, at a minimum, contain the following information:
   a. Table of Contents
      1) A table of contents shall be provided for the entire manual, with the specific contents of each volume clearly listed. The complete Table of Contents shall appear in each volume.
   b. Instrument and Equipment Lists
      1) The following lists shall be developed in Microsoft Excel format and provided as a hard copy in O&M and electronically on a USB thumb drive.
      2) An instrument list for all devices supplied, including tag number, description, specification section and paragraph number, manufacturer,

model number, serial number, range, span, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.

3) An equipment list for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, serial number, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.

c. Equipment Operations and Maintenance Information

1) ISA-TR20.00.01-2007 data sheets shall be provided for all field instruments. For non-field instrumentation devices, provide a cover page for each device, piece of equipment, and Original Equipment Manufacturer (OEM) software that lists the date, specification number, product name, manufacturer, model number, location (s), and power required. The preferred format for the cover page is ISA-TR20.00.01-2007, a general data sheet; however, other formats will be acceptable, provided they contain all the required information.

2) Vendor O&M documentation for each device, piece of equipment, or OEM software shall be either new documentation explicitly written for this project or modified standard vendor documentation. All standard vendor documentation furnished shall have all portions clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply to the specific model supplied shall be removed.

3) Provide the record documentation of the system audit as specified in the 13302 Testing section.

4) Include the calibration forms developed as specified in the 13302 Testing section.

5) Alarm Documentation: Submit alarm documentation as approved in section 13306-3.7.

d. As-Built Drawings

1) Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system is connected to, including terminal points of equipment not supplied by the PCSS . Provide electronic files for all drawings produced. Provide drawings in AutoCAD ".dwg" format and in Adobe Acrobat format.

2) As-built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system. Any errors in or modifications to the system resulting from the Factory and Functional Acceptance Tests shall be incorporated in this documentation.

e. Original Licensed Software

1) Submit original software licenses and keys for all software provided under this Contract. Submit original paper-based and electronic documentation for all software provided. Submit license agreement information, including serial numbers, license agreements, User Registration Numbers, and

related information. All software provided under this Contract shall be licensed to the Owner at the time of purchase. Provide media in software sleeves within the O&M manual.

f. Electronic O&M Information
   1) In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals and data sheets, along with any software back-up of configuration files, on DVD or USB thumb drive. Electronic documents shall be supplied in Adobe Acrobat format.
   2) Provide electronic files for all custom-developed manuals, including training manuals. The text shall be supplied in Microsoft Office and Adobe Acrobat formats.
   3) Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and Adobe Acrobat format. Drawings shall be provided using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.
   4) Each computer system hardware device shall be backed up onto DVD or USB thumb drive after substantial completion and shall be turned over to the owner.
   5) Provide of all training videos in digital format as specified in the 13303 Training section.

1.05 QUALITY ASSURANCE

A. The Process Control System Supplier (PCSS) shall be a regularly engaged in designing and installing instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all the following criteria:

1. Employs personnel on this project who have completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. Key personnel shall hold ISA CCST Level 1 certification or have at least five (5) years of verifiable plant startup experience. Key personnel shall include, as a minimum, the lead field technician.

2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five (5) years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation. All references shall be for projects where the PCSS’s contract was of a similar size to this project.

3. Has been actively engaged in the type of work specified in this Specification Section for at least five (5) years.

4. Applications Engineering Services must be provided by an AESS or PCSS programming staff with a minimum of 5 years of experience or relevant certification in Network components, PLCs and SCADA system software and applications as required for the project.

B. The PCSS shall maintain a permanent, fully staffed, and equipped service facility on the island of Puerto Rico with full-time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the PCSS shall be capable of responding to on-site problems within twelve (12) hours of notice. Provide an on-site response within four (4) hours of notification, starting two months before the scheduled start up to two months after startup completion.

C. The PCSS shall provide evidence of having a panel shop specialized in industrial automation system control panel fabrication under UL-508A and have a minimum of five (5) years documented experience in such type of activities.

D. PCSS shall hold a valid UL-508A certification for their panel fabrication facility.

E. The PCSS's employees need not install the instrumentation system; however, the PCSS, as a minimum, shall be responsible for the technical supervision of the installation by providing on-site supervision to the installers of the various components.

1.06 REFERENCE STANDARDS

A. Publications are referred to in the text by basic designation only. That edition shall be used where a date is given for reference standards. Where no date is provided for reference standards, the latest edition in effect at the time of bid opening shall apply.

B. International Society of Automation (ISA)

1. ANSI/ISA 5.1-2022: Instrumentation Symbols and Identification

2. ANSI/ISA S5.2 Binary Logic Diagrams for Process Operations

3. ISA S5.3 Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.

4. ISA S5.4, Instrument Loop Diagrams.

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

6. ISA RP60.3, Human Engineering for Control Centers

7. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers

8. ISA/IEC-62443, Industrial Automation, and Control Systems Security

C. National Electrical Manufacturers Association (NEMA)

D. National Fire Protection Agency (NFPA)

1. NFPA 70, National Electrical Code (NEC).

2. NFPA 79, Industrial Control Equipment.

E. Underwriters Laboratories, Inc. (UL)

1. UL 508 - Industrial Control Equipment - for custom fabricated equipment

2. A nationally recognized testing laboratory approved by the Authority having jurisdiction may substitute for UL listing on commercial off-the-shelf products.

1.07 COORDINATION MEETINGS

A. Schedule the mandatory coordination meetings as described herein. The meetings shall be held at the Owner's designated location. They shall include attendance by the Owner, Owner representative, the Contractor, the PCSS's, Project Engineer, the AESS Project Engineer, and the Vendor Package System Controls provider, if applicable. Other Division specifications may require additional meetings. Prepare and distribute an agenda for this meeting at least one week before the meeting date. Meeting shall be scheduled for at least one (1) week before the requested meeting date.

1. A project kickoff coordination meeting shall be held within two weeks of submitting the Project Plan. The purpose of the meeting shall be to discuss the PCSS's Project Plan, summarize the PCSS's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware and software-related issues; and request any additional information required from the Owner. The meeting will last up to one business day.

2. A submittal review coordination meeting shall be held after the Hardware, Panel Drawing, and Loop Drawing Submittal package has been reviewed by the Engineer and returned to the PCSS. This meeting shall review comments on the submittal package; refine scheduled deadline dates; coordinate equipment installation activities; and provide a forum for any further coordination between the PCSS, AESS, and Vendor Package System Controls provider;

3. Regular on-site meetings when the PCSS staff is at the plant site.

4. All meetings must be documented with a meeting minute, items discussed, action to be taken, responsible, and date of the pending item and actions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Shipping Precautions

1. After completion of shop assembly, factory test, and approval of all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy-duty (5-mile) polyethylene envelopes or secured sheeting to protect from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing the protective cover. Boxed weights shall be shown on shipping tags and instructions for unloading, transporting, storing, and handling at the job site.

2. Manufacturer's special instructions for field handling, storage, and installation required for protection, shall be securely attached to the packaging for each piece of equipment before shipment. The instructions shall be stored in resealable plastic bags or other means of protection.

3. The HMI control and monitoring equipment shall be shipped to the site once the control room areas comply with specified ambient temperature and humidity. Have qualified personnel accept the equipment on delivery and supervise unloading within the control room areas.

4. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the owner.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Field Instrument Tags

1. See Section 13340 Instruments.

B. Panel Nameplates

1. See Section 13330 Control Panels and Panel-Mounted Equipment.

1.10 WARRANTY

A. Provide warranty per Warranties and Bonds, and as specified in PRASA general conditions.

1.11 MAINTENANCE CONTRACT

A. A written proposal for a maintenance contract executed by the PCSS shall be provided to the Owner for on-site preventive maintenance services related to the Instrumentation and Control system. The cost of this maintenance contract shall not be included in the Contract Price.

B. This proposal shall be provided after final acceptance to enter a contract for annual maintenance after the first year of maintenance. Standard per diem rates for providing breakdown service shall be outlined in the contract. Such rates shall be fair and reasonable and reflect the lowest rates offered to the most favored customers.

C. This maintenance contract shall include all labor, parts, and emergency calls providing an on-site response within twenty (24) hours, to provide complete system maintenance for a period of one year after the date of Substantial Completion of the system for all equipment and software provided as part of the PCSS scope of work.

D. Provide software updates throughout the maintenance contract period. Provide latest official released version for all software provided under this Contract. Owner shall have the latest software releases at the end of the maintenance contract period.

E. The maintenance contract shall also include a minimum of four (4) preventive maintenance visits by qualified service personnel of the Supplier who is familiar with the type of equipment provided for this project. Each preventive maintenance visit shall include routine adjustment, calibration, cleaning, lubrication of system equipment and verification of correct operation.

F. Visits the sites to correct deficiencies under warranty shall not be included in this preventive maintenance service contract.

G. Emergency maintenance procedures or plant visits may coincide with a preventive maintenance visit. However, they shall not replace the work intended to be performed during a preventive maintenance visit. The Supplier shall have full responsibility for the system hardware preventive and corrective maintenance.

H. During the one-year maintenance period, observation of maintenance operations by plant personnel and the instruction of said personnel in the details of the maintenance work being performed shall be provided.

1.12 PROJECT/SITE REQUIREMENTS

A. Elevation: Equipment shall be designed to operate at the project ground elevation.

B. Temperature:

1. Outdoor areas' equipment shall operate, between -22 to 122˚F degrees ambient minimum.

2. Equipment located in indoor locations shall operate between 50 to 95˚F degrees ambient minimum.

3. Storage temperatures shall range from 32 to 122˚F degrees ambient minimum.

4. Additional cooling or heating shall be furnished if required by the equipment specified herein.

C. Relative Humidity. Air-conditioned area equipment shall operate between 20 to 95 percent relative, non-condensing humidity. All other equipment shall operate between 5 to 100 percent relative condensing humidity.

D. Wind:

1. All Outdoor panels and equipment support must be designed to a wind speed maximum of 180 mph or what the Puerto Rico Building code established.

1.13 SPARE PARTS

A. All spare parts shall be wrapped in bubble wrap, sealed in a polyethylene bag complete with a dehumidifier, then packed in cartons and labeled with indelible markings. Complete ordering information, including manufacturer's contact information (address and phone number), part name, part number, part ordering information, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The spare parts shall be delivered and stored in a location directed by the PRASA or Engineer.

B. Furnish one of each installed Surge protection device.

C. Other spare parts are specified in each section. An overview follows:

1. Devices within Control Panels - See Control Panels and Panel-Mounted Equipment section (Sections 13330).

2. PLC spare parts - See the PLC section (Section 13311).

3. Network and Communications System - See the Control and Data Network Equipment section (Section 13320).

4. Instrument-related Spare Parts – see the Instrument section(s) (Sections 1334X).

1.14 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Due to the rapidly evolving technology of the equipment specified herein, the requirements specified are to establish a baseline for the type of equipment required. Provide the current version of hardware and software of similar specification at the time of purchase equivalent in cost to that which is specified. The procedure for submitting and releasing the equipment is as follows:

1. PCSS to submit for approval the required data for the equipment as part of the Control System Architecture Instrumentation, and Packages Submittal.

2. Order equipment as late as possible, depending on the construction schedule to provide the latest equipment. Just before ordering, resubmit for approval the required data of the latest available hardware and software equivalent in cost to that specified.

PART 2 PRODUCTS

2.01 GENERAL

A. All instrumentation and electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or approved equal coating to prevent dust, moisture, and fungus contamination. The field-mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

B. All control panels provided under this contract must be compliant with UL-508A, ensuring adherence to stringent safety and performance standards for industrial control panel assemblies. The panels shall undergo thorough panel shop internal quality inspection, verifying proper component selection, all components must be UL-listed, wiring, and terminal sizing, as well as appropriate short circuit current ratings, etc. The contractor shall also maintain comprehensive documentation practices, including detailed schematics, bill of materials, and specific instructions for proper installation and servicing to be included as part of the panel's submittal.

C. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks unless otherwise noted. Fasteners for securing control panels and enclosures to walls and floors shall be either hot-dipped galvanized after fabrication or stainless steel. Provide stainless steel fasteners only in corrosive areas rated NEMA 4X on the Drawings.

D. All equipment, cabinets, and furnished devices shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer and consist of current equipment models. All equipment provided shall be of modular construction and shall be capable of field expansion.

E. All electronic/digital equipment shall have radio frequency interference protection.

F. Except for field device network-connected devices, all electronic instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet maybe 1-5 VDC (volts direct current).

G. Outputs of equipment that are not of the standard signals as outlined shall have the output immediately raised and converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.

H. All switches have double-pole, double-throw (DPDT) contacts rated at a minimum of 600 VA, unless noted otherwise.

I. Switches and/or signals indicating an alarm, failure or upset condition wired in a fail-safe manner. A fail-safe condition is when an open circuit generates an alarm state (i.e. contact opens).

J. Materials and equipment shall be UL-approved whenever such approved equipment and materials are available.

K. All furnished equipment shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no memory loss and resume regular operation without manual resetting when power is restored unless otherwise noted.

L. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA unless noted otherwise.

M. Electrical 120 VAC

1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where expressly noted. Regulators and power supplies required for compliance with the above shall be provided between the power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

N. Electrical 24 VDC

1. Power must be provided from DC/DC UPS, powered by redundant power supply per specification section 13330 I&C - Control Panels and Panel-Mounted Equipment and 13335 Uninterruptible Power Supply (Single-Phase And DC – DC).

O. Power supply shall be from the following vendors:

1. Allen-Bradley
2. Phoenix Contact
3. Sola HD
4. or approved equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Instrumentation and accessory equipment shall be installed in accordance with manufacturer instructions. The indicated locations of equipment, transmitters, alarms, and similar devices indicated are approximate only. The exact locations of all devices shall be approved by the Engineer during construction. Obtain in the field all information relevant to placing process control equipment and in case of interference with other work, proceed as directed by the ENGINEER and furnish all labor and

materials necessary to complete the work in an approved manner at no additional cost to the Owner.

B. Provide brackets and hangers required for mounting of equipment.

C. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded at only one ground point for each shield.

D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, and their connections to the process equipment panels, cabinets, and devices, subject to the Engineer's approval. Certify that field wiring associated with the equipment is installed in accordance with best industry practices.

E. Provide sunshades for equipment mounted outdoors in direct sunlight. Sunshades shall include standoffs to allow air circulation around the cabinet. Orient equipment outdoors to face to the North or as required to minimize the impact of glare and ultraviolet exposure on digital readouts.

3.02 IDENTIFICATION

A. Provide identification system for all PCSS provided hardware, instrumentation, and communication cabling.

3.03 FIELD QUALITY CONTROL

A. Refer to individual hardware and instrument specification sections.

3.04 TESTING

A. Refer to Section 13302 Testing.

3.05 TRAINING

A. Refer to Section 13303 Training.

3.06 PROCESS CONTROLLER INPUT/OUTPUT (I/O) SCHEDULE

A. Process controller I/O schedule itemizes the process controller Local and Remote I/O associated with the hardware provided under this contract. Provide additional I/O signals and hardware as required to furnish a complete and functional system and submit that revised list as defined in the submittal section. Process controller I/O schedule is included in Appendix 13300-A.

B. If assigned in this I/O schedule, do not modify the PLC I/O addresses without approval by the Engineer.

3.07 **STARTUP SERVICE**

A. Refer to Section 13302 Testing.

B. Refer to Section 13303 Training.

C. Refer to PRASA Facilities Start-up Section 016500.

APPENDIX 13300-A

CONTROL SYSTEM INPUT/OUTPUT (I/O) SCHEDULE

This I/O Schedule is included for reference only. The determination of the exact number and type of I/O points shall be the responsibility of the PCSS based on the Drawings, the Specifications, Control Descriptions Section 13305, auxiliary device requirements, and spare requirements.

TAG. NUMBER	P&ID	DESCRIPTION	SIGNAL TYPE	PLC
LI-01-01	PID-102	PIEZOMETRIC LEVEL TRANSMITTER	AI-S	PLC-01
LI-01-02	PID-102	PIEZOMETRIC LEVEL TRANSMITTER	AI-S	PLC-01
LSLL-01-01	PID-102	LOW LEVEL SWITCH, PROTECTS PUMPS PU-01-01 AND PU-01-02	DI-S	PLC-01
XI-01-01	PID-102	PU-01-01 PUMP FEEDBACK	ETHERNET AO	PLC-01
XI-01-02	PID-102	PU-01-02 PUMP FEEDBACK	ETHERNET AO	PLC-01
PIT-01-01	PID-102	PRESSURE TRANSMITTER	AI-S	PLC-01
PSL-01-01	PID-102	LOW PRESSURE SWITCH	AI-S	PLC-01
PIT-01-01	PID-102	PRESSURE TRANSMITTER	AI-S	PLC-01
FQIT-01-01	PID-102	ELECTROMAGNETIC WATER FLOW METER	AI-S	PLC-01
AI-01-10	PID-102	TURBIDITY ANALIZER	ETHERNET AO	PLC-01

FS-01-20	PID-102	LUBRICATION WATER FLOW SWITCH	AI-S	PLC-01
LSLL-01-20	PID-102	LOW LEVEL SWITCH, PROTECTS PUMPS PU-01-03 AND PU-01-04	DI-S	PLC-01
LI-01-20	PID-102	PIEZOMETRIC LEVEL TRANSMITTER	AI-S	PLC-01
PSL-01-20	PID-102	LOW PRESSURE SWITCH	AI-S	PLC-01
PIT-01-20	PID-102	PRESSURE TRANSMITTER	AI-S	PLC-01
XI-01-21	PID-102	PU-01-03 PUMP FEEDBACK	ETHERNET AO	PLC-01
XI-01-22	PID-102	PU-01-04 PUMP FEEDBACK	ETHERNET AO	PLC-01
SV-01-21	PID-102	SOLENOIDE VALVE	AI-S	PLC-01
SV-01-22	PID-102	SOLENOIDE VALVE	AI-S	PLC-01
PIT-01-01	PID-102	PRESSURE TRANSMITTER	AI-S	PLC-01
PIT-01-01	PID-102	PRESSURE TRANSMITTER	AI-S	PLC-01
YA-76-01	PID-102	ATS ALARM	DI	PLC-01
YS-76-01	PID-102	ATS POSITION	DI	PLC-01
LI-76-01	PID-102	DIESEL STORAGE TANK TK-76-01 GUIDED WAVE RADAR LEVEL TRANSMITTER	AI-S	PLC-01
TI-02-10	PID-102	CONTROL ROOM TEMPERATURE TRANSMITTER	AI	PLC-01

EF-04-01	PID-102	EXHAUST FAN START/STOP COMMAND	DO-DRY	PLC-01
GEN-76-01	PID-102	GENERATOR GEN-76-01 EQUIPMENT	MODBUS 485	PLC-01
XI-76-01	PID-102	GENERATOR GEN-76-01 RUNNING SIGNAL	DI-S	PLC-01
XA-76-01	PID-102	GENERATOR GEN-76-01 FAULT MONITOR	DI-S	PLC-01
LSL-76-01	PID-102	MULTI-POINT LEVEL SWITCH, PROTECTS GEN-76-01	DI-S	PLC-01
XI-01-01	PID-102	VFD PU-01-01 RUNNING SIGNAL	ETHERNET AO	PLC-01
XA-01-01	PID-102	VFD PU-01-01 ALARMS	ETHERNET AO	PLC-01
XI-01-02	PID-102	VFD PU-01-02 RUNNING SIGNAL	ETHERNET AO	PLC-01
XA-01-02	PID-102	VFD PU-01-02 ALARMS	ETHERNET AO	PLC-01
FS-01-30	PID-102	PRESSURE RELIEF FLOW SWITCH	AI-S	PLC-01

(1) DI/DO/AI/AO/ETHERNET/MODBUS

END OF SECTION

SECTION 13302
I&C – GENERAL TESTING

PART 1 GENERAL

1.01 DEFINITIONS

A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

C. Human Machine Interface (HMI): A software-based user interface with supervisory level control of machine level equipment.

D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

E. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

F. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

G. Uninterruptible Power Supply (UPS): A device capable of providing emergency battery power when the main power source fails.

H. Factory Testing-Unwitnessed Factory Test (UFT): A test where the PCSS check the system prior to the Engineer and/or PRASA attending the witness testing.

I. Factory Testing-Witnessed Factory Test (WFT): Test where is allow the Engineer and/or PRASA representatives to witness the functionality, performance, and stability of the entire hardware and software system as a complete integrated system.

J. Field Testing-Functional (FT): Test where is check that the process equipment, instrument installation, instrument calibration, instrument configuration, field wiring, control panels, and all other related system components are ready to monitor and control the processes.

K. Field Testing-Performance Test (PT): Test where is allow the Engineer and/or PRASA representatives to witness the actual functionality, performance, and stability of the system while connected to the process equipment.

L. Field Testing-Start-up Test (ST): Test where the system is started-up and running the treatment process in automatic control during the start-up test period without significant interruptions.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to complete the testing of all devices and systems furnished and installed as detailed on the Drawings, and as specified herein.

B. Refer to Section 13300 - I&C-General Provisions for other general requirements.

1.03 RELATED WORK

A. Refer to Section 13300 - I&C-General Provisions.

B. Division 1 Section 016500 "Facility Start-up".

1.04 SUBMITTALS

A. Refer to Section 13300 - I&C-General Provisions.

B. Testing Submittals - Submit, in one submittal, the following testing related documents:

1. Status signoff forms
   a. Develop and submit project specific I/O Status, Interlocks, and Automatic Control Strategy signoff forms to be used during factory and field testing to organize and track each loop's inspection, adjustment, calibration, configuration, and testing status and sign off. Include sign-off forms for each testing phase showing all loops.
      1) Example forms are shown in the Appendices.
      2) Separate forms for factory and field testing can be used, or they can be combined at the discretion of the Process Control System Supplier (PCSS).
      3) Submit testing forms prior to start of testing.

2. Testing Procedures
   a. Submit detailed procedures proposed to be followed for each of the tests specified herein. The test procedures shall serve as the basis for the execution of the required tests to demonstrate that the system meets and functions as specified.
   b. The documents shall be structured in an orderly and easy to follow manner to facilitate an efficient and comprehensive test.
   c. The test procedures shall indicate all pre-testing setup requirements, all required test equipment, and simulation techniques to be used.
   d. The test procedures shall be structured in a cause and effect manner where the inputs are indicated, and the outputs are recorded.

e. The test procedures shall include the demonstration and validation under normal operating conditions and under various failure scenarios as specified in the contract documents.
f. Testing may not start until all Testing Submittals have been approved.

C. Installation Photo Log

1. Previous of the Fuctional Test, Contractor shall submit photos of each instrument, equipment and controller installation for Engineer and PRASA's representation review. Photos shall included equipment tags, model information and shall be taken in a way the Engineer can confirm installation follows design requirements. Fuctional Test may not start until this submittal has been approved.

D. Test Documentation

1. Upon completion of each required test, document the test by submitting a copy of the signed off Testing Status forms. Testing shall not be considered complete until the signed-off forms have been submitted and approved by Engineer. Submittal of other test documentation, including "highlighted" wiring diagrams with field technician notes, are not acceptable substitutes for the formal test documentation.

2. Provide a Test Summary Report indicating that the I&C requirements (PCSS & AESS) meet the intent of design.

1.05 COORDINATION MEETINGS

A. Preinstallation Conference: Refer to Section 13300 - I&C-General Provisions.

B. Conduct a factory testing coordination meeting two weeks prior to factory acceptance testing. The purpose of this meeting is to discuss specifics of PCSS's proposed tests and to provide a forum for coordinating required AESS factory testing. Meeting will last up to one business day.

C. Conduct a field-testing coordination meeting every two weeks prior to start of field acceptance testing. Purpose of this meeting is to discuss specifics of PCSS's proposed tests and to provide a forum for coordinating required AESS field-testing. Meeting will last up to one business day.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 - I&C-General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 - I&C-General Provisions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 - I&C-General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 - I&C-General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 - I&C-General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 - I&C-General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 - I&C-General Provisions.

1.13 SPARE PARTS

A. Refer to Section 13300 - I&C-General Provisions.

1.14 TEST EQUIPMENT

A. Refer to Section 13300 - I&C-General Provisions.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 - I&C-General Provisions.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 TESTING – GENERAL

A. Refer to Section 13300 - I&C-General Provisions.

B. The results of all testing shall be tracked on a project specific status sign-off form or similar document. The PCSS shall be responsible for maintaining the sheet. The Appendix of this section has an example template for this sheet.

C. The tests the PCSS is required to perform are as follows:

1. Factory Testing
    a. Unwitnessed Factory Test (UFT).
    b. Witnessed Factory Test (WFT).

2. Field Testing
    a. Functional Test (FT).

3. Support testing:
    a. Performance Test (PT).
    b. Start-up Test (ST).

D. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment and data, provide all special testing materials and equipment required for a suitable means of simulation.

E. The PCSS shall coordinate all required testing with the Contractor, all affected Subcontractors, the Engineer, and PRASA or PRASA's representative.

F. No equipment shall be shipped to jobsite until the Engineer and/or PRASA has received all Factory Testing results and approved the system as ready for shipment.

G. The Engineer reserves the right to test or re-test any functions.

H. Correction of Deficiencies

1. All deficiencies in workmanship and/or items not meeting specified testing requirements shall be corrected to meet specification requirements at no additional cost to PRASA.

2. Testing, as specified herein, shall be repeated after correction of deficiencies is made until the specified requirements are met. This work shall be performed at no additional cost to PRASA.

3.02 FACTORY TESTING - UNWITNESSED FACTORY TEST (UFT)

A. The purpose of the UFT is for the PCSS to check the system prior to the Engineer and/or PRASA attending the factory testing. This type of testing should be part of any quality firm's internal QA/QC procedures.

B. Temporary isolated network connections will be required to confirm the network configuration. Temporary wiring of primary elements, final control elements, and field-mounted transmitters is not required.

C. The hardware to be tested shall include all control system devices shown on the System Architecture drawings and provided by the PCSS.

D. Tests to be performed shall include, but not be limited to, the following. Each of these tests shall be specifically addressed in the Test Procedure submittal.

1. All panels and enclosures being provided shall undergo a thorough inspection to verify the integrity of the cabinet enclosures, frame structures, paint work and

finish, etc. Review the panel drawings to ensure they accurately reflect the panel layout and wiring.

2. Perform a system audit to verify all components have been staged for the test and have been documented properly with correct model numbers, serial numbers, etc. The following documentation of the audit shall be provided at the factory test and submitted as part of the Operation & Maintenance (O&M) Manual Documentation:
   a. For each workstation and server, list all software installed (including the operating system), with software revision number, software improvement modules or patches installed, license number and PRASA registration information, warranty period, vendor and local distributor names and contacts.
   b. For each microprocessor-based component connected to the control communication backbone in the system (Programmable Logic Controllers (PLCs), managed switches, protocol converters, communication cards on final field devices, radios, etc.), list the firmware revision, vendor and local distributor information, and system warranty information, configuration parameters (e.g., communication settings, fail position settings, etc.).

3. Panel wire pull tests shall be performed to ensure all wiring has been connected with the appropriate torque to prevent wires from coming loose.

4. UPS shall be tested to verify the uninterruptible power supply (UPS) switch powers correctly while keeping all UPS powered loads online. Testing of the UPS to determine if they have been sized correctly to maintain the specified run time shall be performed during field testing. The PCSS shall verify the UPS monitoring software has been properly configured to illustrate the status of each UPS on the system.

5. A 100 percent Input/Output (I/O) point checkout shall be performed to verify proper operation of the input/output points from the panel terminations to the Human-Machine Interface (HMI) and Operator-Interface Terminal (OIT) nodes. At a minimum, the I/O checkout shall consist of four steps.
   a. Discrete input signals shall be jumpered at the field terminal blocks in the control panels to verify proper status in the HMI and OIT nodes.
   b. Analog input signals shall be connected to a signal generator at the field terminal blocks in the control panels to verify proper status in the HMI and OIT nodes and signals shall be verified at zero percent, 50 percent, and 100 percent of full scale.
   c. Discrete output signals shall be tested by switching the equipment to manual control at the HMI and OIT nodes and turning the output on or other means to turn the output on. Then verify the output is on by connecting a digital multimeter to measure the continuity at the terminations, thus verifying the command from the PLC has properly executed the contact closure.
   d. Analog output signals shall be tested by switching the equipment to manual control at the HMI and OIT nodes and turning the output on or using other means to turn the output on. Then verify the output by utilizing a digital

multimeter to measure the current or voltage generated at the termination points.

6. All control strategies shall be verified using simulation or other means to verify the logic performs as expected. Verify faults and logical failure conditions for control strategies such as instrument failures, equipment failures, loss of communication between the HMI Server and the PLC, loss of peer-to-peer communication, out of range testing (over and under scale) for analog inputs, and all other strategies specified in the control strategy document.

7. For each hardware enclosure, inspection shall include, but not be limited to, cabinet enclosures, frame structure, paint work and finish, dimensions, and hardware operability (i.e., fans, door hinges, keylocks, etc.).

8. For each subpanel, inspection shall include, but not be limited to, I/O subsystem physical layout, power supply sizing and mounting, cable routing, wire runs across hinges properly installed, fans and blowers unobstructed and mounted to maximize air flow, power conditioning correctly installed, and overall layout and installation of components meets manufacturer's recommendations and standard industry accepted practices.

9. All other control panel circuitry.

10. The following systems tests shall be performed:
    a. Demonstrate the ability to share data between operator workstations and servers.
    b. Demonstrate the ability of each workstation to print reports on all designated report printers.
    c. Demonstrate the ability for each workstation to read and write designated files from servers and other workstations on the network.
    d. Demonstrate the operability of all back-up and storage and forward from local historial to centralize historian .
    e. Demonstrate communication failure and recovering self-healing ring testing.
    f. Demonstrate total power failure and recovery. The UPS shall be removed for this test.
    g. Demonstrate the capabilities of the historical archiving.
    h. Demonstrate the failover capabilities of the redundant HMI servers.

E. Upon successful completion of the UFT, the PCSS shall submit a record copy of the test results as specified in Part 1. As part of the UFTtest results submittal, notify the Engineer and PRASA in writing that the system is ready for the WFT. No other notice of Factory test will be accepted. The Engineer and/or PRASA shall schedule a WFT test date within 30 days of receipt of this submittal.

3.03 FACTORY TESTING - WITNESSED FACTORY TEST (WFT)

A. The purpose of the WFT is to allow the Engineer and/or PRASA representatives to witness the functionality, performance, and stability of the entire hardware and software system as a complete integrated system. The WFT shall be run by the PCSS and conducted at the PCSS's facility.

B. Required documents for test

1. Clean set of approved panel drawings and wiring diagrams.

2. Set of contract documents - all drawings and specifications.

3. All design change related documentation.

4. Master copy of the PCSS developed factory testing signoff forms.

5. Testing procedures.

C. The system must operate continuously throughout the WFT without failure, except where initiated per the established test procedures. Any unanticipated failures may, at PRASA and/or Engineer's option, result in the overall WFT being deemed unsuccessful. All deficiencies identified during these tests shall be corrected and re-tested prior to completing the WFT or shipment of panels to jobsite as determined by the PRASA's Representative/Engineer. If testing is to reoccur due to the failure, all re-testing costs and expenses are the responsibility of the PCSS.

D. Tests to be performed during the WFT shall include, but not be limited to, the following:

1. A repeat of all tests specified in the UFT.

E. The daily schedule during these tests shall be as follows:

1. Morning meeting to review the day's test schedule.

2. Scheduled tests and sign-offs.

3. End of day meeting to review the day's test results and to review or revise the next day's test schedule.

4. Unstructured testing period by the witnesses.

F. Upon successful completion of the WFT, the PCSS shall submit a record copy of the test results as specified in Part 1.

3.04 FIELD TESTING – FUNTIONAL TEST (FT)

A. The purpose of the FT is to check that the process equipment, instrument installation, instrument calibration, instrument configuration, field wiring, control panels, and all other related system components are ready to monitor and control the processes. This test will determine if the equipment is ready for operation.

B. This test shall take place prior to Performance Test (PT) and startup. Prior to starting this test, relevant process equipment shall be installed and mechanically tested, instruments installed, control panels installed, and field wiring complete.

C. Required Documents for Test

1. Master copy of the PCSS developed field testing signoff forms.

2. Testing procedures.

3. Calibration forms.

4. PCSS to provide any safety requirements and any lockout tagout if it is tied to live equipment.

D. These inspections, calibrations, and tests do require Engineer and PRASA witnessing. The Engineer may review and spot-check the testing process periodically. Any deficiencies found shall be corrected by the PCSS prior to commencement of the Performance Test.

E. The PCSS shall maintain the Sign-off forms and the Calibration forms at the job site and make them available to the Engineer/PRASA at any time.

F. The following tests shall be performed as part of the FT:

1. Instrument calibration, configuration, and set-up.

2. Input/Output (I/O) Testing to the HMI and OITs.

3. Testing of control strategies.

G. Instrument calibration, configuration, and set-up

1. Calibrate, configure, and set-up all components and instruments to perform the specified functions.

2. Calibration form
   a. For any component or instrument requiring dip switch settings, calibration, or custom configuration, maintain a calibration form in the field documenting this information. These forms shall provide a summary of the actual settings used

in the field to allow an instrument technician to replace the device entirely and configure it to function as it did before.

b. Add this information to the Instrument data sheet and to a copy of manufacturer's standard "Configuration Sheet", or create a separate form.
   1) If a separate form is created, the form shall list the Project Name, Loop Number, ISA Tag Number, I/O Module Address, Manufacturer, Model Number/Serial Number, Output Range and Calibrated Value.

c. Some examples of required information are:
   1) For Discrete Devices: Actual trip points and reset points.
   2) For Instruments: Any configuration or calibration settings entered into instrument.
   3) For Controllers: Mode settings (Proportional-Integral-Derivative, (PID)).
   4) For I/O Modules: Dip switch settings, module configuration (if not documented in the native programming documentation).

d. Maintain a copy of these forms in the field during testing, and make them available for inspection at any time.

e. For any device that allows a software back-up of configuration files to a laptop, make the configuration files available to the Engineer/PRASA for inspection. Submit as part of the Final System Documentation as specified in Section 13300 - I&C-General Provisions.

H. I/O Testing

1. The purpose of the I/O testing is to check that the process equipment, instrument installation, calibration, configuration, field wiring, and the control panels are set-up correctly to monitor and control the processes. This test is commonly referred to as a "loop test" or an I/O checkout.

2. PCSS in conjunction with the Contractor shall test signals under process conditions. The preferred test method will always be to execute the test wherever possible to the end elements. For example, the preferred test will prove valve open/close limit switches by operating the valve, not by installing a jumper on the limit switch contacts. However if the equipment or process is not available to test a signal over its entire calibrated range, the PCSS may test using a simulation methods and make a note on the sign-off form.

3. The following I/O tests shall be performed:
   a. Discrete Input – At the device or instrument, change signal condition from the inactive to active state. Observe results on all indicators within the loop such as the HMI screens, the OIT screens, pilot lights, horns, beacons etc.
   b. Analog Input – Test the analog signal over the entire engineering range at various intervals including 0, 50%, and 100% as well as on increasing and decreasing range. Observe results on all indicators within the loop such as the HMI screens, the OIT screens, recorders, digital indicators, etc.
   c. Discrete output signals shall be tested by switching the equipment to manual control at the HMI and OIT nodes and toggling the output on or using other

means to turn the output on and off. Then verify the equipment responds accordingly.

d. Analog output signals shall be tested by switching the equipment to manual control at the HMI and OIT nodes and varying the output on or using other means to turn ramp the signal up and down. Then verify the equipment responds accordingly.

I. Testing of Automatic Control Strategies

1. All automatic control strategies shall be verified using actual process equipment and instruments, or other means, to verify the logic performs as expected. Verify faults and logical failure scenarios for control strategies such as instrument failures, equipment failures, loss of communication between the HMI Server and the PLC, loss of peer-to-peer communication, out of range testing for analog inputs, loss of power, and all other strategies specified in the control strategy document (Section 13305- I&C-Control Description).

2. All interlocks and alarms shall be verified using actual process equipment and instruments.

J. UPS shall be tested to verify the UPS switch powers correctly while keeping all UPS powered loads online. Also, test the sizing of the UPS by switching off line power to the UPS and verify if they maintain the specified run time.

The PCSS is tasked with ensuring that the UPS monitoring software is appropriately set up to display the status of each UPS within the system

K. After coordinating with Operations, a "Black Start" of the plant shall be performed to confirm the plant operation recovers as specified in the contract documents. Black start means shutting off power to the plant and turning it back on. Separate tests shall be performed by recovering the plant while on generator (if a generator is specified) and while on utility power.

L. Punchlist items and resolutions noted during the tests shall be documented on the Punchlist/Resolution form. In the event of rejection of any part or function test procedure, the PCSS shall perform repairs, replacement, and/or retest within 10 days. Any retest of an item as a result of a discrepancy correction shall also retest all related Equipment/System areas.

M. For all panels with enclosures modified by this contract, internal control panel temperature shall be tested under full running conditions to ensure proper cooling/ventilation is being provided.

N. Upon successful completion of the FT, the PCSS shall submit a record copy of the test results as specified in Part 1.

3.05 FIELD TESTING - PERFORMANCE TEST (PT)

A. The PCSS must provide service for assistance during PT to support the Contractor as required in Section 016500 “Facility Start-Up.”

3.06 FIELD TESTING – START-UP TEST (ST)

A. The PCSS must provide service for assistance during ST to support the Contractor as required in Section 016500 “Facility Start-Up.”

3.07 CERTIFICATE OF INSTALLATION

A. Following successful completion of the ST test, the PCSS shall submit a Certification of Proper Installation for the system as required in the Division 1 Section 016500-Facility Start-up.

APPENDIX 13302-A: EXAMPLE INPUT/OUTPUT (I/O) STATUS SIGN OFF FORM

An example template for the I/O Status signoff form to be used for documenting testing results to PRASA is attached. The PCSS is required, prior to testing, to create a project specific I/O Status signoff form based on the attached template or approved equal.

APPENDIX 13302-B: EXAMPLE AUTOMATIC CONTROL STRATEGIES SIGN OFF FORM

An example template for the Automatic Control Strategies signoff form to be used for documenting testing results to PRASA is attached. The PCSS is required, prior to testing, to create a project specific Automatic Control Strategies signoff form based on the attached template or approved equal. The PCSS may obtain an electronic copy of the template from the Engineer or develop it on their own.

8-Sep-11

[Project Name] Appendix A - Input/Output (I/O) Status Sign-Off Form

All Sections below are required to be filled out by PCSS as part of Field Testing.
Instrument Alarm Setpoint - Setpoint for any alarms set by PCSS
Wiring Complete - Signal wired from field device to PLC
I/O Tested - Signal tested from field device to SCADA HMI

PLC	Signal Tag	Description	Range or Active State when closed	P&ID	Signal	Rack	Slot	Channel	Instrument Alarm Setpoint	Calibrate, config., and Wiring complete	Date	I/O Tested	Date	Notes
PLC-SC	LIT-4000-1	Secondary Clarifier No. 1 Sludge Level	0-10 ft	8	AI	2	1	0						
PLC-SC	LIT-4010-3	Secondary Clarifier No. 3 Sludge Level	0-10 ft	8	AI	2	1	1						
PLC-SC	SI-4100-1	RAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	2						
PLC-SC	SI-4100-4	RAS Pump No. 4 Speed Feedback	0-100%	15	AI	2	1	3						
PLC-SC	FIT-4102-1	RAS Flow Pumps 1-3	0-1900 GPM	14	AI	2	1	4						
PLC-SC	SI-4110-1	WAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	5						
PLC-SC	N/A	Spare Slot	N/A	N/A	Spare	2	5	N/A						
PLC-SC	SC-4100-1	RAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	0						
PLC-SC	SC-4100-2	RAS Pump No. 2 Speed Setpoint	0-100%	14	AO	2	7	1						
PLC-SC	SC-4100-3	RAS Pump No. 3 Speed Setpoint	0-100%	14	AO	2	7	2						
PLC-SC	SC-4110-1	WAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	3						
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	4						
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	5						
PLC-SC	TSH-4000-1	Secondary Clarifier No. 1 High Temp	Normal	8	DI	3	1	0						
PLC-SC	XA-4000-1	Secondary Clarifier No. 1 Motor Overload	Normal	8	DI	3	1	1						
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High Torque	Normal	8	DI	3	1	2						
PLC-SC	WAHH-4000-1	Secondary Clarifier No. 1 High High Torque	Normal	8	DI	3	1	3						
PLC-SC	YRI-4000-1	Secondary Clarifier No. 1 On/Off	On	8	DI	3	1	4						
PLC-SC	YCI-4000-1	Secondary Clarifier No. 1 In Remote	In Remote	8	DI	3	1	5						
PLC-SC	YFI-4100-1	RAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	6						
PLC-SC	FAL-4100-1	RAS Pump No. 1 Low Flow	Normal	14	DI	3	1	7	50 GPM	RJM	12/18/2011	JAS	12/22/2011	Example completed line
PLC-SC	Spare	Spare	Normal	14	DI	3	1	8						
PLC-SC	YRI-4100-1	RAS Pump No. 1 Running	Running	14	DI	3	1	9						
PLC-SC	YCI-4100-1	RAS Pump No. 1 In Remote	In Remote	14	DI	3	1	10						
PLC-SC	YFI-4110-1	WAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	11						
PLC-SC	FAL-4110-1	WAS Pump No. 1 Low Flow	Normal	14	DI	3	1	12						
PLC-SC	Spare	Spare	Normal	14	DI	3	1	13						
PLC-SC	YRI-4110-1	WAS Pump No. 1 Running	Running	14	DI	3	1	14						
PLC-SC	YCI-4110-1	WAS Pump No. 1 In Remote	In Remote	14	DI	3	1	15						
PLC-SC	HSS-4000-2	Secondary Clarifier No. 2 Start Command	Start	8	DO	4	6	0						
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	1						
PLC-SC	HSS-4100-2	RAS Pump No. 2 Start Command	Start	14	DO	4	6	2						
PLC-SC	HSS-7000-2	Sludge Holding tank Tank Blower No. 2 Start Command	Start	17	DO	4	6	3						
PLC-SC	HSS-4100-5	RAS Pump No. 5 Start Command	Start	15	DO	4	6	4						
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	5						
PLC-SC	HSS-4105-1	Secondary Scum Pump No. 2 Start/Stop	Start	15	DO	4	6	6						
PLC-SC	HSS-4110-2	WAS Pump No. 2 Start/Stop Command	Start	15	DO	4	6	7						
PLC-SC	7160-FQI-1	Sludge Loadout LCP Pumping Indicator	Pumping	17	DO	4	6	8						
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	9						
PLC-SC	HSS-7115-2	Sludge Holding Tank Mixer No. 2 Start	Start	17	DO	4	6	10						
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	11						
PLC-SC	HSO-7117-2	Sludge Holding Tank Discharge Valve No. 2 Open CMD	Open	17	DO	4	6	12						
PLC-SC	HSC-7117-2	Sludge Holding Tank Discharge Valve No. 2 Close CMD	Close	17	DO	4	6	13						
PLC-SC	HSS-7120-2	TS Transfer Pump No. 2 Start Command	Start	17	DO	4	6	14						
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	15						

FINAL DRAFT

7-Oct-11	**[Project Name] Appendix B - Automatic Control Strategies Sign-Off Form**				
	All Sections below are required to be filled out by PCSS as part of Testing.				
	Auto. Control Strategies. - Loop operational in Automatic as defined in Control Stategies				
Control Strategies Loop #	**Control Strategy Description**	**P&ID**	**Auto. Control Strategy**	**Date**	Notes
LOOP 281 - 284	LOW FLOW PUMPS	8			
LOOP 290	LOW EQ CHANNEL FLOW NO.4	8			
LOOP 300	MICROFILTRATION AIR SUPPLY LOW PRESSURE	10			
LOOP 351, 352	SITE LIFT STATION PUMP NO.1 AND NO. 2	12			
LOOP 355	SITE LIFT STATION HIGH AND LOW LEVEL CONTROL	12			
LOOP 371, 372	SLUDGE HOLDING TANK NO.1 AND NO. 2 LEVEL	14			
LOOP 381, 382	SLUDGE TRANSFER PUMPS	14			
LOOP 385	SLUDGE TRANSFER PUMPS REMOTE START/STOP COMMAND	14			
LOOP 700	EFFLUENT PUMPING STATION LEVEL	14			
LOOP 701, 702, 703	EFFLUENT PUMP NO.1	14			
LOOP 840	POST AERATION CHANNEL AIR FLOW CONTROL	15			
LOOP 900	SLUDGE TRANSFER PUMPS DISCHARGE FLOW	8			
LOOP 971	CENTRIFUGE SLUDGE FEED PUMP NO.1	8			
LOOP 1001	CENTRIFUGE NO.1 SLUDGE FEED FLOW CONTROL	8			
LOOP 1411, 1412	SODIUM HYPOCHLORITE STORAGE TANKS LEVEL	8			
LOOP 1421, 1422	SODIUM HYPOCHLORITE PUMPS	8			
LOOP 1430	SODIUM HYPOCHLORITE STORAGE TANKS CONTAINMENT AREA HIGH LEVEL DETECTION	14			
LOOP 2051, 2052, 2053	DIESEL ENGINE GENERATOR STATUS	14			
LOOP 2055	TRANSFER SWITCH STATUS	14			
LOOP 2060	GENERATOR KILOWATTS MONITORING	14			
APPENDIX ONE	EQUIPMENT RESTART DURING A POWER LOSS WITH THE GENERATOR RUNNING	14			
APPENDIX TWO	EQUIPMENT RESTART WITH POWER RESTORED AFTER A POWER LOSS	14			
N/A	SELF-HEALING CAPABILITIES OF NETWORK	N/A			
N/A	REDUNDANT SCADA SERVER FAILOVER AND RECOVERY	N/A			
	Page 1 of 1				

EXAMPLE

END OF SECTION

SECTION 13303
I&C – GENERAL TRAINING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish training as specified herein.

B. This section covers the training requirements for all devices and systems furnished and installed as detailed on the Drawings.

C. Refer to Section 13300 I&C-General Provisions.

1.02 RELATED WORK

A. Refer to Section 13300.

1.03 SUBMITTALS

A. Refer to Section 13300 I&C-General Provisions for general submittal requirements.

B. Preliminary Training Plan Submittal

1. Prior to the preparation of the Final Training Plans, submit outlines of each training course including course objectives and target audience, resumes of instructors, prerequisite requirements for each class, and samples of handouts for review.

C. Final Training Plan Submittal

1. Upon receipt of the Engineer's comments on the preliminary training plan, submit the specific proposed training plan. The training plan shall include:

   a. Definitions, objectives, and target audience of each course.
   b. Schedule of training courses including proposed dates, duration and locations of each class.
   c. Complete copy of all proposed handouts and training materials. Training information shall be bound and logically arranged with all materials reduced to a maximum size of 11 inch by 17 inch, then folded to 8.5 inch by 11 inch for inclusion into the binder.

D. Training material submittal.

1. Upon training services completion, submit in digital form with O&M documentation training material in format in concordance with the PRASA's “Departamento de Capacitacion y entrenamiento”

2. Upon training completion submit assistance sheets including as a minimum, the following information

    a. Training title
    b. Training duration
    c. Training Date and Location
    d. Instructor Name
    e. Signed assistance list.

3. Refer to General Conditions in relation on intelectual properties and use of the information provided for the project.

1.04 **DEFINITIONS**

A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

B. Applications Engineering System Supplier (AESS): The entity who provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

C. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

D. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

E. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

F. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

G. Uninterruptible Power Supply (UPS): A device capable of providing emergency battery power when the main power source fails.

PART 2 PRODUCTS

2.01 N/A

PART 3 EXECUTION

3.01 GENERAL

A. The cost of the training programs shall be included in the Contract price. The training and instruction shall be directly related to the system being supplied. The training

program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

B. All training schedules shall be coordinated with and at the convenience of the PRASA. Shift training may be required to correspond to PRASA's working schedule.

C. All onsite instructors must be intimately familiar with the operation and control of the PRASA's facilities.

D. Provide detailed training manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project. The manuals shall be provided in hardcopy for each student. Provide electronic copy of each training manual in PDF format for PRASA's future use.

E. The trainer shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, all training materials shall be delivered to PRASA. Provide of all training videos in digital format.

F. PRASA reserves the right to record all custom training sessions. All recording training shall become the sole property of PRASA.

3.02 TRAINING SUMMARY

A. The following training courses listed in the summary table shall, as a minimum, be provided:

Description	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
Manufacturer's Training				
Human Machine Interface (HMI) Basic	32	2	1	Administrator
Human Machine Interface (HMI) Advanced	32	2	1	Administrator
Historian	16	2	1	Administrator
Programmable Logic Controller (PLC) Basic	32	2	1	Maintenance, Administrator
Programmable Logic Controller (PLC) Advanced	32	2	1	Maintenance, Administrator
Onsite Training				
Control System Overview Seminar	2	12	1	Management

Operator Control System Training (Pre start-up)	8	12	1	Operations
Operator Control System Training (Post start-up)	8	12	1	Operations
Software Maintenance	2	2	1	Maintenance
Installed Control System	2	2	1	Maintenance, Administrator
PLC Hardware/Software	2	2	1	Maintenance
Instruments	16	2	1	Maintenance
Instruments - Operator familiarity	2	8	1	Operations
Alarm system training (Operators)	1	2	2	Operations
Fiber Optics	4	2	1	Maintenance

B. Definitions of audience roles

1. Administrator - personnel responsible for maintaining the HMI / SCADA system.

2. Maintenance - personnel responsible for maintaining the field controller hardware and instrumentation system.

3. Operations - personnel responsible for daily plant operations.

4. Management - non-daily operations personnel

3.03 MANUFACTURER'S TRAINING

A. Human Machine Interface (HMI) Software

1. Provide manufacturer's standard training courses for PRASA's personnel in the configuration, programming, and installation of the HMI software supplied. Conduct this course in separate beginner and advanced training sessions.

2. This training shall be conducted no more than two (2) months before the Witnessed Factory Test (WFT).

3. The following training shall be provided as a minimum:

a. Database generation.
b. Display generation.
c. Alarm system and configuration.
d. Historical data system configuration.
e. Report generation.
f. Security system.
g. Trending system.
h. Remote communications.

i. Software configuration.
j. Object Linking and Embedding (OLE) applications.
k. Test, adjustment, and calibration procedures.
l. Troubleshooting and diagnosis.

4. Training shall include classroom and hands-on instruction such that a student with experience in process instrumentation can configure the HMI with no guidance or with only minimal supervision when attempting complex problems.

B. Programmable Logic Controller (PLC) Hardware and Software

1. Provide manufacturer's standard training courses for PRASA's personnel in the operation, configuration, programming, installation, and maintenance of the PLC hardware and software supplied. Conduct this course in separate beginner and advanced training sessions.

2. The training shall be conducted no more than two (2) months before the WFT.

3. The following hardware training shall be provided as a minimum:

a. Hardware maintenance for the PLC equipment provided.
b. Test, adjustment, and calibration procedures.
c. Troubleshooting and diagnosis.
d. Component removal and replacement.
e. Periodic maintenance.

4. The following software training shall be provided as a minimum:

a. System configuration.
b. Application specific program development/programming.
c. Uploading/downloading programs.
d. Documenting program/configuration.
e. System backups and reload procedures.
f. TCP/IP addressing procedures.
g. Network communications configuration.

3.04 ONSITE TRAINING

A. Training personnel shall be intimately familiar with the control system equipment, its manipulation, and configuration. Training personnel shall command knowledge of system debugging, program modification, troubleshooting, maintenance procedure, system operation, and programming, and shall be capable of transferring this knowledge in an orderly fashion to technically oriented personnel.

B. Control System Overview Seminar

1. Provide a Control System Overview seminar for PRASA’s personnel at the PRASA’s facility. The objective of this seminar is to provide personnel with an overview understanding of the Control System. The seminar material shall target PRASA's management, engineering, and non-operations personnel. The seminar shall include, but not be limited to, the following:

    a. An overview of the Control system explaining how the hardware and software supplied under this Contract are used to operate and control the facilities.
    b. A block diagram presentation of the Control system showing how and what information flow within the system and what each functional unit does.
    c. An explanation of the operator interfaces, including a demonstration of how to use an operator's workstation to monitor, control, navigate, display trends, and all other operational features of the system. Discussion of process control of individual processes shall be addressed outside of this course.
    d. A walkthrough of the installed system explains each item covered in the functional units' discussion. The features and functions of operator controls and interfaces shall be discussed.

C. Operator Control System Training (pre or post-start-up)

1. Operator training shall cover plant operation with the control system and use of the HMI display screens, including, at a minimum, all the following items:

    a. Basics of HMI control and navigation
    b. Alarming and Interlocks
    c. Auto functionality of automated processes and HMI control.
    d. Failure modes of equipment and operator responses.

2. Minimum of two operator training sessions (Pre-Startup) for operators shall be held the week before system startup. The pre-startup training shall make use of the Simulator specified in this project. Additional one or two operator training sessions (Post-Startup) for operators shall be held one week after system startup.

3. Operator training shall be held at the convenience of PRASA. This training may be held during the day, late at night, or early in the morning to accommodate PRASA'S shift schedule.

4. Operator training shall be introductory in nature during pre-startup training and more in-depth and detailed during post-startup training.

5. At a minimum, the following teaching aids shall be available for distribution during Operator training sessions:

    a. Preliminary O&M Manuals (pre-startup); Final O&M Manuals (post-startup).
    b. P&IDs.
    c. Daily syllabus.

6. Fifty percent of all Operator training shall be "hands-on" utilizing the installed Control System to the fullest extent possible. Confirm the operability of the Control System before commencing training. Training performed using a non-functioning Control System shall be rejected and repeated.

D. Software Maintenance

1. Provide training on back-up PLCs, HMIs, OITs, and any other software in this system.

2. Provide training on all aspects covered in the O&M Software Maintenance Manuals.

3. Provide training on PLC program structure, HMI configuration structure, tips in how to edit programming code and other items which will supplement the maintenance staff's ability to edit and maintain the programs.

E. Installed Control System Training

1. Provide training for PRASA's personnel in the functionality, maintenance, and troubleshooting, of the installed Control System. The training shall be held before the Functional Demonstrator Test (FDT), but not more than two (2) months before.

2. Training and instruction shall be specific to the system that is being supplied.

3. Training shall consist of classroom instructions and hands-on instruction utilizing the PRASA's system.

4. Detailed training shall be provided on the actual configuration and implementation for this Contract. Training shall cover all aspects of the system that will allow PRASA's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the system. The training shall cover the following subjects, as a minimum:

a. System overview.
b. System hardware components and specific equipment arrangements.
c. Periodic maintenance.
d. Troubleshooting and diagnosis.
e. Network configuration, communications, and operation.
f. TCP/IP addressing procedures for all Ethernet devices.

F. Programmable Logic Controller (PLC) Hardware and Software

1. Provide training for PRASA's personnel in the operation, maintenance, troubleshooting, etc. with the PLC hardware and software system. The training shall be held before the FDT, but not more than two months before.

2. Training and instruction shall be specific to the system that is being supplied.

3. Training shall consist of classroom instructions and hands-on instruction utilizing PRASA's system.

4. Detailed training shall be provided on the actual configuration and implementation for this Contract. Training shall cover all aspects of the PLC system that will allow PRASA's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the PLC system. The training shall cover the following subjects, as a minimum:

    a. PLC system overview.
    b. PLC system architecture.
    c. PLC system hardware components and specific equipment arrangements.
    d. PLC system startup, shut down, load, backup, and PLC failure recovery.
    e. Periodic maintenance.
    f. Troubleshooting and diagnosis down to the I/O card level.
    g. PLC configuration, communications, and operation.

G. Instrument Training

1. Provide instruction on the maintenance of the field and panel instrumentation for PRASA's instrumentation technicians. This training shall be conducted before the FDT, but no more than one (1)month before and at a time suitable to PRASA. This training shall take place at PRASA's facility. As a minimum the following shall be included:

    a. Training in standard hardware maintenance for the instruments provided.
    b. Specific training for the actual instrumentation configuration to provide a detailed understanding of how the equipment and components are arranged, connected, and set up for this Contract.
    c. Test, adjustment, and calibration procedures.
    d. Troubleshooting and diagnosis.
    e. Periodic maintenance.

H. Instruments - Operator familiarity

1. Provide operator level instruction on the use of the field and panel instrumentation for PRASA's operations staff. This training shall be conducted before the 30 day site acceptance test, but no more than one (1) month before and at a time suitable to PRASA. This training shall take place at PRASA's facility. Include hands on demonstration of the information each transmitter indicates and the method used to retrieve any operator information from the transmitter, including use of pushbuttons and interpretation of international graphic symbols used on the instruments.

I. Alarm System Training:

1. The service provider will conduct training for the AESS operators relate alarm response and rationalization. This will include training on the priority of alarms, operator actions for each alarm, and changes to the system due to alarm design modifications.

J. Fiber Optic Training

1. Provide instruction on the maintenance of the fiber optic system for PRASA's instrumentation technicians. This training shall be conducted before the FDT, but no more than one (1) month before and at a time suitable to PRASA. This training shall take place at the PRASA's facility. As a minimum the following shall be included:

   a. Fiber cable layout and basic of cable construction.
   b. Termination procedures
   c. "Jumper" installation
   d. Testing procedures.
   e. Troubleshooting and diagnosis.

END OF SECTION

SECTION 13305

I&C – CONTROL DESCRIPTIONS

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C-General Provisions.

1.02 SCOPE OF WORK

A. Applications Engineer System Supplier (AESS) Programming Scope

1. Develop the control system applications to implement the process control descriptions for all new and existing systems. This Section defines control strategies for PLC/SCADA programming of the system.

2. The Contract Documents are a single integrated document; as such, all Drawings, Specification Divisions, and Specification Sections apply. The Contractor and Subcontractors are responsible for reviewing all Sections to ensure a complete and coordinated project.

3. Before starting any programming, the AESS must be cautioned to read this Section and all related Sections. Many general control strategies and requirements are defined once in the body of this Section, with the specific requirement called out in the individual control strategy. Unless directed otherwise in the individual loop process control descriptions, implement these general strategies throughout this Contract.

4. Follow loop and device tagging criteria shown on the Drawings without exception.

5. Establish programming approach and database/variable identification standards before performing any programming work.

1.03 RELATED WORK

A. Refer to Section 13300 I&C-General Provisions.

1.04 SUBMITTALS

A. Refer to Section 13300 I&C-General Provisions.

1.05 REFERENCE STANDARDS

A. Refer to Section 13300 I&C-General Provisions.

1.06 QUALITY ASSURANCE

A. Refer to Section 13300 I&C-General Provisions.

1.07 GENERAL

A. The control descriptions are broken into areas. The following is a list of areas and the loop numbers associated with each area.

Raw Water Pumps Station	P&ID-102	0-99

The control descriptions are sorted by loop number for each area. The loop index has three columns: Loop Number, Loop Description, and Page. Each loop is associated with a specific PLC/RIO I/O cabinet location to which it shall communicate.

B. The control descriptions are broken into a hierarchical layer concept. An example of a multiple-layered loop is as follows. The lowest layer of control, local control, is at that piece of equipment or that piece of equipment's panel LCP or drive. The second control layer is at an intermediate control panel between the equipment and the plant PLC/RIO I/O or vendor's PLC I/O. The third layer would be at the vendor's PLC or microprocessor touchscreen station or local OIT. The highest layer of control is by the SCADA System with its associated operator workstations (OWS) in the central control room and remote office locations. The SCADA PLC/ OWS refers to both the SCADA PLC, which does the actual monitoring and control logic for the process equipment, and the SCADA OWS, which are computers that have graphical software that interface to the PLC software for monitoring and implementing all operator-required tasks to control that process equipment.

1.08 CONTROL FUNCTION DEFINITIONS AND GENERAL CRITERIA

A. The hardware and software functions noted by this paragraph reference will be implemented by the SCADA PLC/OWS control system specified herein.

B. The following list of International Society of Automation (ISA) abbreviations is typical of those utilized. Following the abbreviation, the description summarizes the basic function to be implemented in the SCADA PLC/OWS software.

C. HS: Represent selector switches or pushbuttons, which shall be implemented by keyboard entry. The function shall be similar to its hardware counterparts. Examples are as follows:

D. XI: Represents equipment status (i.e., availability, running, in remote, etc.) implemented by a change of color on the OWS symbol for this equipment. For motor-driven equipment such as pumps, blowers, compressors, etc., availability contact represents remote operation and no alarm conditions.

1. Setpoints: Refer to numerical values adjustable from the OWS/OIT.

2. Control Modes:

    a. Local: When local equipment controls HOA or Local OIT selector is in the H or L position, Plant PLCs cannot control operation.

        1) Local Manual: Actions to be executed by local equipment controls to start/stop, open/close, or modulate speed or position from LCP, OIT, or embedded device local control.
        2) Local Auto: Logic to be executed by local when devices can execute logic without Plant PLC intervention.

    b. Remote: When equipment controls HOA or Local OIT selector is in the A or R position, PLCs control operation.

        1) Remote Manual: Commands to be executed by the operators from Plant SCADA.
        2) Remote Automatic: Logic or sequence to be executed by Plant SCADA without operator intervention.

E. Terminology associated with status is as follows:

1. When a contact or status is true, the SCADA PLC or controller will receive power to its input channel. The SCADA computer registers this as a binary bit of one.

2. When a contact or status is false, the SCADA PLC or controller will receive no power (open circuit) to its input channel. The SCADA computer registers this as a binary bit of zero.

F. Interlocks

1. Any interlocks mentioned before the local operational descriptions, or those identified as hardwired interlocks, must be connected to local controls and the SCADA PLC or vendor PLCs. If a hardwired interlock is connected to the SCADA PLC, then the SCADA PLC should be set up to shut down the relevant equipment.

2. All interlocks represented in a particular layer of the operational descriptions shall interlock all the controls in that layer and the layer after it. However, the interlock shall not interlock the commands in the layer before it.

3. Hardwired interlocks will interlock the controls locally at the device LCP, vendor PLC, and plant PLC. If the interlock occurs, the shutdown will cause the equipment to be inoperable at all levels of control.

4. Software interlocks are represented in a particular layer of the operation description and interlock the controls in that layer and the layers above it. However, the interlock does not interlock the commands in the layer before it. For example, a software

interlock implemented at the SCADA/PLC level will not stop equipment from being controlled locally.

5. Once the interlocks shutdown pieces of equipment, the interlock status must prevent the equipment from being restarted or moved until the conditions that trigger the interlock is cleared.

G. Motors

1. Provide monitoring and control of the signals shown on the P&IDs.

2. Hardwired and software interlocks are defined in individual loop descriptions.

3. Local OIT equipment control must mimic PRASA's standard equipment control.

H. Valves

1. Provide monitoring and control of the signals shown on the P&IDs.

2. Hardwired and software interlocks are defined in individual loop descriptions.

3. Local OIT equipment control must mimic PRASA's standard equipment control.

I. Analog Instruments

1. Analog instruments indicate devices capable of providing a continuous output relative to time.

2. Provide monitoring of the analog signals shown on the P&IDs.

3. Local OIT equipment control must mimic PRASA's standard equipment control.

J. Discrete Instruments

1. Discrete instruments refer to indicating devices with any number of non-continuous defined states (e.g., ON/OFF, 0, or 1).

2. Provide monitoring of the discrete signals shown on the P&IDs.

   a. When a contact or status from the instrument is true, the PLC will receive power to its input channel. The PLC registers this as a binary bit of 1.
   b. When a contact or status from the instrument is false, the PLC will receive no power (open circuit) to its input channel. The PLC registers this as a binary bit of 0.

K. PLC Hardware

1. Monitor status and communication faults at the HMI.

2. Program the system time for all PLCs to synchronize with a Network Time Protocol (NTP) server once every 24 hours.

L. Flow Totalizers

1. Flow totalizer must be done using PRASA's standard equipment control logic and graphic symbols.

M. PID Control

1. PID Control must be done using PRASA's standard equipment control logic, graphics, and faceplate.

1.09 INDIVIDUAL CONTROL DESCRIPTIONS AND CONTROL SEQUENCES

LOOP INDEX

LOOP No.	LOOP DESCRIPTION	PAGE No.
0001	RAW WATER PUMPS PU-01-01, PU-01-02	6
0002	WET PIT FLOAT SWITCH (LSLL-01-01)	7
0003	WET PIT LEVEL TRANSMITTERS SUBMERSIBLE (LIT-01-01) WAVE RADAR (LIT-01-02)	8
0004	FLOW TRANSMITTER (FQIT-01-01)	9
0005	PRESSURE TRANSMITTER (PIT-01-01)	9
0006	HIGH PRESSURE SWITCH (PSH-01-01)	10
0007	LOW PRESSURE SWITCH (PSL-01-01)	11
0008	PUMPS PU-01-03, PU-01-04	11
0009	WATER TANK FLOAT SWITCH (LSLL-01-20)	13
0010	WATER TANK LEVEL TRANSMITTERS SUBMERSIBLE (LIT-01-20)	13
0011	PRESSURE TRANSMITTER (PIT-01-22)	14
0012	LOW PRESSURE SWITCH (PSL-01-21)	14
0013	LUBRICATION PUMPS PU-01-03, PU-01-04	15
0014	LUBRICATION FLOW SWITCH (FS-01-20)	16
0015	PU-01-01 SOLENOID VALVE (SV-01-20)	17
0016	PU-01-02 SOLENOID VALVE (SV-01-21)	18
0017	GENERATOR AND AUTOMATIC TRANSFER SWITCH	18
0018	DIESEL FUEL TANK LEVEL TRANSMITTER (LIT-76-01)	21
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LOOP 0001 RAW WATER PUMPS PU-01-01 AND PU-01-02

A. General

1. On/off operation and speed adjustment of the pump. The pump operation is either at the pump's variable frequency drive (VFD) controller panel or at the HMI/ SCADA PLC/OWS/OIT.

B. Hardware Interlocks

1. The pump cannot run if any of the following alarms are active:
   a. VFD Fault
   b. PAH-01-01 (Loop 0006)
   c. LALL-01-01 (Loop 0002)
   d. PU-01-01 if FA-01-21 (Loop 19)
   e. PU-01-02 if FA-01-22 (Loop 20)
   f. PU-01-01 if SV-01-01 closed (Loop14)
   g. PU-01-02 if SV-01-02 closed (Loop14)
   h. FA-01-21 (L00P 0019)
   i. Only one pump can run at the same time.
   j. Pumps start command shall be delayed by 15 seconds.

C. Software Interlocks

1. A low-low wet pit level of the selected level measurement (LI-01-01 & LI-01-02) shall shutdown the Pumps (Loops 0002).

2. The speed output from a drive shall be clamped from increasing if FQIT-01-01 gets to 500 GPM (Loop 0004).

3. The speed output from a drive shall be clamped from decreasing if FQIT-01-01 gets to 250 GPM (Loop 0004).

4. Only one pump can run at the same time.

D. Control

1. When the pump local control switch is in MANUAL or LOCAL position, the pumps must operate to maintain a flow setpoint depending on the pump speed and PID commands.

2. Local:

   a. When the pump local control switch is in MANUAL or LOCAL position, the pump can be manually started or stopped (HSS) by the operator at Pumps LCP.
   b. Control Mode:

1) Local Manual: When the pump is in the manual position, the pump will operate when the start button is pressed. When the pump is running, the pump will stop with the stop push button or any hardwired interlock is active.
2) The operator can adjust the speed (SC) of the VFD keypad manually.
3) Local Automatic: None.
4) Pump shall have a 15 second delay from start command.

3. Remote:

a. When the pump local control switch is in AUTO or REMOTE position, the, control will be executed from PLC/SCADA/OIT/HMI.

b. Pumps shall operate based on PI-01-01 setpoints.
c. Control Mode:

1) Remote Manual: The pump can be manually started or stopped (HSS) and adjust speed by the SCADA PLC/OWS operator.
2) Remote Automatic: When the loop is placed in automatic mode, the pump's on/off control is based on the pump's speed feedback. The speed of the pumps is controlled from the output of the software flow controller, VFD-01-01 or VFD-01-02 Refer to the control sequence write-up below:

If a pump fails, does not start, or is not in the auto, the computer shall go to the lag pump in the sequence.

E. Alarms/Monitoring

1. Provide the status and alarm on the SCADA OWS/OIT as shown on the P&IDs, Instrument Index and required in Specification 13306, I&C - General Applications Engineering Services alarm documentation submittal.

F. Data Collection

Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0002 WET PIT FLOAT LOW LOW (LSLL-01-01)

A. General

1. Continuous monitoring of wet pit using a level floats to SCADA/OIT.

B. Hardware Interlocks

1. LALL-01-01 will shutdown the raw water pumps.

C. Software Interlocks

1. None

D. Control

1. None

E. Alarms/Monitoring

1. Provide LALL-01-01 alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0003 WET PIT LEVEL TRANSMITTERS (LIT-01-01 & LIT-01-02)

A. General

1. Continuous monitoring of wet pit level using a level transmitter to SCADA/OIT.

B. Hardware Interlocks

1. None.

C. Software Interlocks

1. At LIT-01-01 or LIT-01-02 low low level Shutdown Pumps.

2. At LIT-01-01 or LIT-01-02 low level Decrease Pump Flow to a minimum Flow Setpoint Configurable.

3. At LIT -01-01 or LIT-01-02 start pumps at configurable set point.

D. Control

1. None

E. Alarms/Monitoring

1. Provide (HH, H, L, LL), analog alarming, and monitoring as shown on the P&IDs.

2. Continuously compare LIT-01-01 and LIT-01-02 reported water level and trigger and alarm if reported values differ by more than 10%.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0004 DISCHARGE FLOW TRANSMITTER (FQIT-01-01)

A. General

1. Continuous monitoring of Pumps Discharge flow using a flow transmitter to HMI/SCADA/OIT.

B. Hardware Interlocks

1. None

C. Software Interlocks

1. At PIT-01-01 low pressure set point Start Pumps.

2. At PIT-01-01 high pressure set point Shutdown Pumps.

D. Control

1. None

E. Alarms/Monitoring

1. Provide flow totalization, analog alarming, and monitoring as shown on the P&IDs.

2. Generate a NO FLOW alarm if no flow is measured while the Pumps are running.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0005 RAW WATER PRESSURE TRANSMITTER PIT-01-01

A. General

1. Continuous monitoring of raw water pressure using a pressure transmitter to HMI/SCADA/OIT.

B. Hardware Interlocks

1. None

C. Software Interlocks

1. PU-01-02 & PU-01-02 shutdown at PIT-01-01 high pressure.

D. Control

1. Pressure transmitter will control the pumps operation in Auto mode (LOOP 0001)

E. Alarms/Monitoring

1. Provide analog alarming (HH, H, L and LL) and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0006 HIGH PRESSURE SWITCH (PSH-01-01)

A. General

1. Continuous monitoring of Pumps Discharge Pressure Alarm using a pressure switch to HMI/SCADA/OIT.

B. Hardware Interlocks

1. PSH-01-01 Shutdown Pumps as per LOOP 0006.

C. Software Interlocks

1. PSH-01-01 Shutdown Pumps as per LOOP 0006.

D. Control

1. None

E. Alarms/Monitoring

1. Provide digital alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0007 LOW PRESSURE SWITCH (PSL-01-01)

A. General

1. Continuous monitoring of Pumps Discharge Pressure Alarm using a pressure switch to HMI/SCADA/OIT.

B. Hardware Interlocks

1. None.

C. Software Interlocks

1. None.

D. Control

1. None

E. Alarms/Monitoring

1. Provide digital alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0008 PUMPS PU-01-03 AND PU-01-04

A. General

1. On/off operation of the pump. The pump operation is controlled at panel or at the HMI/ SCADA PLC/OWS/OIT.

B. Hardware Interlocks

1. The pumps operate according to the following alarms:
   a. LALL-01-20 (Loop 0009)
   b. SV-01-01 closed (Loop14)
   c. SV-01-02 closed (Loop15)
   d. PSH-01-21 lubrication pumps shut down (Loop 12)
   e. PSL-01-21 lubrication pumps start down (Loop 13)
   f. XC-01-01 pump start command
   g. XC-01-02 pump start command
   h. Only one pump can run at the same time.

C. Software Interlocks

1. A low-low water tank (TK-01-01) level measurement (LI-01-20) shall shutdown the Pumps (Loops 0009).

2. Only one pump can run at the same time.

D. Control

1. When the pump local control switch is in MANUAL or LOCAL position, the pumps must operate to maintain a flow setpoint and PID commands.

2. Local:

   a. When the pump local control switch is in MANUAL or LOCAL position, the pump can be manually started or stopped (HSS) by the operator at Pumps LCP.
   b. Control Mode:

      1) Local Manual: When the pump is in the manual position, the pump will operate when the start button is pressed. When the pump is running, the pump will stop with the stop push button or any hardwired interlock is active.
      2) Local Automatic: Pumps alternate every 8hrs.

3. Remote:

   a. When the pump local control switch is in AUTO or REMOTE position, the, control will be executed from PLC/SCADA/OIT/HMI.
   b. Control Mode:

      1) Remote Manual: The pump can be manually started or stopped (HSS) by the SCADA PLC/OWS operator.
      2) Remote Automatic: When the loop is placed in automatic mode, the pump's on/off control is based on the pump's interlocks.

E. Alarms/Monitoring

1. Provide the status and alarm on the SCADA OWS/OIT as shown on the P&IDs, Instrument Index and required in Specification 13306, I&C - General Applications Engineering Services alarm documentation submittal.

F. Data Collection

Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0009 WATER TANK FLOAT LOW LOW (LSLL-01-20)

A. General

1. Continuous monitoring of water tank (TK-01-01) using a level floats to SCADA/OIT.

B. Hardware Interlocks

1. LALL-01-20 will shutdown the lubrication pumps.

C. Software Interlocks

1. None

D. Control

1. None

E. Alarms/Monitoring

1. Provide LALL-01-20 alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0010 WATER TANK TK-01-01 LEVEL TRANSMITTERS (LIT-01-20)

A. General

1. Continuous monitoring of water tank (TK-01-01) level using a level transmitter to SCADA/OIT.

B. Hardware Interlocks

1. None.

C. Software Interlocks

1. At LIT-01-20 low low level Shutdown Pumps.

D. Control

1. None

E. Alarms/Monitoring

1. Provide (HH, H, L, LL), analog alarming, and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0011 POTABLE WATER PRESSURE TRANSMITTER PIT-01-20

A. General

1. Continuous monitoring of raw water pressure using a pressure transmitter to HMI/SCADA/OIT.

B. Hardware Interlocks

1. None

C. Software Interlocks

1. None

D. Control

1. Lubrication pumps operate based on PIT-01-20 set points.

E. Alarms/Monitoring

1. Provide analog alarming (HH, H, L and LL) and monitoring as shown on the P&IDs.

LOOP 0012 LOW PRESSURE SWITCH (PSL-01-20)

A. General

1. Continuous monitoring of potable water pressure alarm using a pressure switch to HMI/SCADA/OIT.

B. Hardware Interlocks

1. None

C. Software Interlocks

1. None.

D. Control

1. None

E. Alarms/Monitoring

1. Provide digital alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0013 LUBRICATON PUMPS PU-01-03 AND PU-01-04

A. General

1. On/off operation and speed adjustment of the pump. The pump operation is at the local panel or HMI/ SCADA PLC/OWS/OIT.

B. Hardware Interlocks

1. The pump cannot run if any of the following alarms are active:
   a. XC-01-01 or XC-01-02 on signal, starts/shutdown lubrication pumps.
   b. LALL-01-20 (Loop 0010) shutdown.

C. Software Interlocks

1. A low-low water tank level of the selected level measurement (LI-01-20) shall shutdown the Pumps (Loops 0002).

2. Only one pump can run at the same time.

D. Control

1. When the pump local control switch is in MANUAL or LOCAL position, the pumps must operate to maintain a flow setpoint depending on the pump speed and PID commands.

2. Local:

   a. When the pump local control switch is in MANUAL or LOCAL position, the pump can be manually started or stopped (HSS) by the operator at Pumps LCP.
   b. Control Mode:

1) Local Manual: When the pump is in the manual position, the pump will operate when the start button is pressed. When the pump is running, the pump will stop with the stop push button or any hardwired interlock is active.
2) Local Automatic: None.
3) Pump shall have a 15 second delay from start command.

3. Remote:

a. When the pump local control switch is in AUTO or REMOTE position, the, control will be executed from PLC/SCADA/OIT/HMI.

b. Pumps shall operate based setpoints.
c. Control Mode:

1) Remote Manual: The pump can be manually started or stopped (HSS) and adjust speed by the SCADA PLC/OWS operator.
2) Remote Automatic: When the loop is placed in automatic mode, the pump's on/off control is based on the pump's speed feedback.
3) If pump fail refer to the control sequence write-up below:

If a pump fails, does not start, or is not in the auto, the computer shall go to the lag pump in the sequence.

E. Alarms/Monitoring

1. Provide the status and alarm on the SCADA OWS/OIT as shown on the P&IDs, Instrument Index and required in Specification 13306, I&C - General Applications Engineering Services alarm documentation submittal.

F. Data Collection

Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0014 FLOW SWITCH (FS-01-20)

A. General

1. Continuous monitoring of PU-01-01 & PU-01-02 lubrication pipe flow using a flow switch to SCADA/OIT.

B. Hardware Interlocks

1. FA-01-20 will shutdown PU-01-01.

2. FA-01-20 will shutdown PU-01-02.

C. Software Interlocks

1. None

D. Control

1. None

E. Alarms/Monitoring

1. Provide FA-01-20 alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0015 PU-01-01 CLEAN WATER SOLENOID VALVE (SV-01-20)

A. General

1. Continuous monitoring of SV-01-01position to SCADA/OIT.

B. Hardware Interlocks

1. XC-01-01 start command opens SV-01-20.

2. SV-01-20 closed position shuts downs PU-01-01

C. Software Interlocks

1. None.

D. Control

1. PU-01-01 starting command signal (XC-01-01) opens SV-01-20 and delays PU-01-01 start by for 15 second

E. Alarms/Monitoring

1. Provide (HH, H, L, LL), analog alarming, and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0016 PU-01-02 CLEAN WATER SOLENOID VALVE (SV-01-21)

A. Ge6eral

1. Continuous monitoring of SV-01-01position to SCADA/OIT.

B. Hardware Interlocks

1. XC-01-02 start command opens SV-01-02.

2. SV-01-21 closed position shuts downs PU-01-02

C. Software Interlocks

1. None.

D. Control

1. PU-01-02 starting command signal (XC-01-02) opens SV-01-01 and delays PU-01-02 start by for 15 second

E. Alarms/Monitoring

1. Provide (HH, H, L, LL), analog alarming, and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0017 GENERATOR AND AUTOMATIC TRANSFER SWITCH

A. General.

1. The Generator will operate when Normal Power is not Available. It will work in conjunction with Automatic Transfer Switch (ATS). Both systems will be monitored thru Modbus 485 and with Hardwired signals.

B. Hardware Interlocks.

1. During Power Outage ATS will transfer the load to the Generator.

C. Software Interlocks.

1. During Power Outage and Generator Startup all pumps and equipment's shall be commanded to stop. Restart of equipment's will be sequential steps after Generator

Normalize. The starting sequence shall follow the generator capacity to avoid a generator trip.

D. Control.

1. Local:

a. Control Mode

1) Local Manual: Generator and ATS can be tested manually in theirs Local Control Panels.
2) Local Automatic: Generator and ATS will enter in function after a main Power Failure.

2. Remote:

a. Control Mode.

1) Remote Manual: None
2) Remote Automatic: None

3) Communication: The Generator and the ATS will communicate thru Modbus 485.

E. Alarms/Monitoring.

1. Diesel Tank Level LIT-76-01

2. Diesel Tank Low Level Alarm LI-76-01

3. Generator.

a. - Status

b. - Fault

c. - Auto/Manual

d. - Run Time Total

e. - Power in kW

f. - Voltage Phase

g. - Current Phase

h. - Frequency

i. - Velocity rpm

j. - Oil Pressure

k. - Motor Temperature

l. - High Temp (TAH 02-10)

m. - Coolant Temp

n. - Coolant Low

o. - Low Oil Pressure

p. - Battery Voltage

q. - Low Battery

r. - Diesel Level

s. - Diesel Low

t. - Velocity rpm

u. - Oil Pressure

v. - Motor Temp

4. Automatic Transfer Switch

a. Source 1 Available

b. - Source 1 Preferred

c. - Source 1 Connected

d. - Automatic Mode

e. - Source 2 Available

f. - Source 2 Preferred

g. - Source 2 Connected

h. - Load kW

i. - Load kVA

j. - Load kVAR

k. - Load pf

l. - Fault

m. - Vab Source 1

n. - Vac Source 1

o. - Vbc Source 1

p. - Freq Source 1

q. - Vab Source 2

r. - Vac Source 2

s. - Vbc Source 2

t. - Freq Source 2

u. - Load Current Ia

v. - Load Current Ib

w. - Load Current Ic

x. - Transfer In Progress.

F. Data Collection.

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0018 FUEL TANK TK-76-01 LEVEL TRANSMITTERS (LIT-76-01)

A. General

1. Continuous monitoring of fuel tank (TK-76-01) level using a level transmitter to SCADA/OIT.

B. Hardware Interlocks

1. None.

C. Software Interlocks

1. At LIT-76-01 low low level Shutdown generator.

D. Control

1. None

E. Alarms/Monitoring

1. Provide (HH, H, L, LL), analog alarming, and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0019 MULTI-POINT LEVEL FLOAT SWITCH (LSL-76-01)

A. General

1. Continuous monitoring of the diesel fuel tank using a discrete level switch to SCADA/OIT.

B. Hardware Interlocks

1. Any hardwired interlocks must be connected to local controls and the SCADA PLC or vendor PLCs.

2. Emergency generator shall shutdown at LALL-76-01.

C. Software Interlocks

1. None.

D. Alarms/Monitoring

1. Provide LALL-76-01 alarming and monitoring as shown on the P&IDs.

2. Provide LAHL-76-01 alarming and monitoring as shown on the P&IDs

E. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0020 TEMPERATURE MONITOR (TIT-02-10)

A. General

1. Continuous monitoring of room temperature to SCADA/OIT.

B. Hardware Interlocks

1. EF-04-01 starts at TAH-02-20, T=90ºF

2. EF-04-01 stops at TAL-02-20, T=80ºF

C. Software Interlocks

1. VFDs shutdown at room temperature of 100ºF.

D. Control

1. None

E. Alarms/Monitoring

1. Provide analog alarming and monitoring for TAH-02-10 as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0021 EXHAUST FAN (EF-04-01)

A. General

1. On/off operation of the exhaust fan.

B. Hardware Interlocks

1. Exhaust fan turns on at TAH-02-10 (Loop 18).

2. Exhaust fan turns off at TAL-02-10 (Loop 18).

C. Software Interlocks

1. At high temperature (TAH 02-10) in the control room (TIT 02-10) shall turn on the exhaust fan (Loops 0018). Default high temperature set point shall be 90ºF.

2. Once temperature reduces TIL 02-10 (TIT 02-10) shall turn off the exhaust fan (Loops 0018). Default Low temperature set point shall be 80ºF.

3. TAH-02-10 and TAL-02-10 set points shall be configurable.

D. Control

1. When the exhaust fan control switch is in MANUAL or LOCAL position, the exhaust fan must operate to maintain a temperature setpoint depending on the room temperature, time control and PID commands.

2. Local:

a. When the exhaust fan local control switch is in MANUAL or LOCAL position, the exhaust fan can be manually started or stopped (HSS) by the operator at Exhaust Fan LCP.
b. Control Mode:

1) Local Manual: When the exhaust fan is in the manual position, the exhaust fan will operate when the start button is pressed. When the exhaust fan is running, the exhaust fan will stop with the stop push button or any hardwired interlock is active.
2) Local Automatic: None.

3. Remote:

a. When the exhaust fan local control switch is in AUTO or REMOTE position, the exhaust fan, control will be executed from PLC/SCADA/OIT/HMI.
b. Control Mode:

1) Remote Manual: The exhaust fan can be manually started or stopped (HSS by the SCADA PLC/OWS operator.

2) Remote Automatic: When the loop is placed in automatic mode, the exhaust fan's on/off control is based on the control room temperature set points (TAH-02-10 & TAL-02-10).

E. Alarms/Monitoring

1. Provide the status and alarm on the SCADA OWS/OIT as shown on the P&IDs, Instrument Index and required in Specification 13306, I&C - General Applications Engineering Services alarm documentation submittal.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

LOOP 0022 FLOW SWITCH (FS-01-30)

A. General

1. Continuous monitoring of PU-01-01 lubrication pipe flow using a flow switch to SCADA/OIT.

B. Hardware Interlocks

1. None.

C. Software Interlocks

1. None

D. Control

1. None

E. Alarms/Monitoring

1. Provide FA-01-30 alarming and monitoring as shown on the P&IDs.

F. Data Collection

1. Provide historical data collection as required in Specification 13306, I&C - General Applications Engineering Services.

END OF SECTION

SECTION 13306
I&C – GENERAL APPLICATIONS ENGINEERING SERVICES

PART 1 GENERAL

A. The Process Control Systems Supplier (PCSS) shall adhere to Puerto Rico Aqueduct and Sewer Authority (PRASA) PLC/SCADA software and programming standards, including but not limited to programming in ladder logic (LAD), statement list (STL), or structured control language (SCL) and Function block diagram (FBD) programming.

B. PCSS must coordinate and integrate the data mapping to be exchanged with all Programmable Logic Controllers (PLCs), including vendor package systems, to be aligned with PRASA PLC/SCADA software and programming standards.

1.1 DEFINITIONS

A. Automation Engineer: An automation engineer is an individual who improves the efficiency of various manufacturing and computer systems by automating certain parts of the systems to do work on their own.

B. Applications Engineering System Supplier (AESS): The entity that provides all programming, configuration, and related services for the control system equipment supplied by the PCSS.

C. Functional Block Diagram (FBD): Functional Block Diagram (FBD) is a graphical programming language used in industrial automation and control systems to represent control logic through interconnected blocks, showing the flow of data and signals between different components and functions.

D. General Contractor (GC): A general contractor is a person or company responsible for overseeing a construction project.

E. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine-level equipment.

F. Ladder Loggic (LAD): Ladder logic is a programming language representing a program by a graphical diagram based on the circuit diagrams of relay logic hardware.

G. Maintenance of Plant Operations (MOPO): A construction plan that prevents or limits process disruptions during construction.

H. Original Equipment Manufacturer (OEM): An original equipment manufacturer is defined as a company whose goods are used as components in another company’s products, which then sells the finished item to users.

I. Operator Interface Terminal (OIT): A hardware component of the SCADA system used for device-level control and monitoring.

J. Operator Workstation (OWS): A hardware component of the SCADA system used for supervisory level control and monitoring.

K. The Puerto Rico Aqueduct and Sewer Authority (PRASA) is a public corporation and instrumentality of the government that owns and operates Puerto Rico's public water supply and wastewater systems.

L. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

M. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

N. Real-Time Monitoring and Control Software (RTMC): A software used to create and run graphical screen representation and interface in actual time.Leadership in Energy and Environmental Design (LEED): A green building certification indicating that a building was designed and constructed to be environmentally responsible and use resources efficiently.

O. Section 1334X "Sections for Instruments Hardware": The X in the number indicates all spec sections starting with the first four numbers (indicating a category described in the accompanying text) are included in the reference.

P. Sequential Function Chart (SFC): is a graphical programming language used in industrial automation and control systems to represent complex control logic as a series of interconnected steps and transitions, clearly visualizing the sequential execution of tasks.

Q. Software Development Life Cycle (SDLC) is a systematic process or methodology that outlines the steps and stages involved in the development, implementation, and maintenance of software applications. It provides a structured approach for software development teams to plan, design, code, test, and deploy software products efficiently while ensuring quality and meeting project requirements.

R. Statement List (STL): STL (Statement List) is a low-level programming language used in industrial automation and control systems to define and execute control logic using a list of sequential statements.

S. Structural Control Language (SCL): Structural Control Language (SCL) is a specialized programming language used in structural engineering to define and control the behavior of structural systems in simulations and analyses.

T. Supervisor Control and Data Acquisition (SCADA): Hardware and software components used for high-level supervisory monitoring of industrial processes. Typical devices that are part of the SCADA network include computers (OWS), PLCs, Ethernet switches, OITs, and HMIs.

1.2 SCOPE OF WORK

A. Refer to section 13300 I&C-General Provisions.

B. If referred to anywhere else in the project manual, Application Engineering or Applications Engineering System Supplier (AESS) services are specified in this section.

C. Provide all programming, configuration, and related services required to achieve a fully integrated and operational system as specified herein. All equipment shall be controlled in full conformity with the contract drawings, process control descriptions, specifications, engineering data, instructions, and equipment manufacturer recommendations. Coordinate the control system for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications and with related existing equipment.

1. Provide configuration of the PLC for all equipment shown on the drawings, except for control equipment shown as being provided as part of a vendor package system.

2. Provide configuration of the SCADA Workstation, Human-Machine Interface (HMI) System Software, Operator Interface Terminals (OITs), and drivers for all equipment shown on the drawings, including equipment provided by vendor package systems.

3. Provide integration of vendor systems connected to the SCADA.

4. Integrate networked and hardwired UPS status to the SCADA application.

5. Provide the programming and configuration of networked UPS software to allow the execution of auto shutdown based on low battery level and auto-on when UPS is online.

6. Provide for and test communications and functionality between all connected devices (such as PLCs) and the HMI software packages, including devices supplied by others, as depicted on the system architecture drawings to provide a comprehensive working system of data collection, storage, and reporting.

D. All work shall be coordinated with plant operating personnel to minimize impacts on daily operations. Project delays caused for any reason must be noted and formally submitted to the owner representative or PRASA as a letter.

1.3 PRASA PLC AND HMI STANDARD

A. Coordinate with the owner representative and PRASA for the documentation and electronic use of the latest version of the standard applications for PLC programming and HMI applications.

B. Coordinate owner representative and PRASA meetings for clarification and project-specific implementation of PRASA PLC and HMI Standards.

C. AESS to re-use any templates available in the PRASA PLC and HMI Standards for corresponding intended applications.

D. SCADA application programming should follow PRASA PLC and HMI standards.

E. SCADA application developer must provide all required software licenses during the application development.

F. The SCADA application developer must ensure the current workstation operating system and application software versions are the ones PRASA currently uses.

G. System integration shall be designed to meet the PRASA requirements using the Archestra Platform for remote telemetric monitoring. Object design specifications should be delivered to PRASA IT for final approval.

H. PRASA IT department will be responsible for the deployment in a production environment with contractor assistance.

I. PRASA IT is responsible for providing application software licenses under the production environment.

J. PRASA IT is responsible for providing a network communication line (PRASA Telemetry Network). Shall be provided for communication with the Barbosa Building Server.

K. As part of PRASA IT software requirements, the contractor shall complete the Software Development Life Cycle (SDLC). At least the contractor must comply with the following phases:

1. Documentation
2. Development
3. Validation or Testing
4. Training
5. Implementation

1.4 RELATED WORK

A. Refer to Section 13300 I&C-General Provisions.

1.5 SUBMITTALS

A. Provide all required submittals by Section 13300. The submittals listed below shall be provided by as a minimum.

1. HMI Operator Interface
2. Controller Program
3. Reports
4. Alarm Documentation
5. O&M Manuals
6. Cybersecurity
7. Supplement the "Project Plan, Deviation List, and Schedule" submittal in section 13300 – General Conditions by adding the following items to the submittal requirements:
   a. List all graphics intended to be created for this project.
   b. List all PLC programs that will be created or modified for this project.

B. Supplement to Input/Output (I/O) List Submittal

1. Supplement the "Input/Output (I/O) List " submittal in section 13300 – General Conditions by adding the following item to the submittal requirements:
   a. LOGICAL POINT ADDRESS: I/O address of each point.

C. Approach of use of PRASA SCADA and PLC Standards and Conventions Submittal

1. Submit the letter confirming the standards and conventions used on this project. The submittal shall define, at a minimum:
   a. A list of the PLC and Graphic library object to be used associated with the process equipment and instruments
   b. System naming conventions, such as graphic display naming, database naming, tag names, and computer naming.
   c. System configuration, including network addressing and PLC/RTU addressing.
   d. Alarm configuration, including priorities and logging.
   e. Security configuration standards, including user groups and privileges.
   f. PLC/RTU standard programming modules, including analog input scaling, flow totalization, equipment runtime, motor start/stop, valve open/close, and any other standard logic planned to be used.

D. HMI Operator Interface

1. Submit a draft of all proposed graphic displays; for those graphics that will be duplicated more than once for similar types of equipment, submit the graphics for the first equipment only.

2. Following the draft graphics review meeting and before the factory test, submit a ready-for-testing version of all graphic displays. Besides incorporating comments and changes resulting from testing, these graphics should be finished.

3. Submitted graphic displays and trends.

E. Controller Program Submittal

1. Submit the following using the manufacturer's built-in printing functions for each controller. Electronic submission of Adobe Portable Document Format ("pdf") files instead of paper submittals is acceptable. The submittal is intended to review general program organization, level of documentation, and overall programming standards (basic pump and valve control, for example). The submittal is not intended to validate the accuracy of the logic. It will only attempt to confirm that the logic works correctly for some loops.
   a. PLC programs showing ladder logic, function block, high-level language, or other controller language used. Include individual rung, network, and command descriptions with abundant comments to identify each code segment's function and intent clearly. Each logic segment shall be clearly presented, the function of each timer described, and the purpose of each subroutine call labeled and defined, etc. Program documentation shall be sufficiently clear to allow determination of compliance with the process control requirements included in the control descriptions and with the Drawings. The submittal shall demonstrate that this project’s logic follows the same structure and format and reflects a standard programming approach.
   b. Submit a memory usage report for the controller. This report shall indicate total memory capacity and unused memory capacity.
   c. Submit cross-reference index of I/O allocation and controller memory address. Every physical I/O point and calculated or virtual I/O required to implement the process scheme shall be included.

2. Submit details of control system communication. Submit a "memory map" or other means showing which signals are exchanged between PLCs. Also, submit an HMI tag database showing all signals exchanged between the PLCs and HMI. Any specific communication block memory addresses shall be defined.

F. Historical Data Configuration

1. Following the SCADA HMI Workshop, submit a description of the approach of all the main aspects of the historical data configuration strategy considering as minimum the storage method, Deadband, and interpolation type.

G. Reports

1. Following the SCADA HMI Workshop, submit all aspects of the reports generation system and shall include, as a minimum, the following:
   a. A complete list of all reports to be developed.
   b. A complete listing of all signals to be reported, including calculated values.
   c. Description of reporting data storage design, including method data is polled and stored.
   d. Description of methodology for entering manual data and interface used.
   e. Procedures for recall, generation, and printing of reports
   f. Printout of each report with details of each cell, where data comes from, and calculation of raw data.

H. Alarm Documentation:

1. Submitt for review and approval following the alarm workshop the alarm list including as minimum the following:
   a. Alarm's description
   b. Priority
   c. Cause and effect, and consequence
   d. Response time
   e. Recommended operator action will be documented for each alarm

I. Cybersecurity plan Submittal

1. Submit a Cybersecurity plan containing the following:
   a. Preliminary list of cybersecurity controls, cybersecurity software and cybersecurity hardware, including version numbers, solely to determine compliance with the requirements of the Contract Documents before beginning development of cybersecurity controls and configuration. Reviewing and approving this preliminary list does not relieve the PCSS of meeting the functional and performance requirements of the system specified herein. Substitution of manufacturer or model/version of these systems after approval of this submittal is not permitted without engineer approval.
   b. Proposed cybersecurity controls to be utilized for this project based on the ISA/IEC-62443 3-3 Security Level (SL) required herein.
   c. Hardware to be used for security and configuration standards
   d. Software applications utilized for security and configuration standards
   e. Impacts on system performance and operations
   f. Testing methodology

2. The cybersecurity configuration may begin after approval of the Cybersecurity Standards and Requirements submittal.

3. Submit Firewall and Network Segmentation Configuration Information

a. Submit preliminary firewall configuration details for review by the engineer and/or PRASA. Include the following:
   1) Network configuration settings
   2) Preliminary ruleset, including a description of what each rule does and how it protects the network
b. Once preliminary configuration is approved and firewalls are configured and operational, submit final firewall configuration details, including plain English descriptions and configuration exports or screenshots of the devices interface showing selections and configuration details keyed to the plain English descriptions.
c. Submit information on network segmentation configurations (VLANs, switch port configuration, etc.). The network segmentation information must include VLAN identifier, Description of VLAN, devices included in each VLAN, which VLANs can communicate with each other, and if communication between VLANs is controlled by Layer 3 switch Access Control Lists or through the firewall.

J. O&M Manuals - Software Maintenance Manuals

1. This document must include instructions covering the use and operation of the control system equipment to perform the intended functions

2. Include these manuals in 13300 – General Conditions "Operation and Maintenance Manuals". This required information is in addition to any requirements of Section 13300– General Conditions.

3. Software Listings and Databases - Submit hard copies of the same information required in the "Controller Program Submittal," except include files updated to reflect the as-built system. Include PDF versions of these files in the USB thumb drive specified below.

4. PID Loop Tuning Parameters - Submit annotated chart recorder traces or computer system trend screen printouts showing tuned control loop response to plus and minus 40 percent of span step changes of loop setpoint for each loop. For cascade loops, submit charts showing the response of the secondary loop with a secondary setpoint on manual and the response of the entire cascade control loop in automatic mode. Include a description of the tuning methodology used. Clean historical data and trends used for startup and test purpose.

5. If available as part of the software provided, supply hard copies of configuration information for the HMI systems, reporting systems, Historian Systems, and any other programs developed under this Contract.

6. Readable Machine Documentation - Provide two sets of as-built software documentation on a USB thumb drive in original electronic format for all PLC, HMI systems, reporting systems, Historian Systems, and other programs developed

under this Contract. Any changes made during or after testing, start-up, and commissioning shall be incorporated.

K. O&M Manuals - Operator Manuals

1. Provide Operator's Manuals before final acceptance of the system.

2. These manuals shall be separately bound and contain all information necessary for the operator to monitor and control the plant from the control system. The manuals shall be written in non-technical terms and shall be organized for quick access to each detailed description of the operator's procedure. Manuals shall contain, but not be limited to, the following information:
   a. A comprehensive table of contents of the manual.
   b. A simple overview of the entire system indicating the function and purpose of each piece of equipment.
   c. A detailed description of the operation of the HMI and OIT, including all appropriate displays. Including a screenshot of each HMI and OIT display screen and annotating each function in the text is an acceptable format for presenting this information.
   d. Step-by-step procedures for starting up or shutting down an individual component of the control system and the entire system.
   e. Login/logout procedures.
   f. Complete step-by-step procedures for printing reports and entering manual data.
   g. Complete step-by-step procedures for performing system or selected file backup and restoration, including archiving historical data. Include recommended archiving schedule for historical data.
   h. Operational description for operating HMI computer equipment and peripherals, including printers, removable bulk storage devices, UPS, etc. The description shall include procedures for typical maintenance and troubleshooting tasks.
   i. A complete glossary of terms and definitions of acronyms.
   j. List of personnel to be contacted for warranty and emergency services, including name, address, telephone number, pager or cell phone number, fax number, and email address.

1.6 COORDINATION MEETINGS AND WORKSHOPS

A. Refer to Section 13300 I&C-General Provisions. The meetings below are in addition to the meetings specified in that section.

B. Schedule and conduct a standards and conventions workshop. This workshop shall review how the AESS will use the PRASA PLC/HMI standards, conventions, and methodologies used to program and develop the programs (i.e., HMI and PLC databases, HMI graphics, PLC programming, etc.). It will solicit Engineer and PRASA's input. Submit an agenda with examples of items to be discussed at a client workshop.

C. Schedule and conduct a draft graphics review meeting. This meeting shall present draft graphics for the Owner's and Engineer's review and feedback before creating the complete set of graphics for review. For repetitive graphics, such as graphics for multiple process trains, include an example of the first graphic only for discussion. Include a discussion of process and overview displays, examples of pop-ups, trends, and system navigation tools. Expect major comments and incorporate any changes resulting from those comments.

D. Schedule and conduct a second graphics review meeting. The purpose of this meeting is to finalize the process of building the required HMI system. This meeting will be held after the return of the draft graphics submittal and incorporation of comments. At this meeting, present the actual software displays, databases, security systems, alarm setting, etc. The Engineer or PRASA will comment on the system for incorporation before the factory test. Bring a working plan to allow for a live demonstration of the graphics.

E. Schedule and conduct a historical data configuration, . The purpose of this workshop shall be to discuss and solicit Owner Representative/PRASA input relate to the storage configuration.

F. Alarm Configuration workshop

1. Discuss with Owner representative or PRASA or process engineer the Alarm configuration for the system to be delivered. This includes the identification, analysis, and categorization of alarms in coordination with the owner representative or PRASA. The purpose of this workshop is to ensure that alarm are optimally programmed and configure and are in line with the designed safety and security requirements, reduce the occurrence of false or nuisance alarms, and improve the response time and efficacy of system operators.

2. This workshop includes several tasks that assess the requirements needed to correctly set up alarms:
    a. Alarm Identification: The process starts with the identification of all alarms within the AESS. This includes all safety-critical alarms, system performance alarms, and environmental alarms. The output of this step is a comprehensive alarm list.
    b. Alarm Analysis: Each alarm identified in the previous step is analyzed to understand its cause, effect, and consequence. This analysis will also consider the potential for false or nuisance alarms and the operator's capacity to respond.
    c. Alarm Prioritization: Based on the analysis, alarms will be prioritized. Priority is determined by factors such as the severity of the consequence, the time window for operator response, and the frequency of occurrence.

G. Schedule and conduct report workshop. Bring examples of all these documents for review and discussion.

H. Schedule and conduct a factory testing coordination meeting two (2) weeks before factory testing. This meeting aims to discuss the specifics of the proposed tests and provide a forum for coordinating the required factory testing.

I. Schedule and conduct a field-testing coordination meeting two (2) weeks before field testing. This meeting aims to discuss the specifics of the proposed tests and provide a forum for coordinating the required field testing.

1.7 **WARRANTY**

A. Refer to Section 13300 I&C-General Provisions and supplement that with the requirements below.

B. Provide telephone technical support within four (4) hours of a warranty claim. If failure cannot be resolved by telephone, provide onsite technical support within twenty-four (24) hours of a warranty claim.

1.8 **MAINTENANCE**

A. Refer to section 13300 I&C-General Provisions.

PART 2 PRODUCTS

2.1 **NOT USED**

PART 3 EXECUTION

3.1 GENERAL

A. The system specified herein shall perform the following generalized functions:

1. The system shall allow the operator to control equipment such as pumps and valves as shown on the Drawings and as defined in Section 13305 I&C- Control Descriptions.

2. Perform real-time process control, including proportional integral derivative control action, sequencing, process calculations, etc.

3. Collect, calculate, and store accurate, reliable operating information for present and future uses.

4. Assist remote site operating personnel by noting and communicating off-normal operating conditions and equipment failures.

5. Accumulate and store equipment running times for use in preventative maintenance.

6. Provide color graphic displays and reports for the system operating and supervisory personnel.

7. Provide trending for all analog values.

8. Provide control system diagnostics.

9. All process control functions, including PID, calculations, sequencing, timing, etc., shall be done in the process controller. The HMI software shall perform the real-time database, report generation, graphic screens, program development, setpoint modification, data archiving, etc.

10. The system shall allow the operator to control manually (by keyboard entry and mouse type pointing device) the status of pumps, valves, etc. (i.e., on off, open close, setpoint value, etc.) when viewing the appropriate graphic screen on the HMI.

3.2 CONTROLLER PROGRAMS

A. All application programs shall be structured and follow an intuitive arrangement so that an instrumentation technician with basic programming knowledge will be able to understand. Programs shall utilize standard program templates or subroutines for repetitive logic such as equipment control, total flow calculations, and equipment runtime calculations.

B. Make changes to the application programs and software configuration based on comments during the submittals, the factory tests, the field tests, and commissioning to meet the design intent at no additional cost to PRASA.

C. PLC I/O. Organize PLC I/O by data type loating point, integer, bits, etc.. Use PLC data structures and RTMC I/O capabilities to organize data transfer operations for ease of modification and expansion.

D. Control Functions and Calculations. Perform all control functions and calculations in the PLC. This includes calculations like runtime, flow totalizers, and control limit parameters. Alarms setpoints and limits for SCADA standard objects are set to be configured thru the SCADA application then pushed to PLC. Where required provide for easy operator viewing and entry of operator adjustable parameters in human units. Where operations procedures require it, include security protection only to accept changes from those authorized to do so.

3.3 GRAPHIC DISPLAYS - GENERAL

A. Process graphic displays shall be develop using the PRASA Standard Archestra Object and graphics following the standard HMI layouts based on the P&IDs, site plan drawings, mechanical drawings, and electrical drawings included in these Contract

Documents. The graphic shall depict process flow streams, process structures, and all major items of process equipment and control devices in a schematic format.

B. Unless specifically noted, all timers, setpoints, alarm actuation levels, etc., shall be adjustable from the operator interface.

C. All interlocks affecting equipment operation shall be identified by alarm and HMI indication.

D. All structures and equipment shall be identified by name, appropriate equipment, and loop tags.

E. Follow PRASA HMI standard for color coding for equipment status.

F. Alarm setting must be done base on alarm :

1. Date/Time entry

2. Limit changes

3. Any commanded or uncommanded change of any point

4. Alarm conditions

5. PLC activation or deactivation

6. Operator login or logout activity

G. General Graphics Characteristics. Present text in English. Use pre-developed symbols from existing Owner Galaxy symbol libraries where practical. Select or develop graphic symbols to clearly differentiate similar equipment types. “3d” Representation is not allowed. Only include equipment identification numbers or names to distinguish between several parallel equipment items. Use only the minimum text required to identify each item.

H. Analog Values. Depict analog values graphically wherever appropriate; for example, a tank level. However, avoid using gauges where graphic space is limited; text is the preferred representation method in these cases. Where several related analog variables are located on a single display, display them as a vertically aligned set; for example, process value and setpoint on a Process Integral Derivative (PID) controller.

I. Graphics Hierarchy: Arrange graphic displays in a hierarchy. Levels in the hierarchy are system-wide, plant-wide, unit process, field variables, equipment control or pop-up (equipment control) graphics.

J. Place flow stream connectors on graphics where a flow “enters” or “leaves” a graphic and the source or destination is depicted on another graphic. Use pushbutton targets to

provide quick access to related graphics. These pushbuttons should be included in the graphic template.

K. Equipment Control: Equipment control will be a two-step process. A pushbutton serves as the target. Selection of the target will cause a control pop-up window to appear only if the logged user has operator interface permission. The equipment control pop-up window will contain control targets (start/stop buttons, setpoint adjustment targets, etc.) which can be selected to perform the desired action. After selecting the control target, the operator will be prompted to confirm that the requested control action is to be executed. Displays, Files, Disk Locations, and Naming.

L. Rapid Application Development Tools: Fully utilize rapid application development tools (Wizards) to ease application development and maintenance. Utilize objects already developed by PRASA.

M. Database Conventions: Database record (point) and function naming conventions must follow PRASA Standards.

N. Alarming and Messaging: Configuration for alarms loggings and events to alarm and event summary files and to the alarm printer. Events are normal (expected) status changes such as operator log-on, setpoint change, and automatic equipment cycling. Annunciate alarms visually and audibly. For selected alarms, initiate the automated operator paging system. Work with the owner representative to develop operator paging conventions and standards during design.

O. Configure Trending shall provide historical charts using with the AVEVA historian.

P. Manual Data Entry and Reporting. In general, provide graphic displays for manual entry of operator-conducted analysis. Provide control developed visual studio connecting to Microsoft's SQL Server for editing and approving manually entered data from operator and remote Workstations.

Q. Security: Security to be implemented in accordance with Owner HMI Standard and be consistent with that of the existing HMI application.

3.4 SPECIFIC GRAPHIC SCREENS

A. At a minimum, provide the following types of graphic screens indicated below.

1. Plant Overview screen shall include a site plan representation, indicating the geographic location of each process and each building. This screen shall includes Key Performance Indicators (KPI's) like total flow, total power, etc.

2. Overall plant process block flow diagram screen shall show all major processes in block form with flow arrows. Each block shall include a text description of key individual treatment processes. Navigational buttons to the individual treatment processes shall be performed by pressing on the text description.

3. Individual treatment process screens shall graphically screen key process variables and equipment. Individual process flow screens for each process shall include all process components, including tanks, pumps, blowers, mixers, drives, flow meters, valves, mechanical devices, as well as manual shutoff and isolation valves. These diagrams shall be generally depicted from the P&ID, and there shall be at least one screen per P&ID on average.

4. Individual unit process screens depicted from the P&IDs are used to control and display each major item of process equipment, process variables, and control devices, including pumps, blowers, valves, gates, mixers, drives, etc. Navigational buttons shall consist of the P&ID's flow arrows to other individual unit processes. The unit process screens shall allow the operator to access individual equipment popup screens. These diagrams shall be generally depicted from the P&ID, and there shall be at least two screens per P&ID on average.

5. Motors popup screens shall include time in operation totalizer.

6. PLC system diagnostic screens, showing the operational status, and fault conditions of all PLC components, including processors, I/O modules, OITs, power supplies, and UPS units.

7. Communications diagnostic screens, showing the details of network status, and communications status of all major components, including Operator Workstations, peripheral devices, and network components.

8. Analog variable screens showing a tabular summary of main plant process variables, in operator-assigned groupings. Flow meters shall include flow totalizers.

9. Power Monitoring screens showing all Power Monitor, ATS and generator availave signals.

3.5 SECURITY AND CYBERSECURITY CONSIDERATIONS

A. The system shall be configured and implemented with security to prevent unauthorized access. The system shall allow authorized changes to system operation through defined user accounts and password verification.

B. Coordinate with PRASA’s user account information, including login name and password for each account.

C. HMI Security groups of "display only", "operator mode", "supervisor mode", and "engineer mode" will be used for assigning permissions to individual users. Each user will have a unique user account and assigned to one of the user groups based on their required access level. The "display only" security level shall automatically be entered on system startup. In the "display only" mode, information can be displayed on the screen, but no changes may be made. In the "operator mode", changes may be made to process set points, times, etc.; however, the overall control concepts may not be

modified. In the "supervisor mode", all operator functions can be modified and any special reports or critical process set points (data can be modified; however, the overall control concepts may not be modified). In the "engineer mode" level, all user modifiable parameters of the system shall be available for modification.

3.6 HISTORICAL DATA CONFIGURATION

A. The following features shall be provided for the processing and storage of system historical data:

1. For any scope related to historical data management to be customized or not included in the PRASA HMI Standards, the following consideration must be followed:
   a. All process analogs, flow totals, and run-time indications of all primary process equipment motors shall be sampled and stored in the historican.
   b. The storage method must be configure based on delta method with a deadband setting that optimized the use of the storage and network.

3.7 REPORTS

A. Quantity and format of reports shall be determined at the historical data management and reports workshop and, as a minimum, shall include shift, daily, monthly and yearly reports. See attachment A of this section for examples of reports to be provided.

B. The system shall be able to generate reports from online historical data files or prompt the user for the appropriate archived data files.

C. Reports shall be initiated automatically based on the time of day or manually upon operator request.

D. User interface displays for report generation shall be developed with easy recall of reports by entering time:day: year target values.

E. User interface displays shall allow the operator to define the destination of the report (e.g., display, printer, computer file, etc.) and when it is to be printed (e.g., immediately, on demand, or automatically at a specified time).

F. It shall be possible to print quality tags alongside the value.

G. Values for which no data is available shall be identified with a unique character. Thus, only values which are actually zero shall be printed as such.

H. Operational Report Types. The following operational report types shall be provided with the system:

1. Shift Operation Summary Report:

a. An operator-adjustable time interval shift operation report shall summarize plant operation from the start and finish time of operation. .
b. The report format shall consist of the following: correct date, plant name, report name, page number, group headings, subheadings, point identification, and engineering units.

2. Daily Operation Summary Report:
   a. The daily operation report shall summarize plant operation for the previous day. The printed information shall be the stored values (not averages) including scanned, lab, and manually entered data.
   b. The report format shall consist of the following: correct date, plant name, report name, page number, group headings, subheadings, point identifications, and engineering units.
   c. The daily minimum, average, maximum, and total where applicable shall also be calculated and printed for each point and stored.

3. Monthly Operation Summary Report:
   a. The monthly operation summary report shall summarize plant operation for the previous calendar month.
   b. The report format shall be arranged so that the first several pages shall con-form to the requirements of the state regulatory agencies and may be separated from the rest of the monthly operation report for transmittal to the regulatory agency.
   c. The report format shall be similar to the daily operation summary report. It shall consist of the following: month and year, plant name, report name, page number, group headings, sub-headings, point identifications, and engineering units.
   d. Monthly minimum, average, maximum, and totals, where applicable, shall also be printed for each column of points printed.

4. Annual Operation Summary Report:
   a. The annual operation summary report shall summarize plant operations for the previous calendar year. The report shall contain scanned, lab, and manually entered data.
   b. The format of the report shall be identical to the monthly operation summary report except for replacing the month with a year in the heading and replacing the date with the calendar month.

3.8 TESTING

A. Refer to section 13302 I&C- General Testing.

B. Supplement to Field Testing requirements

1. Before leaving the site, use the PRASA's programming computer to monitor all PLC processors online, make online changes, and upload and download the processor to ensure programming software version compatibility.

2. Loop Tuning - All PID control loops (single or cascade) shall be tuned following device installation but before the commencement of the Functional Demonstration Test.
    a. Optimal loop tuning shall be achieved either by auto-tuning software or manually by trial and error, Ziegler-Nichols step-response method, or other documented process tuning method.
    b. Determine and configure optimal tuning parameters to assure stable, steady state operation of final control elements under control PID. Each control loop with anti-reset windup features shall be adjusted to provide optimum response following startup from an integral action saturation condition.
    c. Tune all PID control loops to eliminate excessive oscillating final control elements. Loop parameters shall be adjusted to achieve a decay ratio of 1 / 4 or better. In addition, the loop steady state shall be achieved at least as fast as the loop response time associated with critical damping.
    d. Step changes to setpoint in the field shall verify loop performance and stability.
    e. Submit loop tuning documentation as specified in Part 1 of these Specifications.

3.9 TRAINING

A. Refer to Section 13303 I&C- General Training for general training requirements.

END OF SECTION

SECTION 13311
I&C – PLC HARDWARE AND SOFTWARE

PART 1 GENERAL

1.01 DEFINITIONS

A. Analog Input (AI): An electrical signal (1-5 Volts DC or 4-20 milliamps, for example) to be interpreted by a PLC.

B. Analog Output (AO): An electrical signal (1-5 Volts DC or 4-20 milliamps, for example) sent from a PLC to a field device.

C. Digital/Discrete Input (DI): A binary signal (0 or 1) to be interpreted by a PLC.

D. Digital/Discrete Output (DO): A binary signal (0 or 1) sent from a PLC to a field device.

E. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

F. Human Machine Interface (HMI): A software-based user interface with supervisory level control and of machine level equipment.

G. Operator Interface Terminal (OIT): A hardware component of the HMI used for device level control and monitoring.

H. Peer to Peer: Communication between two or more devices, typically PLC's, in which each device can control the communication exchange.

I. Programmable Logic Controller (PLC): A ruggedized programmable computer used for industrial automation.

J. Remote I/O (RIO): I/O that is located remotely from the processor. Remote I/O can communicate over a variety of communication protocol and can use standard rack based I/O, or specialized Remote I/O hardware referred to as Distributed I/O.

1.02 SCOPE OF WORK

A. This Section includes programmable logic controllers (PLCs) and operator interface terminals (OITs) for control of process equipment, process oriented machinery, and process systems.

1.03 RELATED WORK

A. Section 13300 I&C – General Provisions.

B. Section 13306 I&C – General Application Engineering Services.

C. Section 13330 I&C – Control Panel Enclosures and Panel- Mounted Equipment.

D. Section 13335 – Uniterruptible Supply (single phase dc- dc)

1.04 SUBMITTALS

A. Refer to Section 13300 I&C – General Provisions.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C – General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C – General Provisions.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver PLC components in packaging designed to prevent damage from static electricity and physical damage.

B. Store PLC equipment according to manufacturer requirements. At a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. Protect PLCs from exposure to dirt, fumes, water, corrosive substances, and physical damage. Also, protect the PLC from all forms of electrical and magnetic energy that could reasonably cause damage.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C – General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 I&C – General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C – General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C – General Provisions.

1.13 SPARE PARTS

A. Furnish the following PLC hardware spares:

1. I/O Cards: Provide spares for each unique I/O module type installed.

2. Network interface, remote I/O, and communication modules: Provide one (1) spare module for each unique type of module installed.

1.14 TEST EQUIPMENT

A. Refer to Section 13300 I&C – General Provisions.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C – General Provisions.

PART 2 PRODUCT

2.01 GENERAL

A. Refer to Section 13300 I&C - General Provisions.

2.02 SYSTEM DESCRIPTION

A. Configuration: Networked programmable controller incorporated into PRASA SCADA system for controlling the system.

2.03 SPARE I/O, SLOTS, AND FUTURE EXPANSION

A. Spare PLC I/O:

1. Provide 20 percent,minimum of four points per AI, AO, DI, and DO for future use, regardless of whether any of those point types are used in that panel or not.

2. Provide spare I/O points of same type of I/O modules supplied.

B. Spare PLC Slots (Chassis-Based PLC Systems): Provide at least 2 spare slots for addition of future I/O in each chassis provided

C. Future PLC Expansion (Non-Chassis-Based PLC Systems):

1. Provide adequate space to the right of the last I/O card per row of I/O cards for 2 future I/O cards.

2. Card width based on the widest I/O card provided in panel.

D. Provide external relays for spare output points that require their use.

E. Wire all unused points on all I/O to terminal blocks in the order that they occur on the I/O modules.

2.04 COMPACT PLC SYSTEM

A. General:

1. Provide processor, power supply, I/O modules, communication modules, and remote interface modules as required to meet system requirements.

2. PLC is modular-based, rather than chassis-based.

3. Listed and classified by UL, CSA, or FM approval as suitable for purpose specified and indicated.

4. Contains the required memory and functional capacity to perform the specified sequence of operation with the scheduled inputs and output points.

5. Designed for continuous industrial service.

6. Provide products of a single manufacturer.

7. Provide equipment models that are currently in production.

8. In the event of power interruption, the system undergoes an orderly shutdown with no loss of memory, and resumes normal operation without manual intervention when power is restored.

9. Provide PLCs that communicate between workstations, servers, instruments, switches, controllers, process actuators, etc., as shown on the Drawings.

10. PLC capable of stand-alone operation in the event of failure of the communication link to the HMI subsystem.

B. Physical:

1. Vibration: 3.5mm Peak-to-Peak, 5-9 Hz: 1.0G, 9-150 Hz. Vibration tested in accordance with IEC 68-2-6 and JIS C 0911. The system is to be operational during and after testing. Vibration Rating of 2.0G maximum peak acceleration for 10 to 500 Hz, in accordance with one of the following:
   a. DIN rail-mounted PLC, 10 – 57 Hz., amplitude 0.075 mm, acceleration 25-100 Hz.
   b. Panel or plate-mounted PLC: 2-25 Hz., amplitude 1.6mm, acceleration 25-200 Hz.
   c. In compliance with IEC 60068 and IEC 61131.

2. Shock: 15G, 11msec. Shock-tested in accordance with IEC 68-2-27 and JIS C 0912. The system is to be operational during and after testing.

3. Operating Temperature: 32 to 140 degrees F (0 to 60 degrees C).

4. Storage Temperature: -13 to 158 degrees F (-25 to 70 degrees C).

5. Relative Humidity: 10 to 95 percent, non-condensing.

6. Noise Immunity: Tested to operate in the high electrical noise environment of an industrial plant, as governed by the following regulations: IEEE 472, IEC 801, MILSTD 461B, IEC 255-4, NEMA ICS 2-230.40, and ANSI/IEEE C-37.90A-1978.

7. Altitude (Operating): 0 to 6,500 feet (0 to 1,980 meters).

8. Altitude (Storage): 0 to 9,800 feet (0 to 2,990 meters).

9. Degree of Protection: NEMA 1 (IP20).

10. All products have corrosion protection.

C. Identification:

1. Identify all major assemblies and sub-assemblies, circuit boards, and devices using permanent labels or markings indicating:
   a. Module product type such as analog or digital.
   b. Module catalog number.
   c. Module major revision number.
   d. Module minor revision number.
   e. Module manufacturer vendor.
   f. Module serial number.

D. PLC Central Processing Unit (CPU):

1. General:
   a. Minimum 16-bit microprocessor with system timing and is responsible with scheduling I/O updates with no user programming required to ensure discrete or analog update.
   b. Executes user relay ladder logic programs, communicates with intelligent I/O modules, and performs on-line diagnostics.
   c. Consists of a single module which solves application logic, stores the application program, stores numeric values related to the application processes and logic, and interfaces to the I/O.
   d. Samples all discrete and analog inputs and outputs including internal coils and registers, and services special function modules every scan. The CPU processes the I/O with user programs(s) stored in memory and controls outputs based on the results of the logic operation.
   e. Supply the CPU with a battery-backed time of day clock and calendar.

f. CPU family allows for user program transportability from one CPU model to another.

2. Diagnostics:
   a. Perform on-line diagnostics that monitor the internal operation of the PLC. If a failure is detected, initiate orderly system shutdown and fail-over. Monitor the following, at a minimum:
      1) Memory failure.
      2) Memory battery low.
      3) General fault.
      4) Communications port failure.
      5) Scan time over run.
      6) I/O failure.
      7) Analog or special function I/O module failure.
   b. Make diagnostic information accessible to the host communications interfaces and to the PLC program.
   c. PLC indicators and on-board status area for the following conditions:
      1) CPU run.
      2) CPU error or fault.
      3) I/O failure or configuration fault.
      4) Status of Battery or back-up power module.
      5) Communications indicator.

3. Memory
   a. Provide non-volatile battery-backed memory of type CMOS RAM program memory, or equivalent.
   b. Memory Backup System: Provide lithium battery backup or equivalent capable of retaining all memory for a minimum of three months and a Flash memory system capable of reloading program in the event of memory loss.
      1) Backup Storage: Provide backup battery capable of being replaced without disrupting memory integrity. Provide a visual indication of low battery voltage or module error and an alarm bit in the PLC program.
      2) Flash SD Memory Card: Provide memory card storage with capacity greater than the processor memory capacity. Install memory cards in processors for factory testing.
   c. Operating system contained in non-volatile firmware.
   d. The memory containing the operating system is field updateable via a separate update tool.

4. Programming Environment
   a. Programming port: Use PLC Ethernet port for programming.
   b. On-Line programming: Application programs may be modified or stored while the CPU is running, with minimal impact on the scan time.
   c. Online programming including runtime editing.
   d. IEC 61131-3 programming languages supported: Ladder logic, function block, sequential function chart, and structured text.

e. Supply all hardware and software necessary to program the CPU in these languages.

5. Communication Ports:
   a. Provide expandable CPU supplied with additional modules to support the required communication interfaces.

6. Remote I/O Communications:
   a. Provide CPU capable of communicating with up to 12 remote base locations. Automatically sample and update all local and remote I/O modules each scan cycle of the CPU.
   b. Provide communication link between the CPU and any RIO chassis, as recommended by the PLC manufacturer.
   c. Provide diagnostic and equipment status information from each RIO.
   d. Provide remote I/O system with a remote input/output arrangement capable of operating at locations physically separated from the PLC CPU, as detailed on the drawings.
   e. Communicate with the remote I/O arrangement through cable, as recommended by the PLC manufacturer and provided by the PLC system supplier under this specification Section.

E. Power Supplies:

1. Power Input: 24VDC.

2. Provide DC power supplies capable of handling ripple up to 2.4V peak to peak.

3. Power supply provide power for the processor and applicable modules.

4. Provide clearly visible LED to indicate that the incoming power is acceptable, and the output voltage is present.

5. Provide over-current and over-voltage protection designed to operate in most industrial environments without the need for isolation transformers.

6. Size power supplies to accommodate the nominal load plus 30%.

7. Provide power supplies capable of sustaining brown out conditions of at least 1/2 of a cycle, a harmonic rate of 10%, and continuous operation through momentary interruptions of AC line voltage of 10ms or less.

8. Automatically shut down the PLC system whenever its output power is detected as exceeding 125% of its rated power.

9. Provide surge protection, isolation, and outage carry-over up to 2 cycles of the AC line.

F. Discrete Input & Output Modules:

1. General:
   a. Digital input and output modules provide ON/OFF detection and actuation capability.
   b. Provide cards of I/O type and count as required to implement the functions specified, plus an allowance for active spares, as specified herein.
   c. Provide modules capable of being installed or removed while chassis power is applied.
   d. Provide the following status indicators.
      1) On/Off state of the field device.
      2) Module's communication status.
      3) Module health.

2. Module Specifications – 24VDC Input Module
   a. Nominal Input Voltage: 24VDC.
   b. On-State Current: 2mA minimum.
   c. Maximum Off-State Voltage: 5VDC.
   d. Maximum Off-State Current: 1.5mA.
   e. Number of Points per Card: 16.

G. Analog Input & Output Modules:

1. General:
   a. Analog input modules convert an analog signal (1 to 5 Volts DC, 4 to 20 milliamps, for example) that is connected to the module's screw terminals into a digital value.
   b. Furnish analog output modules to convert a digital value that is delivered to the module into an analog signal on the module's screw terminals.
   c. Provide modules designed to be installed or removed while power is applied.
   d. Provide the following status indicators:
      1) Module's communication status.
      2) Module health.
      3) Input/output devices.
   e. Hardware and software indication provided when a module fault has occurred. Each module provided with an LED fault indicator and the programming software displays the fault information.
   f. Provide analog modules that are software configurable through the I/O configuration portion of the programming software.
   g. Following status can be examined in ladder logic:
      1) Module Fault Word: Provides fault summary reporting.
      2) Channel Fault Word: Provides under-range, over-range and communications fault reporting.
      3) Channel Status Words: Provides individual channel under-range and over-range fault reporting for process alarm, rate alarms, and calibration faults.

h. Provide 24 VDC power for analog instrument loops as a part of the system. Derive 24 VDC power supply from the 120 VAC input power circuit to the PLC control panel. Group the field side of the 24 VDC power sources(s) as individual or grouped (of logically associated circuits) fusing, and provide with a readily visible, labeled-blown fuse indicator.

2. Differential Analog Input Module:
   a. Input Range: 0-20 mA.
   b. Resolution: approximately 16 bits across range.
   c. Input Impedance: Greater than 249 Ohms.
   d. Overvoltage Protection: 8V ac/dc with on-board current resistor.
   e. Normal Mode Rejection: 60 dB at 60 Hz.
   f. Common Mode Noise Rejection: 120 dB at 60 Hz, 100 dB at 50 Hz.
   g. Isolation Voltage:
      1) Channel to Ground/Chassis - 100% tested at 1000 VDC minimum for 1s based on 250 VAC.
   h. Provide individual isolators, in addition to the surge suppression devices specified, in the control panels listed in Section 13330 I&C – Control Panelsand Panel Mounted Equipment for all signals that enter the panel from outside the building. Substitution of isolated analog input cards to meet this requirement is acceptable.
   i. Number of Points per Card: 8.

3. Isolated Analog Output Current Module:
   a. Output Current Range: 4 to 20 mA.
   b. Current Resolution: 12 bits across 20 mA.
   c. Open Circuit Detection: None.
   d. Output Overvoltage Protection: 24V DC/AC maximum.
   e. Output Short Circuit Protection: 20 mA or less (electronically limited).
   f. Calibration Accuracy: Better than 0.1% of range from 4 mA to 20 mA.
   g. Number of Points per Card: 8.

H. Communication Interfaces:

1. Supported protocols:
   a. EtherNet/IP
   b. Modbus TCP/IP
   c. Modbus RTU

2. Ports:
   a. Two (2) 100MB/1G Ethernet
   b. USB

I. Required Accessories:

1. Include all necessary cables as specified by the manufacturer. Assemble and install cables per manufacturer recommendations.

J. Manufacturers:

1. Provide all PLCs from a single manufacturer. If the PLC manufacturer has authorized third party vendors to provide modules that are compatible with their platforms, then products manufactured by these authorized third-party vendors will be acceptable.
   a. Rockwell Automation Allen-Bradley, Model 5069 CompactLogix (Or Latest Model)
   b. No Substitutions Allowed

2.05 PLC SOFTWARE

A. General:

1. Provide a PLC configuration and application development software package complete with documentation and installation media.

2. Install the PLC software package and associated licensing and/or activation on the computers shown on the Drawings.

3. Allows for on-line/off-line program development, annotation, monitoring, debugging, uploading, and downloading of programs to the PLCs.

4. Provide all required hardware (including cables, cable adapters, etc.) for connection to PLCs.

5. Provide all software licenses required to achieve the functionality described in the Specifications.

6. Include a software license agreement allowing PRASA's representative or PRASA the right to use the software as required for any current or future modification, documentation, or development of the PLCs provided for this project.

7. Provide software capable of the following IEC 61131-3 functions:
   a. Ladder logic.
   b. Function block.
   c. Sequential function chart.
   d. Structured text.

8. Add-on instruction editor allows for the development of custom reusable function blocks. The software permits function block modification while on-line.

9. Software is Microsoft Windows-based and run on the supplied computers.

10. Software includes a security feature to prevent unauthorized personnel from modifying and downloading the programs.

11. Provide an I/O simulator which allows the PLC application load program to be tested on a PC with simulated analog and digital inputs and outputs, allowing I/O testing and debugging to be performed in a safe, isolated environment without the need for running the PLC CPU and process I/O boards.

2.06 OPERATOR INTERFACE TERMINALS (OIT)

A. General:

1. OITs are standalone devices with an integrated hardware/software platform to monitor and control a process through an interactive display.

B. Features:

1. Software:
   a. OITs pre-packaged with all configuration and programming software necessary to perform functions as shown on drawings and within the specifications.
   b. Integrated OIT software has the following features:
      1) Trending
      2) Data logging
      3) Alarms
      4) Graphic symbols
      5) Animations

2. Hardware:
   a. Minimum one Secure Digital (SD) card slot

C. Communications:

1. Ports:
   a. Minimum two (2) 10/100MB Ethernet
   b. Minimum one (1) USB
   c. Minimum one (1) serial RS-232

2. Protocols:
   a. EtherNet/IP

D. Display:

1. Minimum of 12” viewable as measured diagonally across screen

2. Minimum display resolution
   a. 320 x 240 for 4” to 6" displays

b. 800 x 600 for 8" to 10" displays
c. 1024 x 768 for 12" to 15” displays
d. 1280 x 1024 for displays larger than 15”

3. Color Active Matrix TFT.

4. Display supports touch screen input.

E. Environmental:

1. Rating: OIT rated to maintain the rating of the control panel it will be mounted on and meet the area classification.

2. Operating Temperature: 32 to 122 degrees F (0 to 50 degrees C).

F. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide the following:
a. Rockwell Automation Allen-Bradley, Model PanelView 5000 series
b. No Substitutions Allowed

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.

2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.02 IDENTIFICATION

A. Refer to drawings for tagging designations.

3.03 STARTUP SERVICE

A. PCSS shall perform startup services.

1. Complete installation and startup check according to manufacturer's written instructions.

3.04 DEMONSTRATION

A. Train PRASA's representative or PRASA's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 13315
I&C HMI SYSTEM SOFTWARE

PART 1 GENERAL

1.01 DEFINITIONS

A. Human Machine Interface (HMI): A software-based user interface with supervisory level control and machine level equipment.

B. Input/Output (I/O): Analog or digital field instrument signals to be received and interpreted by a PLC.

C. Network Interface Card (NIC): A physical or virtual component that connects a computer to a network.

D. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

E. Virtual Machine (VM): An emulated computer system created by software. A VM shares the physical system resources of the host computer.

1.02 SCOPE OF WORK

A. This Section includes process control human-machine interface (HMI) software.

1.03 RELATED WORK

A. Section 13300 I&C – General Provisions.

B. Section 13306 I&C – General Applications Engineering Services.

C. Section 13311 I&C – PLC Hardware and Software.

1.04 SUBMITTALS

A. Refer to Section 13300 I&C – General Provisions.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C – General Provisions.

1.07 **QUALITY ASSURANCE**

A. Refer to Section 13300 I&C – General Provisions.

1.08 **DELIVERY, STORAGE, AND HANDLING**

A. Not applicable.

1.09 **NOMENCLATURE AND IDENTIFICATION**

A. Refer to Section 13300 I&C – General Provisions.

1.10 **WARRANTY**

A. Refer to Section 13300 I&C – General Provisions.

1.11 **MAINTENANCE CONTRACT**

A. Refer to Section 13300 I&C – General Provisions.

1.12 **PROJECT/SITE REQUIREMENTS**

A. Refer to Section 13300 I&C – General Provisions.

1.13 **SPARE PARTS**

A. None required.

1.14 **TEST EQUIPMENT**

A. Refer to Section 13300 I&C – General Provisions.

1.15 **TECHNOLOGY OBSOLESCENCE AND MITIGATION**

A. Refer to Section 13300 I&C – General Provisions.

PART 2 PRODUCTS

2.01 **GENERAL**

A. Refer to Section 13300 I&C – General Provisions.

2.02 **HUMAN MACHINE INTERFACE (HMI) SOFTWARE REQUIREMENTS**

A. Manufacturer:

1. Manufacturers and their products are subject to compliance with requirements. Provide the following:
   a. AVEVA System Platform

b. No Substitutions Allowed

B. Licensing Requirements:

1. Each facility must be provided with at least two physical computers, with two functioning as redundant OI server/automation objects servers.

2. Provide an HMI Supervisory client license for each SCADA node as shown on the Drawings.
   a. Provide the following licences for SCADA node
      1) AVEVA System Platform Runtime (bootstrap)
      2) AVEVA InTouch Runtime (InTouch Application Manager, InTouch Windows Viewer)

3. All licenses must be acquired under Puerto Rico Aqueduct and Sewer Authority (PRASA). Licenses under a third party name won't be allowed.

4. Allow collection of unlimited I/O points and have no licensing restrictions on the number of connected HMI clients.

5. Allow an unlimited number of graphic displays and allow an unlimited number of operator logins available.

6. AESS must have its own development licenses for HMI and aplication development licenses for application development purposes.
   a. Allow an unlimited number of graphic displays.

2.03 HISTORIAN SOFTWARE

A. Manufacturers:

1. Manufacturers and their products are subject to compliance with requirements. Provide the following:
   a. AVEVA Historian No Substitutions Allowed

2.04 REPORTING SOFTWARE

A. Manufacturers:

1. SQL Server Express and SQL Server Reporting Services installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Not applicable.

3.02 INSTALLATION

A. Not applicable.

3.03 IDENTIFICATION

A. Not applicable.

3.04 STARTUP SERVICES

A. PCSS shall perform startup services.

1. Complete installation all all required software and startup check according to manufacturer's written instructions.

2. Refer to specification Section 13302 I&C – General Testing for validation of software installation to ensure complete and functional operation of provide applications.

3.05 DEMONSTRATION

A. Train PRASA's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 13320
I&C – CONTROL AND DATA NETWORK EQUIPMENT

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C - General Provisions.

1.02 SCOPE OF WORK

A. Furnish the labor and materials required to install and bring the control and data network into operation as shown on the Drawings and specified herein.

B. The network shall support communications between all servers, operator workstations, PLCs, RTUs, and other communication devices, as shown on the system architecture block diagram(s). Furnish all necessary cables, face plates, connectors, modems, transceivers, repeaters, modules, splice kits, etc., for a complete and operational network. The system architecture diagram(s) are for network understanding only. Some communication devices may be required for network operation, which may not be explicitly shown on the Drawings. The system shall be designed to accommodate an increase of 100 percent of network nodes.

C. Furnish and install a complete data highway that supports communications between all PLCs, RIOs, Network Capable Equipment, and IIot devices, as shown on the system architecture block diagram. Furnish all necessary cables, face plates, connectors, modems, transceivers, repeaters, modules, splice kits, etc., for a complete and operational data highway.

D. The control and data network shall include all nodes on the network. Communication between nodes may be via Ethernet, serial, Fieldbus, or another method, as shown in the Drawings.

1.03 RELATED WORK

A. Refer to the Drawing package.

B. Refer to Section 13300 I&C – General Provisions.

1.04 SUBMITTALS

A. Refer to Sections 13300 I&C – General Provisions.

B. Descriptive literature, bulletins, catalog cuts, and Drawings for the equipment specified herein.

C. Complete bill of materials for the equipment.

D. Spare parts list.

E. Complete system architecture diagram showing, in schematic form, the interconnections between major hardware components, including control centers, panels, power supplies, consoles, computer and peripheral devices, networking equipment, processors, I/O modules, local operator interfaces, process equipment vendor controllers, and like equipment. The system architecture shall be complete and depict all required cables, media type between components, the network protocol used at each network level, and details on connection requirements such as cable pin-outs, port numbers, and rack slot numbers. This specification requirement intends to develop a complete diagram to allow the purchase of all required equipment by part number and allow a qualified technician to interconnect all equipment without referring to additional manuals or literature. Sheet size shall be 11"x17", and using more than one sheet is acceptable.

F. Submit details of I/O level networks, including field instrument, valve, power monitoring, and field device digital networks. Submittal shall include details of the field device digital networks technology, including type, wiring requirements, configuration details, device addressing, and interface to the process control system. Include details of the field device digital network configuration for each field-level digital network and subnetwork.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C - General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C - General Provisions.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 I&C - General Provisions.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: The Cabling Installer must have personnel certified by BICSI or with 5 years of demonstrated experience providing a list of similar projects during the last two years.

1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, Cabling Administration Drawings, and field testing program development by a Technician.

2. Installation Supervision: Installation shall be under the direct supervision of Technician who shall be present at all times when Work of this Section is performed at the Project site.

B. Testing Agency Qualifications: The testing agency must have personnel certified by BICSI or an on-site supervisor with 5 years of experience providing a list of similar projects during the last two years.

1.09 WARRANTY

A. Refer to Section 13300 I&C - General Provisions.

1.10 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C - General Provisions.

1.11 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C - General Provisions.

1.12 SPARE PARTS

A. General requirements for spare parts are specified in section 13300 I&C – General Provisions.

B. The following Network and Communications System spare parts shall be furnished:

1. One switch of each type is provided.
2. One media converter of each type provided
3. Manufacturer's cables - one of each type installed.
4. Five-10ft CAT 6 cables with connectors installed

1.13 TEST EQUIPMENT

A. Refer to Section 13300 I&C - General Provisions.

1.14 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C - General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. A manufacturer's name and model or catalog number are used to establish the standard of quality and general configuration desired.

2.02 INDUSTRIAL-MANAGED ETHERNET SWITCHES

A. General

1. Refer to the system architecture diagram and Ethernet Switch Schedule for the number of switches and ports.

2. Provide a managed Ethernet switch(s) for connection to the control network backbone as shown in the Drawings and specified herein.

3. Provide ethernet switches by the same manufacturer for the project, regardless of the type.

B. Physical Features

1. SFP slots: quantity as the schedule requires.

2. Copper ports: quantity as the schedule requires.

3. Operating temperature: 32 to 130 degrees F

4. Power: 24 VDC redundant power supply inputs

5. Enclosure: Metal case, DIN-rail mountable

6. Rating: UL Class 1, Division 2 Groups A, B, C, and D, when required

C. Network Features

1. The Operative System must be CISCO IOS.

2. Layer 3 routing or Layer 2 as the schedule requires

3. Fault tolerant for use in a ring topology if shown on drawings. The switch shall be able to detect a blocked port and redirect data flow in the opposite direction within 30 ms.

4. Spanning Tree Protocol (STP).

5. Industrial Ethernet : Support CIP Ethernet/IP, PROFINET v2, IEEE1588 PTP v2 Modbus TCP, Default Profile, CIP Time Sync, NTP to PTP Translation, SPAN Traffic Time Stamping.

6. Topology: Support Redundancy Resilient Ethernet Protocol (REP), Parallel Redundancy Protocol PRP, DLR.

7. Rapid Spanning Tree Protocol (RSTP) (IEEE 802.1w).

8. Full duplex on all port.

9. Auto-negotiation and manual configurable speed and duplex.

10. Wire speed-switching fabric.

11. IEEE 802.1w RSTP.

12. IGMP snooping.

13. IGMP filtering.

14. Configuration password protected.

15. Configuration backup capability required.

16. SNMP V3.

17. Lock port function for blocking unauthorized access based on MAC address.

18. Uplink port.

D. Additional Features

1. The converter shall come equipped with a dry contact rated for 120 VAC 5A that shall be used for common trouble alarms. The alarm shall be programmable. If the contact cannot use 120 VAC 5A, provide the necessary 24 VDC power from the PLC panel and provide interposing relays in the PLC panel.

E. Acceptable Manufacturers

1. Stratix, Model Stratix 5400, 5200 Series

2. Or Approved Equal

2.03 ETHERNET MEDIA CONVERTERS

A. General

1. Provide Ethernet media converter(s) as shown in the Drawings and specified herein.

B. Physical Features

1.	RJ45 ports:	10/100BaseTX to 100BaseTX
2.	Fiber uplinks:	100BaseTX to 100BaseFX (ST/SC connectors)
3.	Fiber optics:	Multi- or single-mode capability as shown in the Drawings
4.	Operating temperature:	32 to 130 degrees F (-17 to 54 degrees C)

5. Power: 24 VDC

6. Enclosure: DIN-rail mountable

C. Acceptable Manufacturers

1. Phoenix Contact, Model FL MC 2000E LC - FO converters.

2. N-Tron, Model 1002MC-LX-10

3. Moxa, Model PTC-101-M-LC-HV

4. Or Approved Equal

2.04 POINT-TO-POINT WIRELESS BRIDGE (900 MHz)

A. General

1. Provide integrated 900 MHz point-to-point wireless bridges suitable for industrial SCADA applications between the Río Prieto Pump Station and the Río Prieto Water Treatment Plant, as shown on the Drawings, as analyzed in the Telemetry Analysis Study, and as specified herein. The radio shall be mounted on a guyed lattice antenna tower as specified in Section 13325.

B. Physical Features

1. Enclosure: IP67-rated housing for weather resistance.

2. Operating Temperature: –40°C to 70°C (–40°F to 158°F).

3. Mounting: Tower-leg side-arm or face-mount on the guyed lattice antenna tower specified in Section 13325. Hardware shall be Type 316 stainless steel.

4. Connectivity: RJ45 Ethernet ports with PoE support.

5. Power: 24 VDC via passive PoE injector; injector powered from UPS-backed 120 VAC service.

6. Wind Load (Equipment Survival): 56 N @ 200 km/h (12.6 lbf @ 125 mph). Note: This is the radio enclosure survival rating. Structural design wind for the supporting tower is governed by Section 13325 (wind per ASCE 7-22, Risk Category III, minimum 175 mph).

7. Integrated Antenna: 11 dBi minimum gain; integrated radio/antenna unit (no external coax cable required).

C. Network Features

1. Frequency Range: 902–928 MHz unlicensed ISM band (FCC Part 15.247), Frequency-Hopping Spread Spectrum (FHSS).

2. Data Rates: Minimum 1 Mbps sustained throughput, full duplex; transmit power maximum 30 dBm (1 W) EIRP; receiver sensitivity −105 dBm or better at 1 Mbps.

3. Security Protocols: AES-128 minimum encryption with site-specific pre-shared key. Disable WPS, telnet, and unencrypted HTTP.

4. Functions: Point-to-Point Bridge (Master / Slave); Transparent Layer 2 Ethernet.

5. Range: Minimum 2 miles near line-of-sight.

D. Additional Features and accesories

1. Remote Management: SNMP, Web-based interface, and CLI management.

2. Mounting: Manufacturer-supplied tower-leg mounting kit (side-arm or face-mount) compatible with the guyed lattice antenna tower in Section 133XX. All mounting hardware shall be Type 316 stainless steel.

3. Aproval: FCC

4. Surge Protection: Provide bulkhead-mounted RF / Ethernet surge protector at the tower base and at the cabinet entrance, per Section 13332.

E. Acceptable Manufacturers

1. Ubiquiti, Model airMAX NanoStation M900.

2. GE MDS, Model Orbit MCR or Mercury 900 — GE MDS, Inc., Lincolnshire, IL (USA). Buy America compliant.

3. Phoenix Contact, Model Radioline 900 MHz.

4. Or Approved Equal

F. Configuration

1. Topology: Water Treatment Plant unit configured as Master (Access Point); Pump Station unit as Slave (Remote).

2. Channel mask: exclude any channel measuring greater than −85 dBm noise floor during commissioning site survey.

3. Transmit power: lowest setting that maintains a 20 dB measured fade margin (typical 27 dBm); do not exceed 30 dBm (1 W) EIRP per FCC Part 15.247.

4. Disable WPS, telnet, and unencrypted HTTP. Change all default administrative credentials; passwords shall meet PRASA cybersecurity policy.

5. Assign management IP addresses on the PRASA SCADA management VLAN as directed by the Owner; enable SNMPv3 read-only access for the SCADA NMS.

6. Acceptance: measured RSSI within ± 3 dB of −71.67 dBm predicted in the Telemetry Analysis Study; demonstrate 1 Mbps sustained throughput.

2.05 FIBER OPTIC

A. Refer to specification section 13321 for Fiber Optic cable specifications.

2.06 ETHERNET WIRES AND CONNECTORS

A. CAT 6 Ethernet 10/100/1000 BASE-T/TX Cable.

1. Description: Four-pair, balanced-twisted pair cable certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

2. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

3. Conductors: 100-ohm, 23 AWG solid copper.

4. Shielding/Screening: Unshielded balanced twisted pairs (UTP).

5. Cable Rating: Plenum.

6. Jacket: Blue thermoplastic.

B. **CATEGORY 6a TWISTED PAIR CABLE**

1. Description: Four-pair, balanced-twisted pair cablecertified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.

2. Standard: Comply with TIA-568-C.2 for Category 6a cables.

3. Conductors: 100-ohm, 23 AWG solid copper.

4. Shielding/Screening: Unshielded balanced twisted pairs (UTP)

5. Cable Rating: Plenum.

6. Jacket: Blue thermoplastic

C. **CABLING IDENTIFICATION**

1. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

D. **SOURCE QUALITY CONTROL**

1. Testing Agency: Engage a qualified testing agency to evaluate cables.

2. Factory test cables on reels according to TIA-568-C.1.

3. Factory test cables according to TIA-568-C.2.

4. Cable will be considered defective if it does not pass tests and inspections.

5. Prepare test and inspection reports.

E. **INSTALLATION OF COPPER CABLES**

1. Comply with NECA 1 and NECA/BICSI 568.

2. General Requirements for Cabling:
   a. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
   b. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM)," Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
   c. Install 110-style IDC termination hardware unless otherwise indicated.
   d. Do not untwist twisted pair cables more than 1/2 inch from the termination point to maintain cable geometry.
   e. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   f. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   g. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
   h. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified by the manufacturer. Use lacing bars and distribution spools.
   i. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice the cable between termination, tap, or junction points. Remove and discard the cable if it is damaged during installation and replace it with a new cable.
   j. In the communications equipment room, install a 10-foot-long service loop on each end of the cable.
   k. Pulling Cable: Comply with manufacturer recommendations. Monitor cable pull tensions.

3. Separation from EMI Sources:
   a. Comply with BICSI's "Telecommunications Distribution Methods Manual" recommendations and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
   b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

1) Electrical Equipment Rating Less Than 2 kVA: At least 5 inches
2) Electrical Equipment Rating between 2 and 5 kVA: At least 12 inches.
3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches

c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches
2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches
3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches

d. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches
3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches

e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches

f. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine walls, floors, roofs, and process areas for suitable conditions where flow devices will be installed.

B. Prepare a written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.

2. Conceal conduit in accessible ceilings, walls, and floors where possible.

3. Refer to section 2.07.F.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.03 IDENTIFICATION

A. Tag items in this specification as follows:

1. ETS-01

3.04 STARTUP SERVICE

A. PCSS shall perform startup service.

1. Complete installation and startup checks according to the manufacturer's written instructions.

2. Refer to specification Section 13302 I&C – General Testing for validation of software installation to ensure complete and functional operation of provide applications.

3. For Managed Ethernet Switches:
   a. The owner will provide the IP addresses and segments.
   b. Enable the lock port function to block unauthorized access based on MAC address for each switch and router. Assign static IP addresses to devices connecting to switch.
      1) Lock down all spare switch and router ports.
   c. For site-to-site VPN Routers:
      1) Configure the router to direct the VPN IPsec tunnel back to the firewall located in either the control room or the office, at one of the following locations: WTP.
      2) Properly configure the routing tables to direct data back to the firewall located in either the control room, at one of the following locations: WTP.
      3) Configure the router such that traffic goes through the VPN IPsec tunnel back to the firewall located in either the control room, at one of the following locations: WTP.
      4) Configure the router to properly communicate with the router of the selected ISP provider.
      5) Configure the router to properly communicate with network equipment at either the pump station including, but not limited to, PLC and Radio.
      6) Configure username and complex password to access router.
      7) Decommission all unused ports on the router except the management interface port.

3.05 ESTABLISHING COMMUNICATIONS

A. The PCSS is responsible for establishing all Remote site communications, RIO communications, PLC to PLC communications, PLC to HMI/OIT communications, and all other network and communication systems shown on the drawings. The PCSS shall perform the following tasks to ensure this communication is achieved:

1. Coordinating with the contractor at the beginning of the project to determine which vendor packages are provided with PLCs. The PCSS shall submit the listing of these PLCs as part of their Hardware submission for review by the Engineer.

2. Identifying any additional hardware or software required to ensure communications as part of the PCSS hardware submittal.

3. Coordinate with PRASA to determine a suitable IP subnet.

4. During factory testing and field testing, the PCSS must demonstrate communications to the Engineer. The burden of proof of communications is the transfer of 1 analog and one discrete register in both directions. The PCSS must turn over all configuration files and programming to the AESS upon successful testing.

5. Assistance during field testing by on-site on-site when AESS tests communications with their software.

3.06 SWITCHES SCHEDULE

1. Provide the devices in the following schedules:

Table 1. Ethernet Switch Schedule

Switch Designation	Type	Mount	Fiber Uplinks (1G/10G SFP)	Copper Ports (10/100/1000 BaseT(X), RJ45)	PoE Copper Ports (10/100/1000 BaseT(X), RJ45)
ETS-01	STRATIX 5200 SWITCH, 8 COPPER 100/1000 PORTS, 2 COMBO 100/1000 PORTS, FULL FW, DLR, PRP, NAT	PANEL MOUNT	2	8	0
ETS-02	STRATIX 5200 SWITCH, 8 COPPER 100/1000 PORTS, 2 COMBO 100/1000 PORTS, FULL FW, DLR, PRP, NAT	PANEL MOUNT	2	8	0
EMC-01	PHOENIX CONTACT FL MC 2000E LC MEDIA TO	PANEL MOUNT	2	1	0

	ETHERNET CONVERTER				
WAP-01	UBIQUITY / GE MDS / Phoenix Contact / 900 MHz POINT-TO-POINT 900 MHz WIRELESS BRIDGE	TOWER MOUNT	1	1	0

END OF SECTION

SECTION 13325
I&C – ANTENNA SUPPORT STRUCTURES AND LIGHTNING PROTECTION

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C – General Provisions.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals to design, fabricate, deliver, and install complete guyed lattice antenna support towers and lightning protection systems at the Río Prieto Pump Station and at the Río Prieto Water Treatment Plant, as shown on the Drawings, as analyzed in the Telemetry Analysis Study, and as specified herein.

B. Each tower system shall include: tower sections, base foundation hardware, base-plate anchor bolts, guy strand assemblies and hardware, guy anchor (deadman) foundations and anchor rods, antenna mounting hardware, air terminal, down conductor, ground ring, guy-anchor grounding, surge protection bonding, and Buy America / Build America Act (BABA) compliance documentation.

C. A self-supporting (free-standing) pole shall not be used. The antenna support structure shall be a guyed lattice tower anchored by pre-tensioned galvanized steel guy strands to concrete deadman anchors, designed to resist hurricane-level wind forces.

1.03 RELATED WORK

A. Refer to the Drawing package.

B. Section 13300 I&C – General Provisions.

C. Section 13320 I&C – Control and Data Network Equipment.

D. Section 13332 I&C – Surge Suppressors.

E. Section 260526 Grounding and Bonding for Electrical Systems.

F. PRASA Standard Section 160200 – Lightning Protection (governs unless this Section is more stringent).

1.04 SUBMITTALS

A. Refer to Section 13300 I&C – General Provisions.

B. Manufacturer's product data and catalog cuts for: guyed lattice tower (with section schedule), guy strand, dead-ends, thimbles, turnbuckles, equalizer plates, base-plate anchor bolts, guy anchor rods, antenna mounting brackets, air terminal, down conductor, surge protectors, ground rods, and exothermic weld kits.

C. Sealed structural calculations for the tower, tower base foundation, and guy anchor foundations, prepared by a Professional Engineer licensed in Puerto Rico, demonstrating compliance with ANSI/TIA-222-H and ASCE 7-22 for the hurricane Ultimate Design Wind Speed (3-second gust) shown on the ASCE 7-22 wind contour for Yauco, Puerto Rico, minimum 175 mph, with the appropriate Risk Category III importance factor.

D. Shop drawings showing tower elevation, section schedule, guy levels, guy attachment details, guy anchor radius and bearing, base-plate anchor template, antenna mounting layout, lightning protection layout, ground ring layout, and bonding details. Indicate the pre-tension value for each guy strand.

E. Calibrated guy-tension measurement report (initial and 30-day re-tensioning).

F. Ground-to-earth resistance test report per IEEE Std 81, including the tower base and each guy anchor.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. ANSI/TIA-222-H – Structural Standard for Antenna Supporting Structures and Antennas.

B. ANSI/TIA-322 – Loading, Analysis, and Design Criteria Related to the Installation, Alteration, and Maintenance of Communication Structures.

C. ASCE 7-22 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. NFPA 780 – Standard for the Installation of Lightning Protection Systems.

E. UL 96 – Lightning Protection Components.

F. UL 96A – Installation Requirements for Lightning Protection Systems.

G. UL 467 – Standard for Grounding and Bonding Equipment.

H. Motorola R56 – Standards and Guidelines for Communication Sites.

I. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

J. IEEE Std 142 (Green Book) – Recommended Practice for Grounding of Industrial and Commercial Power Systems.

K. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

L. ASTM A475 – Standard Specification for Zinc-Coated Steel Wire Strand.

M. ASTM F1145 – Standard Specification for Turnbuckles, Swaged, Welded, Forged.

N. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

O. FCC Part 15.247.

P. State and Local code requirements.

Q. Where any conflict arises between codes or standards, the more stringent requirement shall apply.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 I&C – General Provisions.

B. Store galvanized components off the ground, on dunnage, in well-drained areas to prevent white rust formation. Cover with breathable tarps; do not store in airtight wraps.

1.08 QUALITY ASSURANCE

A. Refer to Section 13300 I&C – General Provisions.

B. Tower Erector Qualifications: Licensed tower erector with a minimum of 5 years of experience erecting guyed lattice towers in hurricane wind zones. Submit list of similar projects within the last 5 years.

C. Field Supervisor: Certified by the Telecommunications Industry Association (TIA) or the National Association of Tower Erectors (NATE), and present on-site at all times during tower erection and guy-tensioning.

1.09 WARRANTY

A. Refer to Section 13300 I&C – General Provisions.

1.10 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C – General Provisions.

1.11 SPARE PARTS

A. None required by this Section, except as noted in Section 13320.

1.12 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C – General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. A manufacturer's name and model or catalog number are used to establish the standard of quality and general configuration desired.

2.02 ANTENNA SUPPORT TOWER (GUYED LATTICE)

A. Type:

1. Guyed lattice tower, 3-leg or 4-leg open frame, anchored by minimum three (3) guy assemblies to concrete deadman anchors.

2. Self-supporting (free-standing) poles are not acceptable.

B. Material:

1. Tower legs: ASTM A500 / A53 steel tube or ASTM A572 solid round, hot-dip galvanized per ASTM A123 after fabrication.

2. Lacing / bracing: ASTM A36 steel, hot-dip galvanized per ASTM A123.

3. Hardware: ASTM A325 hot-dip galvanized bolts, nuts, and washers.

C. Heights (above finished grade):

1. 4.6 m (15 ft).

D. Design Loads:

1. Designed in accordance with ANSI/TIA-222-H, Risk Category III (essential utility / SCADA), and ASCE 7-22 for hurricane wind exposure applicable to Yauco, Puerto Rico.

2. Ultimate Design Wind Speed (Vult) per the ASCE 7-22 wind contour for the site, minimum 175 mph (3-second gust at 33 ft above grade).

3. Include radial ice load if required by the AHJ.

4. The tower shall be analyzed for the hurricane wind loading condition with the antenna at its mounted elevation, including the eccentric load of mounted equipment.

E. Base-Plate Anchor Bolts:

1. ASTM F1554 Grade 55, hot-dip galvanized per ASTM F2329, with double nuts and leveling plates.

2. Quantity, size, and embedment per the structural Drawings.

F. Antenna Mounting Hardware:

1. Tower-leg side-arm or face-mount brackets furnished by the tower manufacturer.

2. Type 316 stainless steel U-bolts, saddle clamps, and antenna mounting plates compatible with the integrated 900 MHz radio enclosure specified in Section 13320.

G. Acceptable Manufacturers (Buy America Compliant):

1. ROHN Products, LLC — Models 25G / 45G / 55G guyed lattice tower (Peoria, IL, USA).

2. Sabre Industries, Inc. — Guyed Lattice Tower series (Sioux City, IA, USA).

3. Universal Towers, Inc. — guyed series (Sturgis, MI, USA).

4. Or Approved Equal — subject to BABA compliance documentation.

2.03 GUY ASSEMBLIES

A. Guy Strand:

1. 7-strand Extra High Strength (EHS) Class A hot-dip galvanized steel guy strand per ASTM A475.

2. Minimum 6.4 mm (1/4 in.) diameter or as required by the structural calculations.

B. Dead-Ends: Preformed (Big-Grip) hot-dip galvanized steel dead-ends sized for the guy strand diameter.

C. Thimbles: Galvanized steel thimbles.

D. Turnbuckles:

1. Closed-body galvanized steel turnbuckles per ASTM F1145.

2. Sized for the design tension with safety factor ≥ 2.0.

E. Equalizer Plates: Galvanized steel yoke / equalizer plates where multiple guys terminate at a single anchor.

F. Safety Wire: Stainless steel anti-rotation safety wire / cotter pins on each turnbuckle.

G. Acceptable Manufacturers:

1. Preformed Line Products (PLP) — Mayfield Village, OH (USA) — dead-ends.

2. Bekaert Corporation — Marietta, GA (USA) — guy strand.

3. Crosby Group — Tulsa, OK (USA) — turnbuckles and hardware.

4. Or Approved Equal — BABA compliant.

2.04 GUY ANCHORS

A. Type: Reinforced concrete deadman or drilled-shaft anchor as detailed on the structural Drawings; rock anchor where bedrock is present.

B. Anchor Rod: ASTM F1554 Grade 55, hot-dip galvanized per ASTM F2329, cast into the deadman, sized to develop the maximum guy tension at the design hurricane wind condition with minimum safety factor of 2.0 against pullout, overturning, and sliding.

C. Quantity and Geometry:

1. Minimum three (3) anchors per tower, spaced equally at 120° (3-leg) or 90° (4-leg) in plan around the tower.

2. Anchor radius from the tower center shall be a minimum of 75% of the tower height unless documented otherwise in the structural calculations.

3. Coordinate anchor locations with property lines, access roads, and underground utilities.

2.05 LIGHTNING PROTECTION COMPONENTS

A. Air Terminal:

1. UL 96 Class I solid copper or copper-clad aluminum.

2. Minimum 12.7 mm (1/2 in.) diameter.

3. Extending a minimum of 600 mm (24 in.) above the highest point of the antenna, mechanically fastened to the tower apex and isolated from the antenna feed line.

B. Down Conductor: Minimum #2 AWG bare tinned-copper, UL 96 listed, secured to one tower leg with stainless steel cable cleats.

C. Bonding Conductors: Minimum #6 AWG bare tinned-copper.

D. Ground Ring and Radial Conductors: #2 AWG bare tinned-copper.

E. Ground Rods: Copper-clad steel, 19 mm × 3,000 mm (3/4 in. × 10 ft), UL 467 listed. Minimum three (3) at the tower base and one (1) at each guy anchor.

F. Exothermic Weld Kits: ERICO CADWELD or equivalent.

G. Surge Protectors (RF and Ethernet): Refer to Section 13332.

H. Acceptable Manufacturers (Buy America Compliant):

1. nVent ERICO — Solon, OH (USA).

2. Harger Lightning & Grounding — Grayslake, IL (USA).

3. Burndy LLC — Manchester, NH (USA) — grounding hardware.

4. PolyPhaser (a Pulse Electronics company) — Minden, NV (USA) — RF surge.

5. Or Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine foundation locations, guy anchor locations, and surrounding access conditions prior to mobilization.

B. Prepare a written report, endorsed by the tower erector, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION – GUYED LATTICE TOWER

A. Erect tower in accordance with the manufacturer's installation drawings and ANSI/TIA-322 (current revision).

B. Plumb to within 1:500 of vertical after final guy tensioning.

C. Coordinate base-plate anchor template with concrete foundation work.

D. Apply zinc-rich field touch-up paint (95% zinc by weight, dry film) to any galvanized coating damaged during shipping, handling, or erection.

E. Maintain minimum 3 m (10 ft) horizontal separation from any overhead power conductor and from each guy strand to overhead conductors.

3.03 GUY TENSIONING

A. Pre-tension each guy strand uniformly to the value shown in the manufacturer's installation drawings (typically 8 – 10% of the rated breaking strength of the strand). Variation between guys shall not exceed ±5% of the design tension.

B. Measure guy tension with a calibrated dynamometer or tension meter. Provide calibration certificate with the test report.

C. Re-check and re-tension all guys 30 days after initial installation. Document the re-tensioning measurements.

D. Apply anti-rotation safety wire or cotter pins to each turnbuckle after final tensioning.

3.04 INSTALLATION – GUY ANCHORS

A. Excavate to depth and dimension shown on the structural Drawings.

B. Set anchor rod with the bearing plate at the correct elevation and angle (matching the line of action of the guy).

C. Place reinforcement and concrete; cure per concrete specifications.

D. Protect anchor rod threads during concrete placement; clean and lubricate after curing.

3.05 INSTALLATION – LIGHTNING PROTECTION

A. Install in accordance with NFPA 780 and the manufacturer's instructions.

B. Air terminal: mechanically fastened to the tower apex, extending minimum 600 mm (24 in.) above the highest point of the antenna.

C. Down conductor: secured to one tower leg with stainless steel cable cleats at maximum 600 mm (24 in.) spacing; no bends less than 200 mm (8 in.) radius; no bends greater than 90°. Do not use the tower steel alone as the lightning down conductor.

D. Ground ring: continuous loop around tower base foundation, minimum 600 mm (24 in.) below grade, minimum 600 mm (24 in.) offset from the foundation.

E. Ground rods at tower base: minimum three (3), distributed around the ground ring, spaced not less than 3 m (10 ft) apart.

F. Ground rod at each guy anchor: drive one (1) 10-ft rod; bond it to the anchor rod / turnbuckle with #6 AWG tinned-copper; bond the rod back to the tower base ground ring with a buried #2 AWG tinned-copper radial conductor.

G. Buried connections: exothermically welded (CADWELD or equivalent).

H. Single-point ground: bond each tower leg at the base, the antenna bracket, every guy turnbuckle / anchor rod, surge suppressor enclosures, PLC / RTU panel, AC service ground, and any nearby metallic structures to the ground ring with #6 AWG tinned-copper bonding jumpers.

3.06 IDENTIFICATION

A. Refer to Drawings for tagging designations.

3.07 FIELD QUALITY CONTROL

A. Visual inspection of all lightning protection and bonding connections prior to backfill of buried connections.

B. Guy tension measurement at initial installation and at the 30-day re-tensioning.

C. Ground-to-earth resistance test per IEEE Std 81 at the tower base AND at each guy anchor; result ≤ 10 ohms (5 ohms preferred). If exceeded, install additional rods, chemical electrodes, or counterpoise until compliance is achieved.

D. RSSI / link verification of the 900 MHz wireless bridge per Section 13320.

3.08 STARTUP SERVICE

A. Refer to Section 13300 I&C – General Provisions.

3.09 DEMONSTRATION

A. Refer to Section 13300 I&C – General Provisions.

END OF SECTION

SECTION 13330
I&C – CONTROL PANELS AND PANEL-MOUNTED EQUIPMENT

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C - General Provisions.

1.02 SCOPE OF WORK

A. Refer to Section 13300 I&C - General Provisions.

B. Furnish and install control panels and panel-mounted equipment as specified herein and shown on the Drawings.

C. All new panels and panel components shall match existing equipment makes and models wherever possible, so that system additions can be most easily integrated with respect to operation and maintenance training, spare parts inventory, and service contracts. Even when exact matches are not possible, equipment furnished must be fully compatible with the existing system. Color, size, and material of new panels should conform to that of existing panels.

D. Furnish the following panels and consoles. Each panel shall be supplied with full sub-panels and side panels as required.

PANEL SCHEDULE

Panel Designation	Minimum Panel Size	Maximum Space Available	Enclosure Rating & Type
CP-01	42-inch high by 36-inch wide by 12-inch deep	38-inch high by 32-inch wide by 10-inch deep	NEMA Type 4X-door, steel construction, Wall Mount. Front Access Only

1.03 RELATED WORK

A. Refer to Section 13300 I&C - General Provisions.

1.04 SUBMITTALS

A. Refer to Section 13300 I&C - General Provisions.

B. Descriptive literature, bulletins, catalog cuts, and Drawings for the equipment specified herein.

C. Complete bill of materials for the equipment.

D. Spare parts list.

E. Panel Layout Drawings and Wiring Diagrams Submittal

1. Where direct hardwired interfaces exist between the PCSS control panels and vendor provided control panels furnished under other Divisions, the Contractor shall provide to the PCSS the approved submittals in order for the PCSS to provide complete wiring diagrams showing all wiring connections in the I/O system. This includes but is not limited to terminal block numbering, relay contact information, instruments, equipment, and control panel names. These drawings shall be included in the Final O&M submittal. Leaving this information blank on the Final Documentation drawings is not acceptable.

2. Panel Layout Drawings: Drawings shall be furnished for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. At a minimum, the panel drawings shall include the following:
   a. Interior and exterior panel elevation drawings to scale.
   b. Nameplate schedule.
   c. Conduit access locations.
   d. Panel construction details.
   e. Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify any component of the assembly by manufacturer and model number.
   f. Fabrication and painting specifications including color (or color samples).
   g. Construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.
   h. For every control panel, heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. Calculations shall include the recommended type of equipment required for both heating and cooling. Calculations shall include sun shields where installed.
   i. Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors. All costs associated with obtaining the UL seal and any inspections shall be borne by the Contractor.
   j. Panel drawings shall be 11” x17” in size.

3. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel, as well as connections to external devices. If Loop Wiring Diagrams are not specified below, equipment external to the control panel and related external connections shall be shown on the Panel Wiring Diagrams.

a. Panel wiring diagrams shall include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering.
b. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer.
c. I/O wiring shall be numbered with rack number, slot number, and point number.
d. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme.
e. Panel drawings shall be 11" x17in size.

4. Loop Wiring Diagrams: The Loop Drawings shall be furnished for all devices external to the control panel and related external connections.
   a. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer.
   b. Field device wiring shall include the device tag and a unique numeric identifier. The diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS.
   c. I/O wiring shall be numbered with rack number, slot number, and point number.
   d. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme.
   e. Loop drawings shall be 11" x17" in size.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C - General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C - General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C - General Provisions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 I&C - General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 I&C - General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C - General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C - General Provisions.

1.13 SPARE PARTS

A. Furnish the following spare instruments:

1. Lamp for Selector Switch, Pushbutton, and Indicating Light: 100 percent, min. two(2) of each type used

2. Light Bulb: 100 percent, two minimum, of each type used.

3. Fuse: 100 percent, two minimum, of each type used.

4. Surge Suppressors: 50 percent, five minimum, of each type used.

5. 20 percent uninstalled (loose) spare I/O modules for each type of module used including processor modules and power supplier (chassis mount or external).

1.14 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C - General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. Refer to Section 13300 I&C - General Provisions.

2.02 LIGHTNING/SURGE PROTECTION

A. Refer to Section 13300 I&C - General Provisions.

2.03 CONTROL PANEL GENERAL REQUIREMENTS

A. The dimensions within this Section and on the Contract Drawings are for general reference only. Ensure that final enclosure sizing and panel arrangements accommodate

all required equipment for a fully integrated and operational system as specified herein and in the Contract Documents.

B. Each control panel and terminal cabinet shall bear the UL label. The UL label shall apply to the enclosure, the specific equipment supplied with the enclosure, and the installation and wiring of the equipment within and on the enclosure. If required for UL labeling, provide ground fault protective devices, isolation transformers, fuses, and any other equipment necessary to achieve compliance with UL 508 requirements. The Drawings do not detail all UL 508 requirements.

C. All panel doors shall have a lock installed in the door handle, or a hasp and staple for padlocking. Locks for all panels provided under this Contract shall be keyed alike.

D. The devices designated for rear-of-panel mounting shall be arranged within the panel according to respective panel drawings and in a manner to allow for ease of maintenance and adjustment. Heat generating devices such as power supplies shall be located at or near the top of the panel.

E. All components shall be mounted in a manner that shall permit servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component mounting shall be oriented in accordance with the manufacturer's recommendations. The internal components shall be identified with suitable plastic or metal engraved nametags mounted adjacent to (not on) each component identifying the component in accordance with the drawing, specifications, and PCSS's data.

F. All exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc. required to maintain the NEMA rating of the panel.

G. Nameplates

1. All panels and panel devices shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Unless otherwise indicated, each device nameplate shall include up to three lines with the first line containing the device tag number as shown on the drawings, the second line containing a functional description (e.g., Recirculation Pump No. 1), and the third line containing a functional control description (e.g., Start).

2. Unless escutcheon plates are specified or unless otherwise noted on the Drawings, nameplates shall be 3/32-inch thick, black and white, Lamicoid with engraved inscriptions. The letters shall be Black against a White background unless otherwise noted. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable.

3. Nameplate fasteners and mounting shall be epoxy adhesive or stainless steel screws for cabinet mounted nameplates.

4. For every panel, provide a panel nameplate with a minimum of 1" high letters. Provide legend plates or 1-in by 3-in engraved nameplates with ¼-in lettering for identification of door mounted control devices, pilot lights, and meters.

5. Single Lamicoid nameplates with multiple legends shall be used for grouping of devices such as selector switches and pilot lights that relate to one function.

H. Mounting Elevations

1. ISA Recommended Practice RP60.3 shall be used as a guide in layout and arrangement of panels and panel mounted components. Dimensions shall account for all housekeeping pads that panels will sit on once they are installed.

2. Centerline of indicators and controllers shall be located no lower than 48-inches or higher than 66-inches above the floor on a panel face.

3. Centerline of lights, selector switches, and pushbuttons shall be located no lower than 32-inches or higher than 70-inches above the floor on a panel face.

4. Tops of annunciators shall be located no higher than 86-inches above the floor on a panel face.

5. Installation of panel components shall conform to component manufacturers' guidelines.

2.04 PANEL MATERIALS AND CONSTRUCTION

A. Structure and Enclosure

1. Panels shall be of continuous welded-steel or FRP construction as shown on the Panel Schedule. Provide angle stiffeners as required on the back of the panel face to prevent panel deflection under instrument loading or operation. Internally, the panels shall be supplied with a structural framework for instrument support purposes and panel bracing. The internal framework shall permit panel lifting without racking or distortion. Provide removable lifting rings designed to facilitate simple, safe rigging, and lifting of the control panels during installation.

2. Each panel shall be provided with full height, fully gasketed access doors where shown. Doors shall be provided with a three-point stainless steel latch (except for NEMA 4X panels) and heavy-duty stainless steel locking handle. Rear access doors (if included) shall be conveniently arranged and sized such that they extend no further than 24-inches beyond the panel when opened to the 90-degree position. Front and side access doors shall be as shown. Panel access doors shall be provided

with full length, continuous, piano type stainless steel hinges with stainless steel pins. Front access doors with mounted instruments or control devices shall be of sufficient width to permit door opening without interference from flush mounted instruments.

3. The panels, including component parts, shall be free from sharp edges and welding flaws. Wiring shall be free from kinks and sharp bends and shall be routed for easy access to other components for maintenance and inspection purposes.

4. The panel shall be suitable for top and bottom conduit entry as required by the Electrical Drawings. For top mounted conduit entry, the panel top shall be provided with nominal one-foot square removable access plates, which may be drilled to accommodate conduit and cable penetrations. All conduit and cable penetrations shall be provided with ground bushings, hubs, gasketed locknuts, and other accessories as required to maintain the NEMA rating of the panel and electrical rating of the conduit system.

5. All panels in indoor, dry, non-corrosive environments shall be NEMA 12 unless otherwise noted. All panels in outdoor, wet, non-chemically corrosive environments shall be NEMA 4 unless otherwise noted. Panels in chemically corrosive environments shall be NEMA 4X unless otherwise noted. All panels located in a hazardous location shall be rated for the type of hazard (e.g., NEMA 7 for Class 1, Division 1).

B. Freestanding and Floor-Mounted Vertical Panels

1. Freestanding and floor-mounted vertical panels shall meet the NEMA classification as shown on the drawings or specified herein. The panels shall be constructed of 12 gauge sheet steel, suitably braced internally for structural rigidity and strength. All NEMA 4X rated panels shall be constructed of 316 stainless steel, unless FRP is specifically indicated to be provided. Front panels or panels containing instruments shall be not less than 10 gauge stretcher leveled sheet steel, reinforced to prevent warping or distortion.

C. Wall and Unistrut Mounted Panels

1. All wall and Unistrut mounted panels shall meet the NEMA classification as shown on the drawings or specified herein. The panels shall be constructed of not less than USS 14 gauge steel, suitably braced internally for structural rigidity and strength. All NEMA 4X rated wall mounted panels shall be constructed of 316 stainless steel, unless FRP is specifically indicated. FRP panels shall be used in chlorine areas. All FRP panels located in direct sunlight shall be provided with a protective coating and sun shield to prevent discoloration and cracking.

D. Finish Requirements

1. All sections shall be descaled, degreased, filled, ground, and finished. The enclosure, when fabricated of steel, shall be finished with two rust resistant phosphate prime coats and two coats of enamel, polyurethane, or lacquer finish, which shall be applied by either the hot air spray or conventional cold spray methods. Brushed anodized aluminum, stainless steel, and FRP panels will not require a paint finish.

2. The panels shall have edges ground smooth and shall be sandblasted and then cleaned with a solvent. Surface voids shall be filled and ground smooth.

3. Immediately after cleaning, one coat of a rust-inhibiting primer shall be applied inside and outside, followed by an exterior intermediate and topcoat of a two-component type epoxy enamel. A final sanding shall be applied to the intermediate exterior coat before top coating.

4. Apply a minimum of two coats of manufacturer's standard flat, light-colored lacquer on the panel interior after priming.

5. Unless otherwise noted, the finish exterior colors shall be ANSI 61 gray with a textured finish.

E. Print storage pockets shall be provided on the inside of each panel. The storage pockets shall be steel, welded onto the door, and finished to match the interior panel color. The storage pocket shall be sufficient to hold all of the prints required to service the equipment, and to accommodate 8.5 inch by 11 inch documents without folding.

F. Where specified on the Panel Schedule, a folding shelf shall be provided on the inside of the door on all free-standing and floor-mounted panels. The shelf shall be suitable for a laptop computer and shall be placed such that an open laptop computer does not interfere with any door-mounted devices. The folded shelf shall not interfere with any internal panel components when the door is closed. The folding shelf shall automatically lock in the horizontal position when raised. The folding shelf shall be approximately 18 inches wide by 12 inches deep and shall have a minimum distributed load rating of 100 pounds. All parts shall be made of heavy gauge steel and shall be painted white or finished to match the interior panel color.

2.05 ENVIRONMENTAL CONTROL

A. All panels shall be provided with louvers, sun shields, heat sinks, forced air ventilation, or air conditioning units as required to prevent temperature buildup inside of panel. The internal temperature of all panels shall be regulated to a range of 45 degrees F to 104 degrees F under all conditions. Under no circumstances shall the panel cooling or heating equipment compromise the NEMA rating of the panel.

B. Except for panels mounted with their backs directly adjacent to a wall, louvers shall be in the rear of the panels, top and bottom, and shall be stamped sheet metal construction.

C. For panels mounted with their backs directly adjacent to a wall, louvers shall be on the sides.

D. Forced air ventilation fans, where used, shall provide a positive internal pressure within the panel, and shall be provided with washable or replaceable filters. Fan motors shall operate on 120-volt, 60-Hz power.

E. For panels with internal heat that cannot be adequately dissipated with natural convection and heat sinks or forced air ventilation, an air conditioner shall be provided.

F. Provide custom fabricated sun shields for all outdoor panels in accordance with the following requirements:

1. Sun shield shall be provided with the enclosure by the enclosure manufacturer. Welding studs directly to the enclosure for sun shield mounting is acceptable when done prior to shipping to site. Drilling holes directly to the enclosure for sun shield mounting is not permitted.

2. Sun shields shall be fabricated from minimum 12 gauge Type 316 stainless steel. Units shall be designed, fabricated, installed, and supported to fully cover and shade the top, sides, and back of the enclosure, and to partially shade the front panel of the enclosure from direct exposure to sunlight from sunrise to sunset.

3. Depending on overall size, sun shields may be fabricated in single or multiple segments for attachment to the enclosure support framing or to separate free standing framing around the enclosure.

4. The sun shield shall be designed and mounted to provide a minimum 3-inch air gap all around the enclosure for air circulation and heat dissipation.

5. The top section of all sun shields shall be sloped at a minimum angle of 5 degrees from horizontal. For wall-mounted enclosures, the top section shall slope downward away from the wall and towards the front of the enclosure. For free standing, floor mounted and frame mounted enclosures, the top section shall slope downward towards the back side of the enclosure.

6. The front edge of the top section of all sun shields shall incorporate a narrow and more steeply sloped drip shield segment which sheds water away from the front of the enclosure and prevents it from dripping or running directly onto the front panel of the enclosure.

7. All seam welds used in sun shield fabrication shall be continuous and shall be ground smooth.

8. All exposed corners, edges, and projections shall be smooth rounded or chamfered to prevent injury.

2.06 CORROSION CONTROL

A. Panels shall be protected from internal corrosion by the use of corrosion-inhibiting vapor capsules as manufactured by ;

1. CORTEC; VpCI®-111 EMITTER

2. Northern Instruments; Model Zerust VC.

3. Hoffmann Engineering; Model A HCI.

4. or approved equal

2.07 CONTROL PANEL - INTERNAL CONSTRUCTION

A. Internal Electrical Wiring

1. All interconnecting wiring shall be stranded, type MTW, and shall have 600 volt insulation and be rated for not less than 90 degrees Celsius. Wiring for systems operating at voltages in excess of 120 VAC shall be segregated from other panel wiring either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier. Panel layout shall be developed such that technicians shall have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.

2. Power distribution wiring on the line side of fuses or breakers shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 16 AWG minimum. Electronic analog circuits shall utilize 18 AWG shielded, twisted pair, cable insulated for not less than 600 volts.

3. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6-inches. Different wiring systems shall terminate on separate terminal blocks. Wiring troughs shall not be filled to more than 60 percent visible fill.

4. Terminations
   a. All wiring shall terminate onto single tier terminal blocks, where each terminal is uniquely and sequentially numbered. Direct wiring between field equipment and panel components is not acceptable.
   b. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Each group of terminal blocks shall have a minimum of 25 percent spares.
   c. Terminal blocks shall be the compression type, fused, unfused, or switched as shown on the Contract Drawings or specified elsewhere in Division 13.

d. Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare PLC and controller points shall be wired to terminal blocks.
e. Analog inputs and outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignments for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the PLC cabinet. All active and spare PLC and controller points shall be wired to terminal blocks.
f. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers.
g. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free-standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.
h. Circuit power from the SCADA cabinet out to field devices (switches, dry contacts etc.) that are used as discrete inputs to the PLC input cards shall be isolated with an isolating switch terminal block with a flip cover that is supplied with a dummy fuse. Isolation switch block shall be an Allen Bradley, Model 1492-H7, or approved equal. One isolating switch terminal block per loop numbered piece of equipment and one per spare I/O point is acceptable.
i. All PLC discrete outputs to the field shall be isolated with individual isolating fuse switch terminal blocks with flip covers and neon blown fuse light indicators. The single circuit fusible terminal block shall be an Allen Bradley, Model 1492-H4 or approved equal.

5. All wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection, shall be clearly identified as such.

6. All wiring shall be clearly tagged and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and loop drawings prepared by the PCSS. All power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used.

7. Provide surge protectors on all incoming power supply lines at each panel per the requirements of Section 13300 I&C - General Provisions.

8. Each field instrument furnished under Division 13 and shown on the Drawings as deriving input power from the control panel(s) shall have a separate power distribution circuit with a circuit breaker or fuse and blown fuse indication. All instruments requiring 120VAC power shall be powered from the UPS source in the panel where the instrument signals lands.

9. Provide redundant 24 VDC power supplies to power field instruments and panel devices. Twenty-four VDC power supplies shall be as specified in this Section.

10. Wiring trough for supporting internal wiring shall be plastic type with snap-on covers. The side walls shall be open top type to permit wire changing without disconnecting. Trough shall be supported to the subpanel by stainless steel screws. Trough shall not be bonded to the panel with glue or adhesives.

11. Each panel shall have a low powered LED light that can be mechanically fastened internally to the ceiling of the panel while maintaining panel UL listing. Light fixture shall be switched and shall be complete with LED light and appurtenances.

12. Each panel shall have a specification grade duplex convenience receptacle with a ground fault interrupter, mounted internally within a stamped steel device box with appropriate cover. Convenience receptacle shall not be powered from a UPS and shall be protected by a dedicated fuse or circuit breaker.

13. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations.

14. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.

15. Each panel shall have control, signal, and communication line surge suppression in accordance with Section 13300 I&C – General Provisions.

16. All microprocessor-based electronic devices in the panel that are powered by 120VAC, shall be powered by the UPS (refer to appropriate Section in Division 13).

17. Each panel shall be provided with a circuit breaker to interrupt incoming power.

18. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. shall be in compliance with the requirements as per design drawigs.

B. Pneumatic Tubing

1. Refer to Section 13300 I&C - General Provisions.

2. Pneumatic tubing shall be a minimum of 1/4-inch O.D. 316 stainless steel with compression fittings. All tubing shall be rigidly supported and run in horizontal or vertical planes.

3. All pneumatic equipment shall be provided with separate shut-off valves. Flexible polyethylene tubing shall be used on all devices mounted on hinged doors, etc.

4. A screened vent shall be provided on all enclosures using pneumatic instruments.

5. All pneumatic tubing shall be routed in separate bundles or wireways and shall be separated from all electrical wiring by a minimum of 3-inches.

C. The orientation of all devices including PLC and I/O when installed, shall be per the manufacturer's recommendations. No vertical orientation of PLC racks shall be allowed unless specifically indicated by the manufacturer as an acceptable mounting alternative, and also approved by the Engineer.

2.08 ELECTRICAL COMPONENTS

A. The main circuit breaker shall be a thermal-magnetic molded case breaker, by Square D Company, or approved equal. Provide a flange mounted main power disconnect operating handle with mechanical interlock having a bypass that will allow the panel door to open only when the switch is in the OFF position.

B. A mechanical disconnect mechanism, with bypass, shall be installed on each motor circuit protector, capable of being locked in the “OFF” position to provide a means of disconnecting power to the motor.

C. Auxiliary contacts shall be provided for remote run indication and indication of each status and alarm condition. Additional controls shall be provided as specified herein and as required by the detailed mechanical equipment requirements, the P&IDs, the Control Wiring Diagrams and as shown on the Drawings.

D. All operating control devices and instruments shall be securely mounted on the exterior door. All controls shall be clearly labeled to indicate function and shall be in accordance with the electrical area classification indicated on the Electrical Contract Drawings.

E. A six-digit, non-resettable quartz time base elapsed time meter shall be connected to each motor starter. Meter shall be Hobbs, Model 98000 Series; Redington, Model 722; Cramer, Model ETI-635 G, or approved equal.

F. The control panel shall be provided with a lightning and surge protection unit on the line side of the main circuit breaker. Unit shall be 600 Volt, 3 Phase, General Electric "Tranquell" Series, or approved equal.

G. Where required by Specifications, an alternator shall be provided to sequence motors. Alternator shall be Catalog No. 008-120-13SP or 009-120-23AP by Stacon; Square D, Class 9039, Type HG-21, or approved equal.

H. Panel-mounted timers shall be flush-mounted, plug-in type, Eagle Signal, Model Bulletin 125 cycle-flex, Idec, Model SR6P-MO8G, or approved equal, with ranges as shown on the Drawings, or as required by the detailed mechanical equipment specifications.

I. Specific control devices, control descriptions, and other data are specified under the detailed specification for the mechanical equipment with which the control panel is supplied.

2.09 PILOT TYPE INDICATING LIGHTS

A. Type: Energy efficient Solid State LED Lamps.

B. Functional:

1. Units shall be provided with low voltage LED lamps suitable for the voltage supplied.

2. Lights supplied with 120V AC power shall have integral reduced voltage transformers.

3. Lamps shall be replaceable from the front of the unit.

C. Physical:

1. Lens color:
   a. Running, on, open – Red.
   b. Stopped, off, closed – Green.
   c. Alarm – Amber.
   d. White - Power on
   e. Blue - All other status indications not covered by the above
   f. Lens caps shall be approximately .46 inch diameter. Provide legend faceplates engraved to indicate the required function of each device; NEMA rating - 4X.

D. Manufacturer(s):

1. Allen Bradley

2. Or Approved Equal

2.10 SELECTOR SWITCHES AND PUSHBUTTONS

A. Type:

1. Control devices shall be heavy-duty oil-tight type with stackable contact blocks.

B. Functional:

1. Provide contact arrangement and switching action as required for the control system specified.

C. Physical:

1. For 120 VAC service, provide contacts rated 10 amps at 120 VAC; for 24 VDC service, provide silver sliding contacts rated 5 amps at 125 VDC; for electronic (millivolt/ milliamp) switching, provide contacts rated lamp at 28 VDC.

2. Pushbuttons shall have flush type operators.

3. Selector switches shall have knob or wing lever operators; NEMA rating - 4X; Provide legend plates denoting switch/pushbutton position/ function.

D. Manufacturer(s):

1. Allen Bradley

2. Or Approved Equal

2.11 GENERAL PURPOSE RELAYS AND TIME DELAYS

A. Type:

1. General purpose plug-in type.

B. Functional:

1. Contact arrangement/function shall be as required to meet the specified control function; Mechanical life expectancy shall be in excess of 10 million.

2. Duty cycle shall be rated for continuous operation; Units shall be provided with integral indicating light to indicate if relay is energized.

3. Solid state time delays shall be provided with polarity protection (DC units) and transient protection.

4. Time delay units shall be adjustable and available in ranges from .1 second to 4.5 hours.

C. Physical:

1. For 120 VAC service, provide contacts rated 10 amps at 120 VAC; for 24 VDC service, provide contacts rated 5 amps at 28 VDC; for electronic (milliamp/millivolt) switching applicator, provide gold plated contacts rated for electronic service. Relays shall be provided with dust and moisture resistant covers.

D. Options/Accessories Required:

1. Provide mounting sockets with pressure-type terminal blocks rated 300 volt and 10 amps.

2. Provide mounting rails/holders as required.

E. Manufacturer(s):

1. Allen Bradley

2. Potter & Brumfield

3. Or Approved Equal

2.12 EMERGENCY ALARM BEACON AND AUDIBLE HORN

A. Beacon alarm light:

1. Type:
   a. Beacon alarm light.

2. Physical:
   a. Beacon alarm light for building exterior mounting shall be 120 VAC, flush mounted, weatherproof construction.
   b. A 750,000-candle power xenon strobe tube and red polycarbonate lens.

3. Manufacturer(s):
   a. Federal Signal
   b. Or Approved Equal

B. Alarm Horn:

1. Type:
   a. Alarm horn shall be a vibrating type for 120 Volts, 60 Hz.

2. Manufacturer(s):
   a. Federal Signal Corp
   b. Or Approved Equal

2.13 24 VDC POWER SUPPLIES

A. Provide a 24 VDC power supply in the control panel to power field instruments, panel devices, etc., as required. Equip the power supply with a power on/off circuit breaker.

B. The 24 VDC power supply shall meet the following requirements:

1. Input power: 115 VAC, plus or minus 10 percent, 60 Hz.

2. Output voltage: 24 VDC.

3. Output voltage adjustment: 5 percent.

4. Line regulation: 0.05 percent for 10-volt line change.

5. Load regulation: 0.15 percent no load to full load.

6. Ripple: 3 mV RMS.

7. Operating temperature: 32 to 140 degrees Fahrenheit.

C. Size the 24 VDC power supply to accommodate the design load plus a minimum 25 percent spare capacity.

D. If power supply on/off status signal is shown, provide a relay contact (internal to the power supply or external if the power supply is not so equipped) to indicate on/off status of the power supply.

E. Provide output overvoltage and overcurrent protective devices with the power supply to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

F. Mount the 24 VDC power supply such that dissipated heat does not adversely affect other panel components.

G. Manufacturer(s):

1. Phoenix Contacts

2. Allen Bradley

3. Or Approved Equal

2.14 SPARE PARTS

A. General requirements for spare parts are specified in Section 13300 I&C - General Provisions.

B. The following control panel spare parts shall be furnished:

1. Timers and sockets - Two of each type installed.

2. Relays and sockets - Two of each type installed.

3. Fuses and circuit breakers - 10% (minimum of 10 fuses and 2 circuit breakers) of each type and size installed.

4. Light bulbs - 10% (minimum of 10) of each type installed. For LED type lights, 5% (minimum of 3) of each color installed.

5. Panel Mounted power supplies - one of each type installed.

6. Selector switches/pushbuttons - Two of each type installed including contact blocks.

7. Provide touch-up paint of each type and color used for all cabinets, panels, and consoles supplied.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 13300 I&C - General Provisions.

3.02 INSTALLATION

A. The panels shall be installed at locations as shown on the Contract Drawings.

B. Refer to Section 13300 I&C - General Provisions.

3.03 IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

3.04 FIELD QUALITY CONTROL

A. Refer to Section 13300 I&C - General Provisions.

3.05 STARTUP SERVICE

A. Refer to Section 13300 I&C - General Provisions.

3.06 DEMONSTRATION

A. Refer to Section 13300 I&C - General Provisions.

3.07 TESTS

A. Refer to Section 13300 I&C - General Provisions.

END OF SECTION

SECTION 13332
I&C – SURGE SUPPRESSORS

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C – General Provisions.

1.02 SCOPE OF WORK

A. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install surge protective devices (SPDs) in the control panels and on-field devices, as required herein and shown on the drawings.

1. Provide surge protection devices to protect field instruments and equipment from the effects of transient surges caused by lightning and other electrical sources.

2. SPDs shall be installed at the following locations:
   a. On 120 VAC, 60Hz power connections to control panels.
   b. On all analog signals at the control panel as the first point of entry to the panel. Include surge protection at 24 VDC loop-powered field instruments for wiring distances over 75 feet from the control panel.
   c. Provide surge protection on all four-wire, 120 VAC field instruments.
   d. On all discrete signals with portions of interconnecting wiring located outside of protected buildings.
   e. On all copper data lines that have portions of interconnecting wiring located outside of protected buildings

1.03 RELATED WORK

A. Refer to Section 13300 I&C – General Provisions.

1.04 SUBMITTALS

A. Refer to Section 13300 I&C – General Provisions.

B. Clearly indicate which instruments will have surge protection and separate enclosures or conduit mounts. Provide listings and/or tables indicating the location of both building and field devices.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. National Fire Protection Association 79, Annex “D” Standards, (NFPA).

B. National Electrical Code (NEC).

C. National Electrical Manufacturer's Association Standards (NEMA).

D. UL 1449 Fourth Edition, Standard for Safety Surge Protective Devices (SPDs).

E. UL 497B, Protectors for Data Communications and Fire-Alarm Circuits.

F. International Electrotechnical Commission (IEC).

G. Institute of Electrical and Electronics Engineers (IEEE).

H. State and Local code requirements.

I. Where any conflict arises between codes or standards, the more stringent requirement shall apply.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C – General Provisions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 I&C – General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C – General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 I&C – General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C – General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C – General Provisions.

1.13 SPARE PARTS

A. One per five of each type of surge protective device; minimum of one of each type of surge protective device.

B. One per five of each type of signal isolator and IS barrier; minimum of one of each type of surge protective device.

1.14 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C - General Provisions.

PART 2 PRODUCT

2.01 GENERAL

A. Refer to Section 13300 I&C – General Provisions.

2.02 SURGE PROTECTION FOR CONTROL SYSTEMS

A. Function/Performance:

1. Provides surge protection of electronic instrumentation from induced surges propagated along the signal and power supply lines from lightning, utility, or the plan electrical systems.

2. Protection system lower than the instrument withstand level, while not interfering with normal operation.

3. Maintenance-free and self-restoring.

4. Response time: Within nanoseconds.

B. Required Surge Protection:

1. Control Panel Power Feed (120VAC)
   a. Nominal Discharge surge current: 20kA (at an 8x20µs impulse waveform) when nominal Current is 20A and accepts 12-24 AWG wire connection.
   b. Provide surge protector from one of the following:
      1) Phoenix Contact, Model "PLT/PT"
      2) Or Approved Equal

2. 4-Wire Field Instrument Power:
   a. Provide surge protection at the field device to protect 120 VAC power and 24 VDC power to analog instruments.
   b. Mount transmitter surge protectors in separate NEMA 4X enclosures for field installations.
   c. Refer to Instrument List for transmitters requiring surge protection in the field.
   d. Nominal Discharge surge current: 2.5kA (at an 8x20µs impulse waveform).
   e. Provide Field Mounted (at instrument) surge protector from one of the following:
      1) Phoenix Contact, Model BoxTrab BXT-N4X Series
      2) Or Approved Equal

3. Analog Signal (4-20mA) Circuits:

a. Provide surge protection where any part of the circuit is outside of the building envelope.
b. Mount transmitter surge protectors in separate NEMA 4X enclosures or conduit mounts for field installations.
c. Protect circuit at both the transmitter side and the PLC panel.
d. Nominal Discharge surge current: 10kA (at an 8x20µs impulse waveform).
e. Provide Field Mounted (at instrument) surge protector from one of the following:
    1) Phoenix Contact SurgeTrab S-PT Series
    2) P & F FN-LB-I
    3) Or Approved Equal
f. Provide panel mounted surge protector for Field Mounted Instruments from one of the following:
    1) Phoenix Contact, Model TermiTrab TTC Series
    2) MTL Surge Technologies, Model SD series
    3) P&F M-LB-4242
    4) Or Approved Equal

4. Discrete Inputs:
    a. Provide surge protection where any part of the circuit is outside of the building envelope.
    b. Provide surge protection at the PLC panel for discrete signal connections.
    c. Nominal Discharge Current (24 VDC circuit): 5kA (at an 8x20µs impulse waveform)
    d. Nominal Discharge Current (120 VAC circuit): 2.5kA (at an 8x20µs impulse waveform)
    e. Provide surge protector from one of the following:
        1) Phoenix Contact, Model TermiTrab TTC Series
        2) MTL Surge Technologies, Model SD series
        3) P&F M-LB-4242
        4) Or Approved Equal

5. Inductive Loads:
    a. Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120VAC or less that drive solenoid, coil, or motor loads.
    b. Nominal Discharge surge current: 20kA (at an 8x20µs impulse waveform)
    c. Provide surge protector from one of the following:
        1) Phoenix Contact, Model PT series
        2) Or Approved Equal

6. Non-Fiber Based Data Highway or Communications Circuits:
    a. Provide protection on all communication and data highway circuits that leave a building or are routed external to a building.
    b. Provide circuit protection at both ends of the line.
    c. Nominal Discharge surge current: 2kA (at an 8x20µs impulse waveform)

d. Provide surge protector from one of the following based on the specific application:
    1) Phoenix Contac, Model DATA Trab or PlugTrab PT Series
    2) Or Approved Equal

7. Ethernet Connection (Outdoor PoE Radio Link):
    a. Provide a shielded Cat 6 / RJ45 surge protector with PoE pass-through at each end of the outdoor drop cable serving the 900 MHz wireless bridge.
    b. Mount one (1) protector inside a NEMA 4X enclosure at the pole base, and one (1) inside the PLC / RTU control panel.
    c. Nominal Discharge Surge Current: 5 kA (8/20 µs); Maximum Discharge: 10 kA.
    d. Response Time: < 1 ns.
    e. PoE Pass-Through Rating: 60 V, 1 A minimum.
    f. Bond ground lug to the antenna-pole single-point ground bus with #6 AWG bare tinned-copper conductor, exothermically welded at the ground ring.
    g. Provide surge protector from one of the following based on specific application:
        1) Phoenix Contact, Model DATA Trab Series
        2) Or Approved Equal

8. Serial Connection (RS-485/RS-232):
    a. Provide surge protection on RS-485 connection. Connection method to device by 9-position D-SUB connector
    b. Mount surge protectors in separate NEMA 4X enclosure for field installations.
    c. Provide circuit protection at both ends of the line.
    d. Nominal Discharge surge current: 5kA (at an 8x20µs impulse waveform)
    e. Provide surge protector from one of the following based on specific application:
        1) Phoenix Contact, Model DATA Trab Series DT-UFB-485/BS
        2) Or Approved Equal

9. RF Coaxial Cable:
    a. Provide bulkhead-mounted gas-discharge or hybrid surge protector at the radio enclosure for any coaxial antenna lead-in, and at every wall/enclosure penetration where a coaxial cable transitions between protected and unprotected zones.
    b. DC-pass design suitable for 900 MHz operation; insertion loss ≤ 0.1 dB at 900 MHz.
    c. Nominal Discharge Surge Current: 5 kA (8/20 µs); Maximum Discharge: 20 kA.
    d. Connectorization: N-type, Type-F, or as required by the radio manufacturer.
    e. Bond housing to the antenna-pole single-point ground bus with #6 AWG bare tinned-copper.
    f. Provide protection on communication cables between radios and antennas, mounted either inside the panel, or in the wall of the enclosure.
    g. Protected in accordance with NEMA and UL 497E standards.

h. Nominal Discharge surge current: 5kA (at an 8x20µs impulse waveform)
i. Provide surge protector from one of the following:
   1) Phoenix Contact, Model Coax Trab series
   2) Polyphaser, Model GT Series
   3) Or Approved Equal

10. Telephone Circuits:
    a. Provide Telephone Company approved line protection units for all telephone lines used for telemetry or SCADA system use under this Contract.
    b. Nominal Discharge surge current: 10kA (at an 8x20µs impulse waveform)
    c. Provide surge protector from one of the following:
       1) Citel, Model MJ8-Telecom or DLA series
       2) Phoenix Contact, Model Data Trab Series or PT-IQ Series
       3) Or Approved Equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.

2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.02 IDENTIFICATION

A. Refer to drawings for tagging designations.

3.03 FIELD QUALITY CONTROL

A. Refer to Section 13300 I&C – General Provisions.

3.04 STARTUP SERVICE

A. Refer to Section 13300 I&C – General Provisions.

3.05 DEMONSTRATION

A. Refer to Section 13300 I&C – General Provisions.

END OF SECTION

SECTION 13335
I&C – UNINTERRUPTIBLE POWER SUPPLY
(SINGLE-PHASE AND DC-DC)

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C - General Provisions.

1.02 SCOPE OF WORK

A. Labor, equipment, supervision and materials for the installation, testing, startup, and training for the uninterruptible power supply (UPS) as shown on the Drawings and as specified herein.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 13300 I&C - General Provisions. Submittals shall include shop drawings and product data, for the following:

1. Product brochure.

2. Bill of materials listing all components provided.

3. Deviation list indicating all proposed exceptions.

4. Power single line and control schematics drawings. All external connection details and their terminal block locations shall be fully detailed. All internal wiring shall include terminal numbers and color coding.

5. UPS performance specifications:

    a. kVA rating.
    b. Input and output voltage and phase.
    c. Run time at full and half load.
    d. Voltage (output regulation, input tolerance, unbalance, transfer/retransfer voltage, etc.).
    e. Heat rejection.

6. Operating Instruction manuals and recommended replacement parts.

7. Name, address, and telephone number of the nearest service facility.

8. Training agenda and information per Section 13300 I&C – General Provisions.

9. Battery specifications and warranty.

10. UPS Loading and battery sizing calculations to support runtimes as specified herein.

1.04 COORDINATION MEETINGS

A. Refer to Section 13300 I&C - General Provisions.

1.05 REFERENCE STANDARDS

A. ANSI C62.41/IEEE 587 – Standards for Surge Withstand ability.

B. FCC (Federal Communications Commission) Rules and Regulations, Part 15, Subpart B, Class A certified compliance.

C. UL (Underwriters Laboratories) 1778 Listed (Rev. Jan 5, 2000), UL497A.

D. CSA 22.2, No. 107.1 M95 AND 107.2.

E. IEC 62040-2 Emission and Immunity.

F. IEC 62040-3 (Uninterruptible Power Systems, Part 3).

G. EN 60529 Equipment Protection.

H. National Electric Code (NFPA-70).

I. ISO 9001.

1.06 QUALITY ASSURANCE

A. UPS systems shall utilize a field proven design. The UPS manufacturer shall demonstrate at least ten years of continuous field operating experience with equipment of similar size and design.

B. A factory authorized service and parts organization shall be located within 100 miles of the project location. Submit the name and address of the factory authorized service and parts organization. The manufacturer shall have a complete selection of service options that may include onsite service by factory-employed service engineers and factory depot quick-return service plan options.

C. Equipment shall be UL or ETL labeled.

D. The UPS manufacturer shall have ISO 9001 certification.

1.07 DELIVERY, STORAGE AND HANDLING

A. Provide delivery, storage and handling in accordance with Section 13300 I&C - General Provisions and per the following:

1. Store the equipment indoors in a clean, dry, heated storage facility until ready for installation. Do not install the equipment in its final location until the facilities are permanently weather tight. Furnish, install and wire temporary electric space heaters in the equipment until the permanent heating equipment is operational. Protect the equipment at all times in storage or equipment room from exposure to moisture and chemicals.

1.08 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

1.09 WARRANTY

A. Refer to Section 13300 I&C - General Provisions.

B. UPS: In addition to the basic warranty, the UPS manufacturer shall provide a standard warranty for the UPS for a period of one year from the date of purchase. The Contractor shall provide an additional one year extended warranty to cover delays associated with equipment startup or date of receipt by end user, whichever occurs first.

C. Battery: In addition to the basic warranty, the UPS manufacturer shall provide a standard warranty for the batteries for a period of one year from the date of purchase. The Contractor shall provide an additional one year extended warranty to cover delays associated with equipment startup or date of receipt by end user, whichever occurs first.

1.10 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C - General Provisions.

1.11 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C - General Provisions.

1.12 SPARE PARTS

A. None required.

1.13 TEST EQUIPMENT

A. Refer to Section 13300 I&C - General Provisions.

1.14 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C - General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. See products requirements 13300-2.01 in Section 13300 I&C – General Provisions.

2.02 SINGLE PHASE UPS - INTERNAL TO CONTROL PANELS

A. SYSTEM DESCRIPTION

1. Provide an industrially rated continuous-duty, on-line, solid state, line interactive, single-phase uninterruptible power system.

2. The UPS shall provide power conditioning and power backup for PLC, communications hardware, and other critical electronic loads as indicated on the Drawings.

3. The UPS system shall consist of the following major components:

    a. Rectifier and battery charger.
    b. Inverter.
    c. Batteries.
    d. Other features as described in this specification and as indicated on the Drawings.

4. The UPS shall be:

    a. Allen Bradley, model 1609 Series
    b. Phoenix Contact, model Quint Series
    c. APC, model Smart-UPS Series Industrial
    d. Or Approved Equal.

B. GENERAL REQUIREMENTS

1. Battery protection shall be provided to an internal circuit breaker disconnect.

2. Current limiting circuitry shall protect the inverter output under any load condition.

3. The AC output neutral shall be electrically isolated from the UPS chassis. The UPS chassis shall have an equipment ground terminal. Provisions for installation of a bonding connector shall be provided.

4. The UPS shall be suitable for installation in a UL508A listed panel.

5. The UPS shall be DIN rail mountable.

6. UL recognized components for industrial applications in accordance with UL508 without derating.

C. PERFORMANCE REQUIREMENTS

1. Ratings

   a. Output power: 350VA – 1500VA.
   b. Battery runtime: 14 minutes at full-load, 34 minutes at half-load.

2. Environment:

   a. Ambient temperature: 0 to 40 degrees C (32 to 104 degrees F).
   b. Elevation: Up to 500-ft above mean sea level.
   c. Relative humidity: 1 to 95 percent non-condensing.

3. System Input – Primary source:

   a. Single input: Nominal Input Voltage: 120 VAC.
   b. Frequency: 45 to 65 Hz.
   c. Input Power Factor: 0.95 lag minimum, 50 to 100 percent load.
   d. Input Surge Withstand ability: Per IEEE 587/ANSI C62.41. Category A and B, (6 kV).

4. System Output:

   a. Nominal Output Voltage:120 VAC.
   b. Frequency: 60 Hertz plus or minus 3 Hertz.
   c. 100 percent load with 3:1 Crest Ratio
   d. Frequency Slew Rate: 1 Hz/second. (Adjustable at startup.)

5. AC to AC Efficiency: (100 percent load @ rated PF): 88 percent online, 86 percent on battery.

6. Acoustical Noise: Noise generated by the UPS under normal operation shall not exceed 65 dBA (60 dBA typical) at one meter from any surface, measured at 25 degrees C (77 degrees F) and full load.

7. EMI Suppression: The UPS shall meet FCC Rules and Regulation 47, Part 15, Subpart J, for Class A devices.

D. MODES OF OPERATION

1. The UPS shall operate as a line interactive on-line, fully automatic system in the following modes:

a. Normal: The critical load shall be continuously supplied with filtered and regulated AC power by the inverter. The rectifier/battery chargers shall derive power from the preferred AC source and supply DC power to the inverter while simultaneously floats charging the batteries.
b. Emergency: Upon failure of the preferred AC power source, the critical load shall continue to be supplied by the inverter. Inverter power shall be supplied without switching from the storage battery. There shall be no interruption to the critical load upon failure or restoration of the preferred ac sources. If the AC source cannot be restored before the battery discharges to its low voltage dropout value, the UPS shall automatically shut itself down in an orderly manner.
c. Recharge: Upon restoration of the AC source, the rectifier/battery charger shall power the inverter and simultaneously recharges the batteries. This shall be an automatic function causing no interruption to the critical load.

E. RECTIFIER/CHARGER

1. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for input to the inverter and for battery charging. The rectifier/charger shall be a Solid-State Relay/Insulated Gate Bipolar Transistor (SCR/IGBT) power transistor type with constant voltage/current limiting control circuitry.

F. INVERTER

1. The inverter shall include all solid-state equipment and controls to convert DC power from the rectifier/charger or battery to a regulated AC power for powering the critical load. The inverter shall use Insulated Gate Bipolar Transistors (IGBTs) in a phase-controlled, pulse width modulated (PWM) design capable of providing the specified AC output.

2. The inverter shall be capable of supplying current and voltage for overloads exceeding 100 percent. The inverter is to provide 150 percent of full load for 30 seconds and 125 percent of full load for 2 minutes. A status indicator and audible alarm shall indicate overload operation.

3. The output voltage shall be maintained to within plus or minus 5 percent.

4. The output voltage Total Harmonic Distortion (THD) shall not be greater than 5 percent at full load.

G. BATTERIES

1. The batteries shall be High Temperature sealed, maintenance-free, high-rate discharge, lead-acid cells suitable for use indoors with no off gassing, or water addition requirements. Batteries shall not require special ventilation. The battery

shall consist of one or more battery banks with the number of cells required to meet the requirements of the rest of these specifications.

2. Battery Design Life: three to five years.

H. **CONTROLS AND MONITORING**

1. Microprocessor-controlled circuitry: Fully automatic operation of the UPS shall be provided through the use of a microprocessor-based controller. All operating and protection parameters shall be firmware-controlled. The logic shall include system test capability to facilitate maintenance and troubleshooting. Startup, battery charging, and transfers shall be automatic functions.

2. Front Indicators: As a minimum, the following indicators shall be provided on the UPS control panel:

   a. On-line (UPS is using utility power to power the load)
   b. In bypass mode
   c. On battery
   d. Overload
   e. Replace battery / battery disconnected
   f. Fault
   g. Bar graph for utility voltage
   h. Bar graph for battery

3. Front Panel Controls: As a minimum, the following controls shall be provided on the UPS control panel.

   a. Power On/Off
   b. Self-test
   c. Alarm silence
   d. Cold start
   e. Load off

4. Remote alarm and status indication: Isolated SPDT dry contacts shall be provided to indicate UPS status for remote monitoring. Contacts shall be rated for 250VAC @ 5A or 30VDC @ 5A Individual contacts shall be provided for separate annunciation of the following alarm and status conditions: On Battery Common Alarm On Static Bypass.

PART 3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 13300 I&C - General Provisions.

3.02 INSTALLATION

A. Install and connect the equipment in accordance with the manufacturer's instructions.

B. Remove temporary lifting angles, lugs and shipping braces.

C. Touch up damaged paint finishes.

3.03 IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

3.04 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. UPS will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.05 FACTORY TESTING

A. Prior to shipment, the complete UPS system shall undergo the manufacturer's standard factory test.

3.06 FIELD TESTING

A. Perform the following minimum test and checks:

1. Verify that all connections are completed in accordance with shop drawings.

2. Verify supply voltage and phase sequence are correct.

3. Check mechanical interlocks for proper operation.

4. Test ground connections for continuity and resistance.

5. Check control circuit interlocking and continuity.

B. Submit the test plan for review and approval.

C. For UPSs rated 3-6kVA, the manufacturer's field service technician shall perform startup and adjustment of the UPS in accordance with the manufacturer's written instructions. Submit a copy of the field report containing verification of all startup tests and adjustments performed.

D. The Contractor shall include testing of battery runtime under full load with loss of AC power.

E. Perform all additional tests required by Section 16850 Electrical Testing.

F. In the event of an equipment fault, notify the Designer immediately. After the cause of the fault has been identified and corrected, a joint inspection of the equipment shall be conducted by the Contractor, the Construction Administrator and the equipment manufacturer's factory service technician. Repair or replace the equipment as directed by the Construction Administrator.

3.07 ADJUSTMENT

A. Make all UPS adjustments necessary for manual and automatic operation of the entire system.

3.08 CLEANING

A. Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

3.09 STARTUP SERVICES

A. Refer to Section 13300 I&C - General Provisions.

3.10 DEMOSTRATION

A. Provide training of staff in accordance with Section 13300 I&C – General Provisions.

END OF SECTION

SECTION 13340
I&C – INSTRUMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Process Control System Supplier (PCSS): The entity responsible for providing all materials, equipment, labor, and services required to achieve a fully integrated and operational control system.

B. Applications Engineering System Supplier (AESS): The entity that provides all programming, configuration, and related services for the control system equipment provided by the PCSS.

1.02 SCOPE OF WORK

A. This section covers the furnishing, installation, and services of instruments.

B. Refer to Section 13300 I&C – General Provisions.

1.03 RELATED WORK

A. Section 13300 I&C – General Provisions.

B. Section 13341 I&C – Flow Devices through Section 13344 I&C - Temperature Devices, if included.

1.04 SUBMITTALS

A. Submit complete documentation of all field instruments using ISA-TR20.00.01-2007 data sheet formats. Submit a complete Bill of Materials (BOM) or Index that lists all instrumentation equipment. The list shall be sorted by Loop Number.

B. Submit separate data sheets for each instrument, including:

1. Plant Equipment Number and International Society of Automation (ISA) tag number per the drawings

2. Product (item) name used herein and on the Contract Drawings

3. Manufacturer's complete model number

4. Location of the device

5. Input - output characteristics

6. Range, size, and graduations in engineering units

7. Physical size with dimensions, enclosure National Electrical Manufacturers Association (NEMA) classification, and mounting details in sufficient detail to determine compliance with requirements

8. Materials of construction for enclosure and wetted parts

9. Instrument or control device sizing calculations where applicable

10. Manufacturer independent certified calibration data for all flow metering devices

11. Two-wire, four-wire, or smart IIot device type as applicable

C. All standard vendor documentation furnished shall have all portions that apply clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply to the specific model supplied shall be removed.

D. Submit catalog cuts for all instruments. Submit descriptive literature for each hardware component, which fully describes the units being provided.

E. Submit index and data sheets in electronic format as well as hard copies in 8-1/2" x 11" formats. The electronic format shall be in Microsoft Excel or Word. Submit electronic copy on USB thumb drive.

F. Instruments calibration service shall be performed by technicians with the following certification: Certificación de Técnico en Instrumentación expedido por la Junta Examinadora de Puerto Rico.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to individual instrument specification sections.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C – General Provisions.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 13300 I&C – General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to individual instrument specification sections.

1.10 WARRANTY

A. Refer to individual instrument specification sections.

1.11 MAINTENANCE CONTRACT

A. Refer to individual instrument specification sections.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C – General Provisions.

1.13 SPARE PARTS

A. Refer to individual instrument specifications for spare parts requirements.

1.14 TEST EQUIPMENT

A. Refer to individual instrument specification sections.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C – General Provisions.

1.16 OZONE/OXYGEN SERVICE

A. This paragraph applies to gaseous, liquid, or mixtures of ozone, oxygen, ozone off-gas, and ozone vent gas.

B. All instrumentation equipment, valves, analyzers, seals, gaskets, valve seats, and associated appurtenances to be used with the above-noted special services shall be cleaned, sealed, and protected in accordance with Compressed Gas Association (CGA) publication G-4-1 and certified for oxygen service before shipping.

C. All equipment, valves, valve seats, analyzers, seals, gaskets, welds, and all associated appurtenances to be used with the above noted special services shall be specially certified resistant to degradation and gas losses due to the use of these gases or liquids.

D. Greases and lubricants shall be oxidation resistant and shall be DuPont "Krytox" for the above-noted special services.

E. Gaskets shall be expanded PTFE, Teflon, or Hypalon (80 Durometer) or Viton "A."

F. All pipe, tube, fittings, couplings, and appurtenances for use with these services shall be Type 316L stainless steel.

G. Where necessary, diaphragm seals shall be provided as specified in Section 13343 I&C – Pressure Devices.

1.17 MANUFACTURERS' STARTUP AND TRAINING SERVICES

A. If indicated in the individual instrumentation paragraphs, the instrument manufacturer or manufacturer's certified service representative shall provide start-up and training services. This work shall not be done by the PCSS or AESS contractor.

B. The startup services shall be to calibrate, oversee the installations of the sensor, and startup the sensor/transmitter in order to provide reliable measurement at the instrument and to a remote system. The vendor shall work with the PCSS and AESS to verify the transmitter sends correct information to the remote system (i.e., that the scaling and units are the same at the instrument and on the remote operator interface).

C. While the instrument manufacturer or manufacturer's certified service representative is starting up the instrumentation, training shall be provided to the PRASA's instrumentation technicians. The training shall be on how to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.

PART 2 PRODUCTS

2.01 GENERAL

A. See products requirements 13300-2.01 in Section 13300 I&C – General Provisions.

2.02 INSTRUMENT TAGS

A. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as indicated in the Contract Drawings, shall be provided on each piece of equipment supplied under this Section and related sections. Equipment shall be tagged before shipping to the site.

B. Provide 1/8-in by 3/8-in, Type 316 stainless steel button head machine screws or paper tag.

C. All supplied instrument transmitters and instrument transmitter elements shall have a stainless steel or paper identification tag attached to each transmitter and element prior to shipment. Tag shall be attached via stainless steel chain or stainless steel wire (24 gauge min) to a non-removable part of the device. The tag size shall be a minimum of 1.5 square inches. Tag shall include the ISA alphanumeric instrument number as indicated in the P&ID, loop, and detail Contract Drawings. The alphanumeric instrument number shall be stamped into the tag and shall have a minimum of 3/16-in high alphanumeric characters.

PART 3 EXECUTION

3.01 GENERAL

A. See execution requirements in Section 13300 I&C – General Provisions.

B. Unless specifically indicated, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands. All instrumentation connections shall be provided with shutoff and drain valves. For differential pressure transmitters, 5-valve manifolds for calibration, testing, and blow down service shall also be provided. For chemical or corrosive fluids, diaphragm seals with flushing connections shall be provided.

C. Instrument calibration installed in the project is to be done by the PCSS using PRASA's calibration Standard Operating Procedures (SOPs) and forms.

3.02 EXAMINATION

A. Refer to individual instrument specification sections.

3.03 INSTALLATION

A. Refer to individual instrument specification sections.

3.04 IDENTIFICATION

A. Refer to individual instrument specification sections.

3.05 FIELD QUALITY CONTROL

A. Refer to individual instrument specification sections.

3.06 STARTUP SERVICE

A. Refer to individual instrument specification sections.

3.07 DEMONSTRATION

A. Refer to individual instrument specification sections.

3.08 FIELD INSTRUMENT SCHEDULE

A. The field instrument schedule Section 13340 I&C - Instruments APPENDIX A itemizes field instruments being provided by the PCSS (Division 13) or manufacturers of vendor provided equipment.

B. Each column of the field instrument schedule is defined as follows:

1. **DRAWING NO**.: The P&ID or drawing where the I/O point appears on.

2. **ISA TAG NAME** AND LOOP NO.: The identifier assigned to the field instrument.

3. **LOOP SUFFIX**: Used to distinguish instruments that share an ISA tag and loop number.

4. **TYPE**: The type of instrument to be provided. For example, if the instrument is a pressure, this will specify whether it is a differential pressure transmitter, gauge pressure transmitter, etc. Specific criteria will also be included in this column, such as if a diaphragm seal is required.

5. **RANGE**: Required measurement span of the instrument.

6. **UNITS:** Engineering units being measured.

7. **LOCATION AND DESCRIPTION:** The process being measured.

8. **PROVIDE BY:** The entity responsible for providing the instrument.

9. **SPEC:** The specification section number where the instrument details can be found.

10. **INSTALLATION DETAIL:** Detail on the drawings showing specific installation requirements.

SECTION 13340 APPENDIX-A: FIELD INSTRUMENT SCHEDULE

TAG. NUMBER	DRAWING	DESCRIPTION	TYPE	SIZE	RANGE	UNITS	PROVIDED BY	SPEC.	INSTALLATION DETAIL
LIT-01-01	PID-102	LEVEL TRANSMITTER SUBMERSIBLE	LEVEL TRANSMITTER SUBMERSIBLE	N/A	0-25	FT	13	13342 (L03)	ID-02
LIT-01-02	PID-102	LEVEL TRANSMITTER RADAR	LEVEL TRANSMITTER RADAR	N/A	0-25	FT	13	13342 (L01)	ID-02
LSLL-01-01	PID-102	LEVEL FLOAT LO LO	LEVEL FLOAT LO LO	N/A	10	%	13	13342 (L04)	ID-02
FQIT-01-01	PID-102	FLOW TRANSMITTER MAGNETIC	FLOW TRANSMITTER MAGNETIC 0D/1D	8"	0-1000	GPM	13	13341 (F02G)	ID-02
PSH-01-01	PID-102	DISCHARGE PRESSURE SWITCH HI	PRESSURE SWITCH HI	N/A	SET @ 220	PSIG	13	13343 (P03) (P01)	ID-02
PSL-01-01	PID-102	DISCHARGE PRESSURE SWITCH LOW	PRESSURE SWITCH LOW	N/A	SET @ 100	PSIG	13	13343 (P03) (P01)	ID-02

TAG. NUMBER	DRAWING	DESCRIPTION	TYPE	SIZE	RANGE	UNITS	PROVIDED BY	SPEC.	INSTALLATION DETAIL
PIT-01-01	PID-102	DISCHARGE PRESSURE TRANSMITTER	PRESSURE TRANSMITTER	N/A	0-350	PSIG	13	13343 (P01) (P02)	ID-02
AIT-01-10	PID-102	HI-RANGE TURBIDIMETER		N/A	0-3000	NTU	13	13345	ID-02
PSL-01-20	PID-102	POTABLE PIPE PRESSURE SWITCH LOW	PRESSURE SWITCH LOW	N/A	SET @ 170	PSIG	13	13343 (P03) (P01)	ID-02
PIT-01-20	PID-102	POTABLE PIPE PRESSURE TRANSMITTER	PRESSURE TRANSMITTER	N/A	0-350	PSIG	13	13343 (P01) (P02)	ID-02
LIT-01-20	PID-102	LEVEL TRANSMITTER PEZIOMETRIC	LEVEL TRANSMITTER PEZIOMETRIC	N/A	0-25	FT	13	13342 (L03)	ID-02
LSLL-01-20	PID-102	LEVEL FLOAT LO LO	LEVEL FLOAT LO LO	N/A	10	%	13	13342 (L04)	ID-02
PIT-01-21	PID-102	DISCHARGE PRESSURE TRANSMITTER	PRESSURE TRANSMITTER	N/A	0-350	PSIG	13	13343 (P01) (P02)	ID-02

TAG. NUMBER	DRAWING	DESCRIPTION	TYPE	SIZE	RANGE	UNITS	PROVIDED BY	SPEC.	INSTALLATION DETAIL
PSH-01-21	PID-102	DISCHARGE PRESSURE SWITCH HI	PRESSURE SWITCH HI	N/A	SET @ 220	PSIG	13	13343 (P03) (P01)	ID-02
FS-01-20	PID-102	PU-01-01 FLOW SWITCH	NORMALLY OPEN FLOW SWITCH	1 1/4”	N/A	N/A	13	13341 (F03B)	ID-02
SV-01-21	PID-102	SOLENOIDE VALVE	SOLENOIDE VALVE	1 ¼”	0-350	PSIG	13	13341	ID-02
SV-01-22	PID-102	SOLENOIDE VALVE	SOLENOIDE VALVE	1 ¼”	0-350	PSIG	13	13341	ID-02
LIT-76-01	PID-102	FUEL TANK LEVEL TRANSMITTER	LEVEL TRANSMITTER SUBMERSIBLE	N/A	0-15	FT	13	13342 (L01)	ID-02
LSLL-76-01	PID-102	FUEL TANK LEVEL SWITCH	MULTIPOINT LEVEL SWITCH	N/A	015	FT	13	13342 (L05)	ID-02
TIT-02-10	PID-102	CONTROL ROOM TEMPERATURE TRANSMITTER	TEMPERATURE TRANSMITTER	N/A	0-200	ºF	13	13344	ID-01

TAG. NUMBER	DRAWING	DESCRIPTION	TYPE	SIZE	RANGE	UNITS	PROVIDED BY	SPEC.	INSTALLATION DETAIL
PG-01-01	PID-102	PRESSURE GAUGE		2" ½	0-300	PSIG	13	13343 (P04)	ID-02
PG-01-02	PID-102	PRESSURE GAUGE		2" ½	0-300	PSIG	13	13343 (P04)	ID-02
PG-01-03	PID-102	PRESSURE GAUGE		2" ½	0-300	PSIG	13	13343 (P04)	ID-02

END OF SECTION

SECTION 13341
I&C – FLOW DEVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C - General Provisions.

1.02 SCOPE OF WORK

A. This section covers the furnishing, installation, and services for flow-related instruments as detailed in the Drawings.

B. Refer to Section 13300 I&C - General Provisions.

1.03 RELATED WORK

A. Refer to Section 13300 I&C - General Provisions.

1.04 SUBMITTALS

A. Refer to Sections 13300 I&C - General Provisions and 13340 I&C - Instruments.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C - General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C - General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C - General Provisions.

1.08 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300 I&C - General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 I&C - General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C - General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C - General Provisions.

1.13 SPARE PARTS

A. None required.

1.14 TEST EQUIPMENT

A. Refer to Section 13300 I&C - General Provisions.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 I&C - General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. See products requirements 13300-2.01 in Section 13300 I&C – General Provisions.

2.02 MAGNETIC FLOWMETER (F02)

A. Flow Element

B. Type:

1. Analog 4-20mA type.

C. Function/Performance:

1. Operating Temperature: Process liquid temperatures of 0 to 140 degrees F or greater dependent upon liner and an ambient of minus 30 to 150 degrees F.

2. Radio Frequency Interference (RFI) protection: RFI protection shall be provided as recommended by the manufacturer.

3. Pressure rating: Equal to piping system where meter is installed.

4. Additional: Meter shall be capable of running empty indefinitely without damage to any component.

D. Physical:

1. Metering Tube: 316 stainless steel or equivalent.

2. Flanges: ANSI 150 lb. or DIN PN 16 carbon steel, as the piping system requires, unless otherwise indicated. ANSI 150 lb. or DIN PN 16 stainless steel flanges shall be used on all SS process pipes.

3. Electrodes: 316 stainless steel standard minimum requirements. All electrodes to be compatible with process fluid as indicated on the Contract Drawings or electrodes to be supplied as listed in the Instrument Device Schedule on Section 13340 I&C - Instruments.
   a. For sludge, polymer, or any slurry application where the electrodes will be coated, a self-cleaning or a removable electrode option must be provided with that meter.

4. Housing: For meters with remote-mounted transmitters (vault installation), meters below grade shall be suitable for submergence for up to 48 hours to a depth of 30 ft (9m) 168 hours to a depth of 10 ft (3m). Meters above grade shall be National Electrical Manufacturers Association (NEMA) 4X (IP68). Where hazardous areas are indicated on the Contract Drawings, the equipment shall be rated for that area.

5. Finish: All external surfaces shall have a chemical and corrosion-resistant finish.

E. Accessories/Documentation Required:

1. Factory calibration: All meters shall be factory calibrated. A copy of the calibration report shall be included in the O&M manual.

2. Grounding: Meter shall be grounded in accordance with the manufacturer's recommendation. Provide ground ring, ground wires, gaskets, etc., as required. All materials shall be suitable for the liquid being measured and must be compatible with process fluid and with the process pipe.

3. For meters with remote mounted transmitters, the signal cable length between the flowtube and the transmitter shall be as required by installation guidelines on the Contract Drawings.

F. Flow Converter/Transmitter

1. Type:
   a. Microprocessor based; intelligent transmitter compatible with flowtube provided.
   b. Integral mount or mounted remote from the flowtube as shown on the drawings or as required by the physical location.

2. Functional/Performance:
   a. Accuracy (including flowtube): Plus/minus 0.5 percent of flowrate or better.

b. Operating Temperature: –20 to 140 degrees F .
c. Output: Isolated 4-20 mA with HART protocol. Current output adjustable over the full range of the instrument. Provide a dry contact to indicate reverse flow.
d. Diagnostics: Self diagnostics with on screen display of faults.
e. Display: Digital indicator displaying flow in engineering units indicated in the Instrument Device Schedule on Section 13340 I&C - Instruments.
f. Totalizer: A fully configurable totalizer integral to the transmitter. Totalized flow shall be displayed.
g. Empty Tube Zero: The transmitter shall include a feature that will lock the output at zero when no flow is detected. This feature shall be enabled automatically when the transmitter detects no flow or manually through a contact input.
h. Provide electrode cleaning unit to match flow element requirements.

3. Physical:
   a. Transmitter shall be suitable for surface or pipe stand mounting.
   b. Enclosure shall be NEMA 4X (IP65).

4. Power Requirements:
   a. The transmitter shall be 120 VAC powered instrument.

5. Accessories/ Required:
   a. Keypad where required for transmitter configuration.

G. Manufacturer:

1. ABB, MagMaster Series WaterMaster Series (F02A)

2. Endress + Hauser, Promag Series (F02B)

3. Krhone, Optiflux Series (F02C)

4. Rosemount, 8705 Series 8732E Series (F02D)

5. Yokowaga, Admag Series (F02E)

6. Krhone, Water Flux 3000 (F02F)

7. Magmeter, Ulttra Mag 5000 (F02G)

8. Or Approved Equal

2.03 VANE ACTUATED FLOW SWITCH (F03)

A. Type:

1. Vane or disc actuated flow switch.

2. Switch magnetically linked to vane or disc actuated mechanism.

B. Function/Performance:

1. Output: Form 2C (DPDT) snap action, hermetically sealed switch, rated for 10 amps, 125/250 volts AC.

C. Physical:

1. Switches for pipe sizes of 3/4 to 1-1/2inch (19 to 40 mm) shall be provided with a flowbody. Switches for pipe sizes greater than 1-1/2 inch (40 mm) shall be for installation directly in the field piping.

2. Flowbody and all wetted parts shall be [304] [316] stainless steel.

3. Switch housing shall be NEMA 4X (IP65) and where installed in hazardous areas, shall be approved for Class I, Division 1, Groups C and D (EEx d IIC T6).

D. Manufacturer(s):

1. Dwyer, V4 Flotect Series (F03A)

2. Magnetrol, F50 (F03B)

3. SOR Inc, 900 Series (F03C)

4. Or Approved Equal

2.04 SOLENOID VALVE (F04)

A. Type:

1. Two-way, pilot-operated or direct-acting solenoid valve (as indicated on the Contract Drawings).

2. Electrically actuated, normally closed (NC) or normally open (NO) configuration as required by the process application.

B. Function/Performance:

1. **Operating Medium:** Suitable for water, air, light oils, or compatible process liquids/gases as indicated.

2. **Operating Temperature:** Process fluid temperatures of 32 to 150 degrees F minimum; ambient operating temperature of minus 20 to 140 degrees F.

3. **Pressure Rating:** Operating pressure differential shall match or exceed the maximum pipeline operating and surge pressures, up to a minimum of 350 psi unless otherwise indicated.

4. **Electrical/Coil:** Continuous duty molded coil, Class H insulation minimum. Power requirements shall be 120 VAC, 60 Hz powered unless otherwise specified.

C. Physical:

1. **Body and Wetted Parts:** Brass or 316 Stainless Steel body to match the piping system material. All internal wetted elastomeric seals (Buna-N, Viton, or EPDM) must be fully compatible with the process fluid.

2. **Connections:** NPT threaded end connections for pipe sizes up to 2 inches; ANSI 150 lb. flanged connections for pipe sizes greater than 2 inches to match process piping.

3. **Enclosure/Housing:** Solenoid enclosure shall be rated NEMA 4X (IP65) minimum. Where installed in hazardous areas indicated on the Contract Drawings, the enclosure shall be explosion-proof and approved for Class I, Division 1, Groups C and D.

4. **Manual Override:** Provide a manual operator/override mechanism to allow manual valve cycling during testing or power failure.

D. Manufacturer(s):

1. ASCO, RedHat Series

2. Parker, 2-Way Solenoid Valve Series

3. Burkert, Type 6213 / 6281 Series

4. Or Approved Equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.

2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.02 IDENTIFICATION

A. Tag items in this specification as follows:

1. FIT-01-01 (F02G)

2. FS-01-20-(F03B)

3. SV-01-20 (F04)

4. SV-01-21 (F04)

5. FS-01-30-(F03B)

3.03 STARTUP SERVICES

A. PCSS shall perform startup services.

1. Complete installation and startup check according to manufacturer's written instructions.

3.04 DEMONSTRATION

A. While starting up the instruments, the PCSS shall provide training to the PRASA's instrumentation technicians as follows:

1. How to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.

2. Provided 2 times and last up to 2 hours in the field.

END OF SECTION

SECTION 13342
I&C - LEVEL DEVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C - General Provisions.

1.02 SCOPE OF WORK

A. This section covers the furnishing, installation, and services for level-related instruments as detailed in the Contract Drawings.

B. Refer to Section 13300 I&C - General Provisions.

1.03 RELATED WORK

A. Refer to Section 13300 I&C - General Provisions.

1.04 SUBMITTALS

A. Refer to Sections 13300 I&C - General Provisions and 13340 I&C-Instruments.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C - General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C - General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C - General Provisions.

1.08 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300 I&C - General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 I&C - General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 I&C - General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 I&C - General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 I&C - General Provisions.

1.13 SPARE PARTS

A. None required.

1.14 TEST EQUIPMENT

A. Refer to Section 13300 I&C - General Provisions.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to section 13300 I&C - General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. See products requirements 13300-2.01 in Section 13300 I&C – General Provisions.

2.02 GUIDED WAVE RADAR LEVEL METER (L01)

A. Radar Transducer

1. Type
   a. Contact microwave type level meter that utilizes Time Domain Reflectometry (TDR) technology by sending pulses of electromagnetic energy transmitted down a rigid or flexible probe.
   b. Guided Radar sensor to come equipped with remote electronic display transmitter or remote programming display module.

2. Function/Performance
   a. Measuring Range: Range shall be suitable for the installation indicated.
   b. Temperature Range: –40 to 302 degrees F.
   c. Calibrated Range: Device to be programmed to display and output the actual level.
   d. Accuracy: Plus or minus .12 inch.
   e. Output: Isolated 24 VDC, 4-20 mA output powered from remote indicating signal conditioning transmitter.

3. Physical
    a. Coaxial probe, Single element rod or cable probe or twin element rod or cable probe to be supplied for tanks 12 feet (3.65 m) or smaller where head room is available for installation. Cable shall be flexible with weight or have the option to be bolted down inside tank where tanks are 12 feet or larger or head room is not available for installation.
    b. Exterior components and cable probe shall be minimum 316 SS with option of other material if process is not compatible with SS.
    c. Instrument shall be provided with a minimum Class 150 pound DN 80 mounting flange to match vessel flange size, material and class.
    d. Housing shall be NEMA 4X (IP66). Where the instrument is installed in a hazardous area, the housing shall be explosion-proof, approved for Class I, Division 1, Groups C and D (EEx d IIB T4) installation.

B. Options/Accessories Required

1. Signal cable with sealed connectors, as recommended by the manufacturer, for installation between the transducer and the remote indicating transmitter. Length from 9 to 33 feet shall be as required by installation indicated on the Contract Drawings. Certain manufacturers listed can only remote mount the transmitter 9 feet from the transducer.

C. Remote Indicating Transmitter

1. Type
    a. Microprocessor based compatible with the radar sensor transducer/transmitter provided.
    b. Sensor Transducer/Transmitter to be powered from remote transmitter.

2. Functional/Performance
    a. Resolution (including sensor): Plus or minus 0.1 percent of sensor measuring range.
    b. Accuracy (including transducer): Plus or minus 0.12 inch.
    c. Repeatability: Plus or minus 0.04 inches .

    d. Range: See Instrument List in Section 13340 I&C-Instruments..
    e. Temperature Range: -4 to 140 degrees F .
    f. Output: One isolated 4-20 mA Hart protocol output.
    g. Loop Powered 24 VDC.
    h. Programmable features: Self-adjusting operation through keypad or personal computer port.
    i. Display: Digital indicator displaying level in engineering units or percent.
    j. Diagnostics: On-screen instructions and display of self- diagnostics.

3. Physical
    a. Transmitter shall be suitable for surface or pipe stand mounting.

b. Enclosure shall be NEMA 4X.

4. Accessories Required
   a. Hand-held programmer with configuration software to program and calibrate the instrument.

D. Manufacturer(s)

1. Emerson Rosemount 3300, 3308, 5300

2. Endress + Hauser LevelFlex FM

3. VEGA Vegaflex Serie

4. Or Approved Equal

2.03 NON-CONTACT RADAR LEVEL METER (L02)

A. Type

1. Non-contact, microwave type level meter.

2. Low 6.3 GHz radar frequency for continuous level measurement of liquid, slurry and sludge processes in storage vessels that may be turbulent, have heavy vapors and foaming conditions in nominal pressure and temperature.

3. Antenna: Rod, Horn, Parabolic, or Encapsulated. The type chosen shall be based upon the type of process being measured and in what storage vessel used.

B. Function/Performance

1. Measuring Range: Range shall be suitable for the installation indicated in Section 13340 I&C-Instruments and Contract Drawings.

2. Accuracy: Plus or minus 0.32 inches .

3. Operating Temperature: –40 to 149 degrees F .

4. Output: Isolated 4-20 mA + Hart output.

5. Display: Digital indicator displaying level or volume in engineering units or percent, as indicated on the Contract Drawings or in the Instrument Device Schedule in Section 13340 I&C-Instruments.

6. Diagnostics: On-screen instructions and display of self-diagnostics.

C. Physical

1. Antenna shall be PVDF, 316 SS, or other material depending upon its compatibility to the process in which it is measuring. Transmitter and antenna shall be integral.

2. Instrument shall be provided with a minimum Class 150 pound DN 80, PN16 mounting flange to match vessel flange size, material and class.

3. Housing shall be NEMA 4X (IP66).

4. Power Requirements: 24 VDC Loop powered.

5. Remote Display: Digital indicator displaying level or volume in engineering units or percent, as indicated on the Contract Drawings or in the Instrument List in Section 13340 I&C-Instruments.

6. Display unit shall also be used to remotely program the transmitter.

D. Accessories Required

1. Where required for calibration/programming, a hand-held programmer shall be provided.

E. Manufacturer(s)

1. Endress + Hauser, Model Micropilot Series

2. Krohne, Model Optiwave

3. Rosemount, Model 5408

4. VEGA, Model Vegapuls Series

5. BinMaster CNCR 230

6. Approved Equal

2.04 SUBMERSIBLE LEVEL TRANSMITTER (L03)

A. Type

1. Submersible, hydrostatic pressure type level transmitter.

B. Function/Performance

1. Range: Range selected shall be the manufacturer's standard range closest to the span to be measured.

2. Temperature Compensation: Temperature compensated over a range of zero to 122degrees F.

3. Accuracy: Plus or minus .025 percent of range.

4. Over Pressure: Transducer shall be protected for over pressure of 1.5 times the span.

5. Output: 4-20 mA proportional to the calibrated span.

C. Physical

1. The transmitter assembly shall have a 316 stainless steel or titanium body with a bottom diaphragm.

2. Sensors shall be suspended by cable. Cable shall include a vent tube for the transducer.

3. Sensor shall be suspended with a tension-relieving mounting clamp from a 4 inch (100 mm) flange. Clamp and flange shall be 316 stainless steel.

4. Sensor shall be submersible (IP68) and shall be CSA approved or CENELEC (EEx d IIC T4) certified intrinsically safe when intrinsically safe barriers are provided for the instrument loop.

5. 24 VDC loop powered.

D. Accessories Required

1. Sufficient manufacturer's cable for installation between the sensor and the transmitter as indicated on the Drawings. Cable shall be reinforced to support the weight of the transducer and cable.

2. Cable clamp for suspending instrument provided by instrument supplier.

3. Any fittings required for pressure calibration of the instrument.

4. Vent tube with vent filter or aneroid bellows to prevent moisture or dust/dirt from getting in the vent tube.

E. Manufacturer(s)

1. Ametek, Model PMT

2. Druck; Type PTX1835

3. Endress + Hauser, Model Deltapilot DB 52A

4. MJK, Model 1100,2100, 3100

5. WIKA, Model LS-10

6. Or Approved Equal

2.05 FLOAT SWITCHES (L04)

A. Type

1. Mercury free ball float switch.

B. Function/Performance

1. Differential: Less than 8 inch.

2. Switch Rating: 1 amps at 120 VAC

3. Provide NO or NC type contact for fail-safe operation per section 13300-2.01. F or as shown on the Contract Drawings.

C. Physical

1. Float: Teflon or non-stick coating, minimum 5 inch diameter.

2. Totally encapsulated switch.

3. Cable shall be heavy-duty, PVC or equivalent jacketed integral to float.

D. Options/Accessories Required

1. Provide stainless steel hardware.

2. Lead wire shall be a waterproof cable of sufficient length so that no splice or junction box is required in the vault.

3. Provide a cast-aluminum weatherproof junction box outside the sump pit with terminals for all floats and tapped as required for conduit connections.

E. Manufacturer(s)

1. MJK, Model 7030

2. Pepperl & Fuchs LFL

3. Or Approved Equal

2.06 MULTI-POINT FLOAT LEVEL SWITCH (L05)

A. Multi point magneticswitch

1. Type
   a. Multipoint magnetic stem float switch utilizing sealed reed switches.

2. Function/Performance
   a. Multiple independent switch points custom-configured for specific tank operations (e.g., High Level Alarm, Pump Off, Pump On, and Low Level/Critical Alarm).
   b. Provide NO or NC type contact for fail-safe operation per section 13300-2.01. F or as shown on the Contract Drawings.
   c. Temperature Range: –40 to 302 degrees F.

3. Physical
   a. Stem and Float Material: 316 Stainless Steel or Brass, specifically rated for the specific gravity of diesel fuel (approximately 0.85 SG).
   b. Custom manufactured insertion length as per fuel tank.
   c. Threaded NPT fitting (e.g., 1.5-inch or 2-inch) or flanged to match the day tank's vessel flange size, material and class.
   d. Housing shall be NEMA 4X (IP66). Where the instrument is installed in a hazardous area, the housing shall be explosion-proof, approved for Class I, Division 1, Groups C and D (EEx d IIB T4) installation.

B. Options/Accessories Required

1. Slosh shields (protective metal tubing around the floats) to prevent false actuation from turbulent fuel during rapid transfer pump filling.

2. Provide a cast-aluminum weatherproof junction box outside the tank with terminals for all floats and tapped as required for conduit connections

C. Manufacturer(s)

1. Gem Sensors, LS-700 or LS-800

2. Madison Company, M5000 Series

3. Or Approved Equal

2.07 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.

2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

2.08 IDENTIFICATION

A. Tag items in this specification as follows:

1. LIT-01-01 (L03)

2. LIT-01-02 (L03)

3. LIT-01-20 (L03)

4. LSLL-01-01 (L04)

5. LSLL-01-20 (L04)

6. LIT-76-01 (L01)

7. LSL-76-01 (L05)

2.09 STARTUP SERVICES

A. PCSS shall perform startup services.

1. Complete installation and startup check according to manufacturer's written instructions.

2. The startup services include calibration, oversight of installations of the sensor, and start-up of the sensor/transmitter in order to provide reliable measurement at the instrument. Work with the PCSS and AESS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

2.10 DEMONSTRATION

A. While starting up the instruments, the PCSS shall provide training to the PRASA's instrumentation technicians as follows:

1. How to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.

2. Provided 2 times and last up to 2 hours in the field.

END OF SECTION

SECTION 13343
I&C – PRESSURE DEVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 I&C – General Provisions.

1.02 SCOPE OF WORK

A. This section covers the furnishing, installation, and services for pressure-related instruments as detailed in the Contract Drawings.

B. Refer to Section 13300 I&C - General Provisions.

1.03 RELATED WORK

A. Section 13300 I&C – General Provisions.

B. Section 13340 I&C – Instruments.

1.04 SUBMITTALS

A. Section 13300 I&C – General Provisions.

B. Section 13340 I&C – Instruments..

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 I&C – General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 I&C – General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 I&C – General Provisions.

B. Privde Component compatible with functions required to form complete working system.

C. Ensure that materials of construction of wetted parts are compatible with process liquid

1.08 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300 I&C – General Provisions.

1.09 **NOMENCLATURE AND IDENTIFICATION**

A. Refer to Section 13300 I&C – General Provisions.

1.10 **WARRANTY**

A. Refer to Section 13300 I&C – General Provisions.

1.11 **MAINTENANCE CONTRACT**

A. Refer to Section 13300 I&C – General Provisions.

1.12 **PROJECT/SITE REQUIREMENTS**

A. Refer to Section 13300 I&C – General Provisions.

1.13 **SPARE PARTS**

A. None required.

1.14 **TEST EQUIPMENT**

A. Refer to Section 13300 I&C – General Provisions.

1.15 **TECHNOLOGY OBSOLESCENCE AND MITIGATION**

A. Refer to Section 13300 I&C – General Provisions.

PART 2 PRODUCTS

2.01 **GENERAL**

A. See products requirements 13300-2.01 in Section 13300 I&C – General Provisions.

2.02 **DIAPHRAGM SEAL – THREADED (P01)**

A. Type:

1. Thread attached.

2. Welded Metal Diaphragm.

B. Function/Performance:

1. Maximum Pressure: Two times the maximum process pressure.

2. Operating Temperature: -40 to 212 degrees F .

C. Physical:

1. All 316L stainless steel construction.

2. Teflon gaskets and O rings on process connection.

3. Sensing Liquid: Silicone Oil.

4. Bleeding connection provided.

D. Accessories Required:

1. Stainless steel armored capillary tubing as required for the installation.

E. Manufacturer(s):

1. Rosemount, Model 1199

2. Ashcroft, Model 510-511

3. Or Approved Equal

2.03 GAUGE PRESSURE OR PRESSURE SENSING LEVEL TRANSMITTERS (P02)

A. Type:

1. Microprocessor based, intelligent type.

B. Function/Performance:

1. Range: As shown in the field instrument schedule in Section 13340 I&C – Instruments.

2. Accuracy: 0.075 percent of span.

3. Operating Temperature: -4 to 176 degrees F (-20 to 80 degrees C).

4. Temperature Effect: Combined temperature effects shall be less than 0.2 percent of maximum span per 82 degrees F (28 degrees C) temperature change.

5. Output: 4-20 mA DC linear with pressure or level, with HART protocol. Zero adjustable over the range of the instrument provided calibrated span is greater than the minimum calibrated span.

6. Stability: 0.05 percent of upper range limit for 1 year.

7. Display: Digital indicator displaying pressure or level in the engineering units indicated in the field instrument schedule in Section 13340 I&C – Instruments.

8. Diagnostics:

a. Self-diagnostics with transmitter failure driving output to above or below out of range limits.
b. Simulation capability for inputs and loop outputs.
c. Test terminals available to ease connection for test equipment without opening the loop.
d. Data registers available to record minimum and maximum pressure and temperatures transmitter has been exposed.

9. Over Range Protection: Provide positive over range protection to 150 percent of the maximum pressure of the system being monitored by the instrument.

10. If required to meet the range or suppression/elevation requirements, a differential pressure transmitter shall be provided.

C. Physical:

1. Enclosure: NEMA 4X (IP66). Where indicated on the drawings to be installed in a hazardous location, the sensor assembly shall be explosion proof approved for Class I, Division 1, Groups C and D (EEx d IIC T5).

2. Process Wetted Parts: Isolating diaphragm and other wetted metal parts shall be 316L stainless steel. Gaskets and O-rings shall be Teflon.

3. Power Supply: 24 VDC loop power.

4. Sensor Fill Fluid: Silicone.

D. Accessories Required:

1. Provide span and zero adjustment at each transmitter and through the handheld programming unit.
   a. Configuration of the transmitter may be accomplished using the local display and pushbuttons without the use of an external programming device.

2. For each transmitter, provide a 316 stainless steel block & bleed shut off valve. Valves may be mounted directly to the instrument or separately mounted. Valves shall be by the instrument manufacturer or by D/A Manufacturing or Anderson Greenwood.

3. For each transmitter provide a diaphragm seal as shown on the drawings.

E. Manufacturer(s):

1. Endress + Hauser, Model Cerabar

2. Rosemount, Model 3051CG

3. Or Approved Equal

2.04 PRESSURE SWITCH (P03)

A. Type:

1. Diaphragm actuated.

B. Function/Performance:

1. Repeatability: Better than 1 percent of full scale.

2. Setpoint: Field adjustable and set between 30 and 70 percent of the adjustable range.

3. Dead Band: Adjustable to 60 percent of full scale.

4. Reset: Unit shall be of the automatic reset type unless noted otherwise in the field instrument schedule in Section 13340 I&C – Instruments.

5. Over Range Protection: Over range protection to 150 percent of the maximum process line pressure.

6. Output: Single pole double throw (SPDT) unless requirement for double pole double throw (DPDT) switch is shown on the field instrument schedule in Section 13340 I&C – Instruments. Switch rating shall be 10 A at 230 VAC.

C. Physical:

1. Housing: NEMA 4X (IP65) for non-hazardous areas. For installation in hazardous areas, housing shall be explosion proof approved for Class 1, Division 1, Groups C and D (EEx d IIB).

2. Switch Assemblies: Hermetically sealed switches.

3. Wetted Parts: 316L stainless steel diaphragm, Viton seals, 316 stainless steel connection port.

D. Accessories/Options Required:

1. Shutoff Valve: Provide a 316 stainless steel shutoff valve. Valve shall be by D/A Manufacturing, Anderson Greenwood, or Approved Equal.

2. Provide diaphragm seals as shown on the drawings.

3. Where indicated on the Contract Drawings, provide a 316 stainless steel snubber for pulsation dampening.

E. Manufacturer(s):

1. Ashcroft, Model B Series

2. Mercoid, Model DA Series

3. Or Approved Equal

2.05 PRESSURE GAUGE (P04)

A. Type:

1. Bourdon tube actuated dial face pressure gauge.

B. Function/Performance:

1. Accuracy: Plus or minus 1.0 percent of span or better.

C. Physical:

1. Case: Phenolic shock resistant for surface/stem mounting with a pressure relieving back. The case shall be vented for temperature/atmospheric compensation. Gauge shall be capable of being liquid filled in the field or at the factory.

2. Window: Clear acrylic or shatter proof glass.

3. Bourdon tube: Stainless steel.

4. Connection: 1/2 in. NPT

5. Gauge size: Minimum 4-in. viewable.

6. Pointer travel: Not less than 200 degrees not more than 270-degree arc.

7. Range: As shown in the field instrument schedule in Section 13340 I&C – Instruments.

D. Accessories/Options Required:

1. Shutoff valve: Each gauge shall have a process shutoff valve that can also be used as an adjustable pressure snubber.

2. Special scales: Engineer reserves the right to require special scales and/or calibration if the manufacturer's standard is not suitable for the application.

3. Provide diaphragm seals as shown on the Contract Drawings.

4. Sensing Liquid: Silicone Oil.

5. Liquid filled at the factory.

E. Manufacturer(s):

1. Ametek US Gauge, Model 659
2. Ashcroft, Model 1259
3. Or Approved Equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.
2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

3.02 IDENTIFICATION

A. Tag items in this specification as follows:

1. PIT 01-01 (P01) (P02)
2. PSH-01-01 (P01) (P03)
3. PSL-01-01 (P01) (P03)
4. PG-01-01 (P04)
5. PG-01-02 (P04)
6. PG-01-03 (P04)
7. PG-01-04 (P04)
8. PIT 01-20 (P01) (P02)
9. PSL-01-20 (P01) (P03)

3.03 STARTUP SERVICES

A. PCSS shall perform startup services.

1. Complete installation and startup check according to manufacturer's written instructions.

2. The startup services include calibration, oversight of installations of the sensor, and start-up of the sensor/transmitter in order to provide reliable measurement at the instrument. Work with the PCSS and AESS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

3.04 DEMONSTRATION

A. Train PRASA's maintenance personnel to adjust, operate, and maintain units.

B. While starting up the instruments, the PCSS shall provide training to the PRASA's instrumentation technicians as follows:

1. How to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.

2. Provided 2 times and last up to 2 hours in the field.

END OF SECTION

SECTION 13344
I&C - TEMPERATURE DEVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.02 SCOPE OF WORK

A. This section covers the furnishing, installation, and services for temperature-related instruments as detailed in the Drawings.

B. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.03 RELATED WORK

A. Section 13300 Instrumentation and Controls -General Provisions.

B. Section 13340 Instrumentation and Controls -Instruments.

1.04 SUBMITTALS

A. Section 13300 Instrumentation and Controls -General Provisions.

B. Section 13340 Instrumentation and Controls-Instruments.

1.05 COORDINATION MEETINGS

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.06 REFERENCE STANDARDS

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.07 QUALITY ASSURANCE

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.08 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.09 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.10 WARRANTY

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.11 MAINTENANCE CONTRACT

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.12 PROJECT/SITE REQUIREMENTS

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.13 SPARE PARTS

A. None required.

1.14 TEST EQUIPMENT

A. Refer to Section 13300 Instrumentation and Controls -General Provisions.

1.15 TECHNOLOGY OBSOLESCENCE AND MITIGATION

A. Refer to Section 13300 Instrumentation and Controls – General Provisions.

PART 2 PRODUCTS

2.01 GENERAL

A. See products requirements 13300-2.01 in Section 13300 Instrumentation and Controls – General Provisions.

2.02 RESISTANCE TEMPERATURE DEVICES (RTD)

A. Sensor:
   1. Type:
      a. Thin-film RTD.
   2. Function/Performance:
      a. Range: As required by the measuring range indicated in the field instrument schedule in Section 13340 Instrumentation and Controls-Instruments.
      b. Accuracy: Plus or minus 0.1 percent at 32 degrees F (0 degrees C).
      c. Stability: Tested to meet IEC 60751.
      d. Tolerance: Class B, according to IEC 60751.
      e. Vibration Resistance: 3g over frequency range 5 Hz to 500 Hz. Tested to meet IEC 60751.
      f. Maximum Thermal Response Time: 9 seconds to reach 50 percent sensor response when tested in flowing water according to IEC 60751.

g. Temperature Coefficient: 100 ohms at 32 degrees F (0 degrees C), with temperature coefficient of 0.00391 ohms/ohm/degree C
h. Self-Heating: Tested to meet IEC 60751.

3. Physical:
   a. Platinum.
   b. Sensor shall penetrate into the pipe where it is installed, by 1/3 to 1/2 of the pipe diameter.
   c. Sensor shall be provided with covered connection head. Sensor and connection head shall be NEMA 4X (IP66). Where indicated on the drawings to be installed in a hazardous location, the sensor assembly shall be explosion proof approved for Class I, Division 1, Groups C and D (EEx d IIC).
   d. Three-wire configuration.
   e. Probe: 1) 1/4 inch in diameter with stainless steel sheath. 2) Operating Temperature: -58 to 482 degrees F.

Accessories Required:

a. Sensors shall be installed in 316L stainless steel thermowells. Thermowells shall be threaded.
b. Extensions shall be provided for sensors installed in insulated pipe. Extensions shall clear the pipe insulation. Extensions shall also be provided where process temperatures are above 212 degrees F.

B. Manufacturer(s):
   1. Rosemount, Model 214C RTD.
   2. Foxboro, Model PRMTA.
   3. Or Approved Equal.

C. Transmitter:
   1. Manufacturer:
      a. Same manufacturer as RTD sensor, and in accordance with the "Temperature Transmitters" paragraph below.

2.03 TEMPERATURE TRANSMITTER

A. Type:
   1. Remotely mounted, intelligent transmitter compatible with sensor provided.

B. Function/Performance:
   1. Digital Accuracy: plus or minus 0.36 degrees F.
   2. Stability: plus or minus 0.1 percent or 0.18 degrees F, whichever is greater, for 24 months.

3. Operating Temperature: -40 to 185 degrees F.
4. Output: 4-20 mA DC linear with temperature. Transmitter shall also communicate using HART protocol.
5. Output may be set as difference or average of two measured temperatures.
6. Output may be configured for custom curves including Callendar-Van Dusen correction.
7. Display: Digital indicator displaying temperature in engineering units.
8. Diagnostics:
   a. Self-diagnostics with transmitter failure driving output to above or below out of range limits.
   b. LED indication of transmitter faults.
9. Simulation capability for inputs and loop outputs.
10. Test terminals available to ease connection for test equipment without opening the loop.
    a. Run-time clock available to determine usage for warranty purposes. A 5-year warranty on this clock reading is included.

C. Physical:

1. Enclosure shall be NEMA 4X (IP66). Where indicated on the drawings to be installed in hazardous locations, the transmitter shall be explosion proof approved for Class I, Division 1, Groups C and D (EEx d IIC).

2. Power supply shall be 24 VDC loop power.

D. Manufacturer(s):

1. ABB, Model TTF300
2. Rosemount, Model 3144P
3. Or Approved Equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method:

1. Conductors and cables must be inside conduit.
2. Conceal conduit in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without

exceeding manufacturer's limitations on bending radii.

3.02 IDENTIFICATION

A. Tag items in this specification as follows:
   1. TIT-02-10

3.03 FIELD QUALITY CONTROL

A. Temperature devices will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.04 STARTUP SERVICES

A. PCSS shall perform startup services.
   1. Complete installation and startup check according to manufacturer's written instructions.
   2. The startup services include calibration, oversight of installations of the sensor, and startup of the sensor/transmitter in order to provide reliable measurement at the instrument. Work with the PCSS and AESS to verify the transmitter sends correct information to the control system (i.e., that the scaling and units are the same at the instrument and on the control system's operator interface/PLC). Submit an instrument calibration report in order to document the calibration procedure of the instruments.

3.05 DEMONSTRATION

A. While starting up the instruments, the PCSS shall provide training to the PRASA's instrumentation technicians as follows:
   1. How to calibrate, install, troubleshoot, read the diagnostics, and maintain the sensor and transmitter.
   2. Provided 2 times and last up to 2 hours in the field.

END OF SECTION

SECTION 13350
I&C – VENDOR PACKAGE SYSTEM CONTROLS INTEGRATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section is related to the vendor system requirements for integration with the PRASA Control and SCADA system.

1.02 COMPATIBILITY OF THE OWNER'S PROGRAMMING EQUIPMENT WITH THE VENDOR SYSTEM

1. Readable Machine Documentation The supplier shall provide two sets of documented unprotected as-built Electronic Programmable Logic Controller (PLC), Program Counter (PC), Human-Machine Interface (HMI), and all other required software files on a USB thumb drive in a native machine-readable format, final software programs, and any passwords or hardware/software needed to modify or restore all programs and configurations developed under this Contract. This machine-readable documentation shall include all documentation files, including logic and annotation files. Any changes made during or after the factory acceptance test shall be incorporated at no additional cost to the Puerto Rico Aqueduct and Sewer Authority (PRASA). Supply of these items shall not require any ongoing support contract or long-term relationship with the supplier.

2. Before leaving the site, the supplier shall ensure that any devices or programming computers that PRASA will use to maintain the system can monitor the control processors online, make online changes, and upload and download the processors to ensure proper communication has been set up and that programming software versions are compatible with the processors provided.

3. Before leaving the site, the supplier shall ensure the PLC and HMI addresses ("IP addresses" if an Ethernet network) are configured to be compatible with the plant's Supervisory control and data acquisition (SCADA) system. Also, before leaving the site, the supplier must perform a communication verification of each piece of data listed on the memory map.

1.03 MEMORY MAPS REQUIREMENTS

1. Submit a memory map of PLC registers to be transmitted and received and function from and to the plant PLC in coordination with the Process Control System Supplier/ Applications Engineering System Supplier (PCSS/AESS) and in concordance with the PRASA PLC SCADA Standard requirements.

2. PLC shall communicate to the plant SCADA system as shown on the Contract Instrumentation drawings.

3. All control and monitoring functions available on the vendor control panel or operator interface shall be designed for duplication in the plant's SCADA system.

4. All vendors supplying control panels that communicate with the plant SCADA network shall submit a memory map of PLC registers to the AESS by 30 days before the scheduled shipment of the vendor equipment to the site. The vendor shall contact and coordinate with the AESS to ensure a compatible configuration of the vendor PLCs to match the facility network. The vendor shall configure the network addresses in their equipment to check the addresses determined by the PRASA IT. Software communication shall be provided in contiguous registers. One set of records shall be provided for writing discrete-type information, and one set shall be provided for reading discrete-type information. One set of registers shall be provided for writing floating-point information (i.e. from Analog input or internal Setpoints), and one set shall be provided for reading floating-point information (i.e. Analog output or Setpoints command).

1.04 NETWORK COMPONENT AND CYBERSECURITY

A. Profibus to Etherene Gateway Converter.

1.05 SURGE PROTECTION REQUIREMENTS FOR VENDOR EQUIPMENT

1. Provide individual device protection for any 4-20 mA signal and 24 VDC power to an instrument or equipment mounted outside the building or facility housing. Instruments shall be housed in a grounded metallic case. Device surge protectors shall be mounted within the instrument enclosure or a separate junction box coupled to the enclosure. Refer to Surge Protection specification 13332- I&C – Surge Suppressors.

2. Provide a network surge suppressor for each ethernet connection to the Plant PLC network. Refer to Section 13332- I&C – Surge Suppressors

3. Old hardwired discrete connection between Plant PLC and vendor PLC must be done via interposing relays.

END OF SECTION

SECTION 15002

TESTING OF PIPING SYSTEMS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor and materials required for testing of piping systems installed in this Contract.

B. Pipe installed in this Contract, including piping which is installed between or connected to existing piping, shall be tested.

1.02 RELATED WORK

Section 02A092, TRENCH EXCAVATION FOR PIPE.

1.03 SUBMITTALS

Submit to the OWNER a schedule, procedure, and a list of equipment and materials necessary to perform the testing for review at least 30 days prior to the start of testing.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.01 GENERAL

Time and sequence of testing shall be scheduled by the CONTRACTOR, subject to observation and approval by the ENGINEER and OWNER.

3.02 TESTING OF PIPING SYSTEM

A. Conduct test on buried piping that is to be hydrostatically tested after the trench has been completely backfilled. The CONTRACTOR may, if field conditions permit and if approved by the OWNER, partially backfill the trench and leave the joints open for inspection and conduct an initial service leak test. The acceptance test shall not, however, be conducted until backfilling has been completed.

B. Conduct the test on exposed piping after the piping has been completely installed, including supports, hangers, and anchors, but prior to insulation.

C. Testing of pipe with concrete thrust blocking shall not be performed until the

concrete has cured at least five days.

D. If any pipe fails to meet the specified requirements for water tightness, the cause of the excessive leakage shall be determined and remedied and the pipe retested until requirements are satisfied.

E. No pipe installation will be accepted until known leaks have been repaired. Locating and repairing of leaks shall: be performed by the CONTRACTOR at no additional cost to the OWNER.

F. Submit written reports on pipe tests and certify that required tests have been successfully completed before the piping is accepted. Reports shall be submitted on forms provided by the Representative of the OWNER.

G. Pressure and Leakage Tests of Underground Pressure Piping

1. Hydrostatic pressure and leakage tests shall conform with Section 4 of AWWA C600, and Chapter 15 of AWWA M9 (as applicable) with the exception that the CONTRACTOR shall furnish all gauges, meters, pressure pumps and other equipment needed to test the line.
2. The pressure required for the field hydrostatic pressure test shall be 1.2 times the design pressure for prestressed concrete cylinder pipe and 1.5 times the design pressure for steel pipe. The test pressure for all other pipes shall be 1.5 times the normal working pressure. The CONTRACTOR shall make necessary provisions for filling the pipelines for testing. The CONTRACTOR shall provide temporary plugs and blocking necessary to maintain the required test pressure. Corporation cocks at least ¾ inch diameter, pipe riser and angle globe valves shall be provided at each pipe dead-end in order to bleed air from the line.
3. All visible leaks shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced. Pipelines shall be tested in such sections as may be directed by the ENGINEER or OWNER by shutting valves or installing temporary plugs as required. The line shall be filled with water, air removed, and the test pressure maintained in the pipe for the entire test period by means of a force pump to be furnished by the CONTRACTOR. Accurate means shall be provided for measuring the water required to maintain the test pressure. Test pressure shall not vary by more than + 5 psi for the duration of the test.
4. The amount of leakage permitted for underground piping shall be as follows: Prestressed concrete cylinder pipe: 25 gallons/in dia./day/mile. Ductile Iron Pipes: Per AWWA C600.
5. Remove and adequately dispose of all blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise directed by the OWNER. Any damage to the pipe coating shall be repaired by the CONTRACTOR.
   Lines shall be totally free of material and clean prior to final acceptance.

H. Pressure and Leakage testing of Above Ground Pressure Piping

1. Pressure piping located above ground (not buried) shall be pressure and leakage tested in accordance with AWWA C600, modified for interior use, as acceptable to the ENGINEER and OWNER's Representative and as follows:
   a. Duration of each test: 2 hours.
   b. Pressure for each test: Per the AWWA C600, or AWWA M9 as applicable. (Note: Valves shall not be operated at higher than their rated pressure. Temporary bulkhead method, may be required).
   c. Pressure test shall be done first. If it is acceptable, leakage tests may then be done.

2. If leaks are discovered, they shall be repaired by the CONTRACTOR at his expense. No leakage will be permitted for pipes above ground.

3. Equipment, pipe, and appurtenances shall be repaired or replaced and the tests repeated at the CONTRACTOR's expense until pipe, appurtenances and equipment are in satisfactory compliance with these Contract Documents in the judgment of the OWNER's Representative.

3.03 TESTING OF SEWERS, STORM DRAINS AND OTHER GRAVITY YARD PIPING

A. Exfiltration Test (Hydrostatic Leak Test)

1. Leakage tests by exfiltration shall be performed after backfilling. The length of pipe to be tested shall be such that the head over the crown of the upstream end is not less than 2 feet and the head over the downstream crown is not more than 6 feet. The pipe shall be plugged by pneumatic bags or mechanical plugs in such a manner that air can be released from the pipe while it is being filled with water. The test shall be continued for one hour and provisions shall be made for measuring the amount of water required to maintain the water at a constant level during this period.

2. Leakage must be within maximum allowable with no visible leaks, or the jointing material shall be removed and the joint remade. If any pipe is defective, it shall be removed and replaced. If the quantity of water required to maintain a constant level in the pipe for one hour does not exceed the applicable standard for the typo of pipe and all the leakage is not confined to a few joints, the workmanship shall be considered satisfactory. If the amount of leakage indicates defective joints or broken pipes, they shall be corrected by the CONTRACTOR at his expense.

3. If an inspection of the completed pipe lines or any part thereof shows pipes, or joints which allow the infiltration of water in a noticeable stream or jet, the defective work or material shall be replaced or repaired as directed.

4. Rates of infiltration shall be determined by means of V-Notch weirs, pipe spigot or by plugs in the end of the pipe to be provided and installed by the CONTRACTOR in an approved manner and at such times and locations as may be directed by the ENGINEER's Representative.

B. Low Pressure Air Test

1. An air test may be used in lieu of the exfiltration test or if pipeline grades do not allow filling the entire pipeline segment or manhole to the specified depth. Air testing shall be performed in accordance with the procedures described in ASTM C-828, ASTM C-924 and ASTM C-969. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply unless the pipe is to be joint tested. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be Computed from the following equation:

$$T = \frac{0.085 \times D \times K}{Q}$$

T=time for pressure to drop 1.0 pound per square inch gauge in
D=0.000419xDxL, but not less than 1.0
L=average inside pipe diameter in inches
Q=rate of loss, 0.0015 cubic feet per minute per square foot
internal surface shall be used

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined or until failure. Lines with a 27-inch average inside diameter and larger may be air tested at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be ten seconds.

3.04 TEST RECORDS

CONTRACTOR shall maintain records of each test on approved forms. The CONTRACTOR shall provide all the personnel, equipment and materials required to collect the test records. Personnel shall have at least basic experience with the type of test to be performed. The records shall be submitted to the ENGINEER shall include:

1. Date of test.

2. Description, location and identification of piping tested.
3. Test fluid.
4. Detailed test pressures record.
5. Graphical presentation of the test record to facilitate its interpretation.
6. Remarks, to include such items as:
   a. Leaks (type, location).
   b. Repairs made on leaks.
7. Certification by CONTRACTOR and initialed acknowledgment by ENGINEER's or OWNER's Representative.

3.05 WATER SOURCE

CONTRACTOR shall make all necessary provisions and get all applicable permits for hydrostatic testing of pipelines.

3.06 FINAL ACCEPTANCES

No pipe installation will be accepted until successful completion of hydrostatic test.

END OF SECTION

SECTION 15031
DUCTILE IRON PIPE AND FITTINGS

PART 1. GENERAL

1.01 SUMMARY

Furnish all labor, materials, equipment and incidentals required and install ductile iron pipe, ductile iron fittings, and appurtenances as shown in the Construction Drawings and as specified herein.

1.02 PAYMENT PROCEDURES

A. Pipe and fittings shall be paid once they pass test, and it is accepted by (approved) by Engineer.

1.03 REFERENCES

A. American Water Works Association (AWWA):

1. C 104 (ANSI A21.4): Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for water.

2. C 105 (ANSI A21.5): Polyethylene Encasement for Ductile-Iron Piping for Water and other Liquids.

3. C 110 (ANSI A21.10): Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in., for Water and other Liquids.

4. C 111 (ANSI A21.11): Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

5. C 115 (ANSI A21.15): Flanged Ductile-Iron Pipe with threaded Flanges.

6. C 150 (ANSI A21.50): Thickness Design of Ductile-Iron Pipe.

7. C151 (ANSI A21.51): Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water.

8. C 153 (ANSI A21.53): Ductile-Iron Compact Fittings, 3-in. through 16-in., for Water and othe Liquids.

9. C600: Installation of Ductile-Iron Water Mains and their Appurtenances.

10. C606: Grooved and Shouldered Joints.

11. C651: Disinfecting Water Mains.

1.04 **SUBMITTALS**

1.04.1 **SHOP DRAWING AND PRODUCT DATA**

A. In accordance with the requirements of General Specifications, submit the following:

1. Shop and Working Drawings.

a) Piping layouts in full detail.

b) Location of pipe hangers and supports.

c) Location and type of backup block or device to prevent joint separation.

d) Large scale details of all wall penetrations and special castings.

e) Schedules of all pipe, fitting, special castings, couplings, expansion joints, and other appurtenances.

1.04.2 **QUALITY ASSURANCE/CONTROL SUBMITTALS**

A. Certificates

1. The manufacturer shall furnish a certified statement that the pipes and fittings have been inspected and tested in accordance with the specifications to which the material is manufactured.

1.05 **QUALITY ASSURANCE**

A. Ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. Ductile iron pipe to be installed under this Contract may be inspected at the plant for compliance with these Specifications by an independent testing laboratory selected by the Engineer. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of initial inspections at the plant will be borne by the Authority. The cost of additional inspections deemed necessary by the Authority because of the failure of the pipe to meet the Specification shall be borne by the Manufacturer.

B. Inspection of the pipe will be made by the Engineer's Representative after delivery. Pipe or fittings shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though they may have been accepted as satisfactory at the place of manufacture.

C. Pipe or fittings rejected after delivery shall be marked for identification and shall immediately be removed from the job.

D. Pipe and fittings shall be as manufactured by American Cast Iron Pipe Company, U.S. Pipe, Clow Corporation, or approved equal.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Delivery, storage and handling of pipe, fittings, and appurtenances shall be in accordance With AWWA C600, Section 2 except as specified otherwise.

B. Delivery. The contractor, as directed, shall furnish the pipe; fittings, gaskets or other material specified or required and shall deliver these materials at the places designated by the Authority.

Pipes, fittings, special pieces and joint materials should be delivered along sides the pipe trench, near the places where they are to be installed, as shown on the project plans.

PART 2. PRODUCTS

2.01 **DUCTILE IRON PIPE**

A. Ductile iron pipe shall conform to AWWA C151. Flanged pipe shall conform to AWWA C115.

B. Unless otherwise noted in the Construction Drawings, Pipe and fittings shall be Class 250.

C. The barrel thickness of the pipe shall not be less than that stated in the specification ANSI A21.50 of latest revision, for the respective diameter of pipe.

2.02 **FITTINGS**

A. Fittings shall be ductile iron and shall conform to AWWA C 110.

B. Compact fittings from 3-inch through 12-inch shall be also in accordance with ANSI specifications A21.53 and/or A21.11 of latest revision (AWWA C153 and/or C111 of latest revision, respectively). All necessary corten bolts gaskets and ductile iron glands must be included. All accessories shall be individually packaged.

C. Outlet from 4-inch to 12-inch may be provided by tapping saddle, such as American Tapping Saddle and Branch Connection, or approved equal.

D. All fittings shall be bituminous coated outside and cement lined inside, in accordance with ANSI specification A21.4 (of latest revision) (AWWA C104, of latest revision).

E. Wall Casting:

1. Wall casting shall be of the sizes and type as shown in the Construction Drawings. Flanges and mechanical joint bells shall be drilled and tapped for studs where flush with the wall.

2. Wall casting shall be provided with an intermediate wall collar. The collar shall be located at the center of the overall length of casting set flush with the wall. For casting which

extend through the wall, the collar shall be located such that it is within the middle third of the wall. Collars shall either be cast integrally with the casting or shall be of the assembled type as manufactured by U.S. Pipe & Foundry Company, consisting of two mechanical joint retainer glands with gasket.

2.03 **JOINTS**

A. Mechanical joints and push-on joints shall conform to AWWA C 111. The design and shape of the gasket and the annular recess shall be such that the gasket is locked in place against displacement, as the joint is assembled. The Contractor shall furnish the necessary gaskets, lubricants and other accessories for jointing rubber gasket bell and spigot joints in quantities ten percent (10%) in excess of the theoretical requirement.

B. Buried joints shall be push-on or mechanical joint type. Joints above finished grade or in vaults and pump station shall be flanged unless shown otherwise in the Construction Drawings.

C. Restrained joints shall be " Flex-ring" or "Lok-Ring" by American Cast Iron Pipe Company, "TR Flex" by U.S. Pipe Company, "Super-Lock" by Clow Corporation, or approved equal.

D. Flanges shall have a 3.2-mm (1/8") thick flat inserted rubber gaskets. Flanges shall be flat faced with a serrated finish.

E. Filler flanges and believed filler flanges shall be furnished and install as required. Filler flanges and believed filler flanges shall be furnished faced and drilled complete with extra length bolts.

2.04 **ACCESSORIES**.

A. The contractor shall furnish all other materials and accessories required for the successful handling, laying, jointing, and testing of the pipeline. This material shall include all temporary bulkheads, over flanges and similar appurtenances required for protection of the pipe during the work and all equipment except gauges required for field testing of the pipe lines.

B. Closure pieces. Closure pieces shall be furnished after the pipes, which they are to joint, are completely installed and will be furnished to the field dimensions required. Closures shall be made with standard pipe sleeves with push-on joints.

2.05 **COATING AND LININGS**

A. Pipe and fittings shall have a cement mortar lining and asphaltic seal coat on the inside in accordance with AWWA C 104. All pipe and fittings, except where painting is specified, shall have an asphaltic coating on the outside in accordance with AWWA C 151.

2.06 **IDENTIFICATION**

A. The weight, class or nominal thickness, and casting, period shall be shown on each pipe. The manufacturer's mark, the year in which the pipe was produced and the letters “DI” of "ductile", shall be cast or stamped on the pipe.

B. Gaskets shall be marked with name of manufacturer, size, and proper insertion direction.

PART 3. EXECUTION

3.01 **INSTALLATION OF BURIED PIPE**

A. The contractor shall furnish, deliver, haul, store, protect and perform all work necessary for installing, jointing, and testing the ductile cast iron pipes, fittings and accessories required. Including everything necessary to complete the work in readiness for operation, as shown on plans.

B. Contractor shall excavate all trenches and lay pipes as specified in Section 02A092 "Trench Excavation for Pipe".

C. Placing pipe in the trench. Proper implements, tools, and facilities satisfactory to the engineer shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipes, fittings, valves, and similar pieces will be carefully lowered into the trench. Piece by piece, by means of derricks, ropes, or other suitable tools or equipment; in such manner as to prevent damage to the pipe. Under no circumstances shall pipe or accessories be dropped or dumped into trench.

In lowering the pipe into the trench, care shall be exercised to avoid bumping the pipe already in the trench. Timbers shall be used in front of the end of the pipe previously laid. To serve as a bumper to prevent damage from a swinging pipe, as it is lowered into the trench.

D. Pipe Kept Clean. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.

E. Blocking of pipe. Only if approved by the engineer, shall pipes be laid on wood blocking and hold in correct alignment by wood wedges, placed transversely to the line of pipe. Blocking and wedges shall be out from sound lumber.

Blocks shall be bedded firmly with uniform bearing and shall be level across the bottom of the trench. The trench shall be excavated at least 2.5 cm. below grade, and the block shall project at least 2.5 cm. above the trench bottom. They shall be aligned to the proper grade.

F. Making the Joints. All joints shall be made in strict agreement with the instructions of the pipe manufacturer.

The contractor shall assume full responsibility for satisfactory performance of the pipe in the line, as far as meeting the leakage test specified on the priory mentioned correspondent specification.

G. Prevention of trench water from entering pipe. At times when pipe laying is not in progress, the open ends of the pipe shall be tightly closed by approved means, and no trench water shall be permitted to enter the pipe. No pipe shall be laid in water, or when the trench conditions or the weather are unsuitable for such work, except by permission of the Engineer.

H. Cutting pipe. Pipe shall be cut by means of pipe cutters, sharp diamond point chisels or other approved means which will produce a clean true cut, free from irregularities, and leave a smooth end at right angles to the axis of the pipe. In planning his work, the contractor shall exercise care to minimize the number of cuts required and to avoid wasting pipe.

I. Installation and joints assembly of pipe, fittings, and appurtenances shall be in accordance with AWWA C600, Sections 3.3 and 3.4 except as specified otherwise.

J. Joint deflection shall not exceed 75 percent of the pipe manufacturer's maximum recommended deflection.

K. Valves shall be installed so that an adjacent pipe will not be required to support the weight of the valve. Pipe shall be supported in such a manner to prevent stress on the valve. In no case shall valves be used to bring misaligned pipe into alignment. Valves shall be installed in the closed position.

L. Dead ends shall be closed with plugs or caps that are suitably restrained to prevent blowing off under test pressure. If a valve precedes the plug or cap, it too shall be restrained against blowing off.

3.02 **INSTALLATION ABOVE GRADE PIPE**

A. Install piping and fittings true to alignment. Provide rigidly supported thrust anchors where required.

B. Install proper size sleeves for all pipes passing through floors or walls as shown in the Construction Drawings. Where indicated in the Construction Drawings or required for liquid or gas-tightness seal the pipe with a mechanical seal.

C. Furnish and install concrete inserts the hangers and supports in the concrete as it is placed. Set in compliance with the requirements of the piping layout and jointing method. Verify locations from approved piping layout drawings and the structural drawings.

D. Flanged joints shall be made with bolt studs with a nut on each end, or stud with nuts where the flange is tapped. The number and size of bolts shall comply with AWWA C 110.

E. Prior to assembly of grooved couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately

coated with petroleum jelly, cup grease, soft soap, or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal- to-metal, without excessive bolt tension.

F. Valves, fittings, equipment, and appurtenances needed upon the pipelines shall be set and jointed as indicated in the Construction Drawings or as required. Pipe and appurtenance connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

3.03 **CONNECTIONS WITH EXISTING PIPES**

A. Connections to existing pipes shall be made using suitable joints and fittings for the conditions encountered. Each connection with an existing pipe shall be made at the time and under conditions which will least interfere with operation of the treatment plant. Connections with buried existing flanges shall require removal of grout from the flanges. Remove concrete thrust block in when encountered for connections to existing pipes.

B. Facilities shall be provide for proper dewatering and for disposal of all water removed from the dewatering lines and excavations without damage to adjacent property.

3.04 **FIELD TESTING AND DISINFECTION**

A. Prior to testing, pipe shall be thoroughly flushed to remove all foreign material. Material flushed from the pipe shall be removed from the site.

B. General

1. Test all piping as specified below except as otherwise authorized by Engineer.

2. Testing shall be tested in sections. The maximum section size is the distance between two consecutive valves in the system. Smaller section sizes may be required by the Engineer.

3. Notify Engineer 48 hours in advance of testing.

4. Provide all testing apparatus, including pumps, hoses, gates and fittings

5. Pipelines shall hold the specified test pressure for a period of 2 hours.

6. Pipelines which fail to hold specified test pressure or which exceed the allowable leakage rate shall be repaired and retested.