CONTRACT DOCUMENTS FOR:

ITB #15-004
KEY WEST HISTORIC SEAPORT
COMMON AREA ENHANCEMENTS PROJECT
PHASE I

DECEMBER 2014

MAYOR: CRAIG CATES

COMMISSIONERS:

TONY YANIZ

BILLY WARDLOW

JIMMY WEEKLEY

CLAYTON LOPEZ

MARK ROSSI

TERI JOHNSTON

WPHORN & ASSOC.

CITY OF KEY WEST

CAROLINE STREET AND BAHAMA VILLAGE COMMUNITY
REDEVELOPMENT AGENCY (CRA)
KEY WEST, FLORIDA

CONTRACT DOCUMENTS

for

KEY WEST HISTORIC SEAPORT
COMMON AREA ENHANCEMENTS PROJECT
PHASE I
****

CONSISTING OF:
BID REQUIREMENTS
CONTRACT FORMS
CONDITIONS OF THE CONTRACT
SCOPE OF WORK
SPECIFICATIONS
DRAWINGS

****

KEY WEST, FLORIDA

December 2014

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PART 1

BIDDING REQUIREMENTS

INVITATION TO BID

Sealed bids for the City of Key West Caroline Street and Bahama Village Community Redevelopment Agency CRA ITB #15-004 KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I, addressed to the City of Key West, will be received at the Office of the City Clerk, 3126 Flagler St., Key West Florida, 33040 until 3:00 pm on February 25, 2015 and then will be publicly opened and read. Any bids received after the time and date specified will not be considered.

Please submit one (1) original, one (1) copy and two (2) flash drives each with one single PDF file of the entire bid package. Bid package is to be enclosed in a sealed envelope, clearly marked on the outside "BID FOR KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I - ITB 15-004" addressed and delivered to the City Clerk at the address noted above.

The project consists of the construction of various site improvements at the Historical Seaport as shown on the Construction Documents.

Drawings and Specifications may be obtained from Demand Star by Onvia. Please contact Demand Star at www.demandstar.com or call 1-800-711-1712 or www.cityofkeywest-fl.gov

A mandatory **pre-bid meeting** will be held in the Port & Marine Services conference room at 201 William, Key West, Florida on **February 11, 2015 at 2:30 p.m.**

The successful Bidder will be required to furnish the necessary additional bond(s) for the faithful performance of the Contract, as prescribed in the Bidding Documents. The Bidder will also be required to furnish documentation showing that he is in compliance with the licensing requirements of the State and the provisions of Chapter 66 section 87 of the Code of Ordinances of the City of Key West. Compliance with these provisions is required before the Contractor can enter into the agreement contained in the Contract Documents. Specifically, Bidder shall demonstrate that he holds, as a minimum, the following licenses and certificates required by State Statute and local codes.

EACH BID MUST BE SUBMITTED ON THE PRESCRIBED FORM AND ACCOMPANIED BY BID SECURITY AS PRESCRIBED IN THE INSTRUCTIONS TO BIDDERS, PAYABLE TO THE CITY OF KEY WEST, FLORIDA, IN AN AMOUNT NOT LESS THAN FIVE (5) PERCENT OF THE AMOUNT BID.

THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.

The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of the provisions of Chapter 66 Section 87 of the Code of Ordinances of the City of Key West; within 10 days the following the Notice of Award and must demonstrate that he holds at a minimum, the following licenses & certificates;

A. City of Key West Business Tax License Receipt
B. A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida.

All bid bonds, contract bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or Insurance Company having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida.

Before a Contract will be awarded for the work contemplated herein, the CRA will conduct such investigation as is necessary to determine the performance record and ability of the apparent low Bidder to perform the size and type of work specified under this Contract. Upon request, the Bidder shall submit such information as deemed necessary by the CRA to evaluate the Bidder's qualifications.

For information concerning the proposed work, or for appointment to visit the site of the proposed work, contact Karen Olson, Deputy Port & Marine Services Director, Key West Historic Seaport at 305-809- 3808 or kolson@cityofkeywest-FL.gov.

As stated above at the time of the bid submittal the Bidder must provide satisfactory documentation of State Licenses. The Bidder shall furnish documentation showing that he is in compliance with the licensing requirements of County, and City licenses as would be required within ten days of the award. The successful Bidder must also be able to satisfy the City Attorney as to such insurance coverage and legal requirements as may be demanded by the Bid in question. The CRA may reject bids for any and/or all of the following reasons: (1) for budgetary reasons, (2) if the bidder misstates or conceals a material fact in its bid, (3) if the bid does not strictly conform to the law or is non-responsive to the bid requirements, (4) if the bid is conditional, or (5) if a change of circumstances occurs making the purpose of the bid unnecessary to the CRA. The CRA may also waive any minor formalities or irregularities in any bid, (6) if such rejection is in the best interest of the CRA. The CRA may also waive any minor formalities or irregularities in any bid.

* * * * * *

INSTRUCTIONS TO BIDDERS

1. CONTRACT DOCUMENTS

A. FORMAT

The Contract Documents are divided into parts, divisions, and sections for convenient organization and reference. Generally, there has been no attempt to divide the sections into work performed by the various building trades, work by separate subcontractors, or work required for separate facilities in the project.

B. DOCUMENT INTERPRETATION

The separate sections contained within these Contract Documents are intended to be mutually cooperative and to provide all details reasonably required for the execution of the proposed work.

Should there be any doubt as to the meaning or intent of said Contract Documents, the Bidder should request of the Engineer, in writing (at least 8 working days prior to bid opening) an interpretation thereof. Any interpretation or change in said Contract Documents will be made only in writing in the form of Addenda to the documents which will be furnished to all registered holders of Contract Documents. Bidders shall submit with their Proposals, or indicate receipt of, all Addenda. The CITY will not be responsible for any other explanation or interpretations of said Documents.

2. GENERAL DESCRIPTION OF THE PROJECT

A general description of the work to be done is contained in the Invitation to Bid. The scope is specified in applicable parts of these Contract Documents.

3. QUALIFICATION OF CONTRACTORS

The prospective Bidders must meet the statutorily prescribed requirements before award of Contract by the CITY. Bidders must hold or obtain all licenses and/or certificates as required by the State and Local Statutes in order to bid and perform the work specified herein.

4. BIDDER'S UNDERSTANDING

Each Bidder must inform himself of the conditions relating to the execution of the work, and it is assumed that he will inspect the site and make himself thoroughly familiar with all the Contract Documents. Failure to do so will not relieve the successful Bidder of his obligation to enter into a Contract and complete the contemplated work in strict accordance with the Contract Documents. It shall be the Bidder's obligation to verify for himself and to his complete satisfaction all information concerning site and subsurface conditions.

The CITY will make available to prospective Bidders upon request and at the office of the Engineer, prior to bid opening, any information that he may have as to subsurface conditions and

surface topography at the worksite.

Each Bidder shall inform himself of, and the Bidder awarded a Contract shall comply with, federal, state, and local laws, statutes, and ordinances relative to the execution of the work. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, nondiscrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non-burning requirements, permits, fees, and similar subjects.

5. TYPE OF BID

A. LUMP SUM

The Bid for the work is to be submitted on a lump sum basis. Lump sum prices shall be submitted for all items of work set forth in the Proposal. All items required to complete the work specified but not included in the Proposal shall be considered incidental to those set forth in the Proposal.
The Bidder shall submit a Schedule of Values with the Proposal. It shall be broken down by trade and type of work and it shall be used as a basis for payment. Payment to the Contractor will be made on the measurement of the work actually performed by the Contractor as specified in the Contract Documents.

6. PREPARATION OF BIDS

A. GENERAL

All blank spaces in the BID form must be filled in, as required, preferably in BLACK ink. All price information shall be shown in both words and figures where required. No changes shall be made in the phraseology of the forms. Written amounts shall govern in case of discrepancy between the amounts stated in writing and the amounts stated in figures. In case of discrepancy between unit prices and extended totals, unit prices shall prevail.

Any BID shall be deemed informal which contains omissions, erasures, alterations, or additions of any kind, or prices uncalled for, or in which any of the prices are obviously unbalanced, or which in any manner shall fail to conform to the conditions of the published Invitation to Bid.

Only one BID from any individual, firm, partnership, or corporation, under the same or different names, will be considered. Should it appear to the CITY that any Bidder is interested in more than one Proposal for work contemplated; all Proposals in which such Bidder is interested will be rejected.

B. SIGNATURE

The Bidder shall sign his BID in the blank space provided therefore. If Bidder is a corporation, the legal name of the corporation shall be set forth above, together with the signature of the officer or officers authorized to sign Contracts on behalf of the

corporation. If Bidder is a partnership, the true name of the firm shall be set forth above, together with the signature of the partner or partners authorized to sign Contracts in behalf of the partnership. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a notarized power-of-attorney must be on file with the CITY prior to opening of Proposals or submitted with the Proposal, otherwise the Proposal will be regarded as not properly authorized.

C. SPECIAL BIDDING REQUIREMENTS

The Bidder's attention is brought to the hiring practices and licenses and permits of the City of Key West. These are defined in the addition to Article 39, ORDINANCES, PERMITS, AND LICENSES, as set forth in the Supplementary Conditions.

The Bidder shall submit with his Bid his experience record showing his experience and expertise in site construction and related work. Such experience record shall provide at least five current or recent projects of similar work, not more than 5 years old within the State Florida and preferably Monroe County. For each project the following information shall be provided:

1. Description and location of work.
2. Contract amount.
3. Dates work was performed.
4. Owner.
5. Name of Owner's contact person and phone number.
6. Engineer.
7. Name of Engineer's contact person and phone number.

The bidder shall submit with his bid a list of items to be performed by his own labor and that performed by subcontractors or others.

D. ATTACHMENTS

Bidder shall complete and submit the following forms with his bid:

Anti-Kickback Affidavit
Public Entity Crimes Form
Indemnification Form
Local Vender Form
City of Key West Business License Tax Receipt
Domestic Partnership Affidavit
Cone of Silence Affidavit

E. PUBLIC ENTITY CRIMES FORM

Pursuant to the requirements of Chapter 287.133, Laws of Florida, pertaining to the sworn statement on Public Entity Crimes and the Convicted Vendor List, all Bidders shall submit a signed and notarized statement with their Bid on the form provided herein.

7. STATE AND LOCAL SALES AND USE TAXES

Unless the Supplementary Conditions contains a statement that the CITY is exempt from state sales tax on materials incorporated into the work due to the qualification of the work under this Contract, the Contractor, as required by the laws and statutes of the state and its political subdivisions, shall pay all state and local sales and use taxes. Prices quoted in the Proposal shall include all nonexempt sales and use taxes, unless provision is made in the Proposal form to separately itemize the tax.

8. SUBMISSION OF BIDS

All BIDS must be submitted not later than the time prescribed, at the place, and in the manner set forth in the Invitation to Bid. BIDS must be made on the BID forms provided herewith, **submit one (1) ORIGINAL and one (1) COPY of bid package and two (2) FLASH DRIVES each containing a single PDF file of the entire bid package.**

Each BID must be submitted in a sealed envelope, so marked as to indicate the Bidder's name and its contents (project name and number) without being opened, and addressed in conformance with the instructions in the Invitation to Bid.

9. MODIFICATION OR WITHDRAWAL OF BIDS

Prior to the time and date designated for receipt of BIDS, any BID submitted may be withdrawn by notice to the party receiving BIDS at the place designated for receipt of BIDS. Such notice shall be in writing over the signature of the Bidder or by telegram. If by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of BID. No BID may be withdrawn after the time scheduled for opening of BIDS, unless the time specified in paragraph AWARD OF CONTRACT of these Instructions to Bidders shall have elapsed.

10. BID SECURITY

BIDS must be accompanied by cash, a certified check, or cashier's check drawn on a bank in good standing, or a bid bond issued by a Surety authorized to issue such bonds in the state where the work is located, in the amount of five (5) percent of the total amount of the Proposal submitted. This bid security shall be given as a guarantee that the Bidder will not withdraw his BID for a period of sixty (60) days after bid opening, and that if awarded the Contract, the successful Bidder will execute the attached Contract and furnish properly executed Performance and Payment Bonds, each in the full amount of the Contract price within the time specified. Agent and Surety phone numbers must be provided.

The Attorney-in-Fact who executes this bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond. Where State Statute requires, certification by a resident agent shall also be provided.

If the Bidder elects to furnish a Bid Bond, he shall use the Bid Bond form bound herewith, or one conforming substantially thereto in form and content.

11. RETURN OF BID SECURITY

Within 15 days after the award of the Contract, the CITY will return the bid securities to all Bidders who's BIDS are not to be further considered in awarding the Contract. Retained bid securities will be held until the Contract has been finally executed, after which all bid securities, other than Bidders' bonds and any guarantees, which have been forfeited, will be returned to the respective Bidders whose Proposals they accompanied.

12. AWARD OF CONTRACT

Within ninety (90) calendar days after the opening of Proposals, the CITY will accept one of the Proposals or will act in accordance with the following paragraphs. The acceptance of the Proposal will be by written notice of award, mailed to the office designated in the Proposal, or delivered to the Bidder's representative. In the event of failure of the lowest responsive, responsible Bidder to sign the Contract and provide an acceptable Performance Bond, Payment Bond, insurance certificate(s) and evidence of holding required licenses and certificates, the Owner may award the Contract to the next lowest responsive, responsible Bidder. Such award, if made, will be made within one hundred twenty (120) days after the opening of Proposals.

The CITY reserves the right to accept or reject any or all Proposals, and to waive any informalities and irregularities in said Proposals.

13. BASIS OF AWARD

The award will be made by the Owner on the basis of the BID from the lowest, responsive, responsible BIDDER which, in the Owner's sole and absolute judgment will best serve the interest of the Owner.

14. EXECUTION OF CONTRACT

The successful Bidder shall, within ten (10) working days after receiving Notice of Award, sign and deliver to the CITY an original Contract and two (2) copies in the form hereto attached, together with the insurance certificate examples of the bonds as required in the Contract Documents and evidence of holding required licenses and certificates. Within 10 working days after receiving the signed Contract from the successful Bidder, the City's authorized agent will sign the Contract. Signature by both parties constitutes execution of the Contract.

15. CONTRACT BONDS

A. PERFORMANCE AND PAYMENT BONDS

The successful Bidder shall file with the CITY, at the time of delivery of the signed Contract, a Performance Bond and Payment Bond on the form bound herewith, each in the full amount of the Contract price in accordance with the requirements of Florida Statutes Section 255.05 or 713.23, as applicable, as security for the faithful performance of the Contract and the payment of all persons supplying labor and materials for the construction of the work, and to cover all guarantees against defective workmanship or materials, or both, during the warranty period following the date of final acceptance of

the work by the CITY. The Surety furnishing this bond shall have a sound financial standing and a record of service satisfactory to the CITY, shall be authorized to do business in the State of Florida, and shall be listed on the current U.S. Department of Treasury Circular Number 570, or amendments thereto in the Federal Register, of acceptable Sureties for federal projects. The CONTRACTOR shall supply the OWNER with phone numbers, addresses, and contacts for the Surety and their agents. Pursuant to Section 255.05(7), Florida Statutes, in lieu of the bond required by law, the contractor may file with the city an alternative form of security in the form of cash, a money order, a certified check, a cashier's check or an irrevocable letter of credit.

B. POWER-OF-ATTORNEY

The Attorney-in-Fact (Resident Agent) who executes this Performance and Payment Bond in behalf of the Surety must attach a notarized copy of his power-of-attorney as evidence of his authority to bind the Surety on the date of execution of the bond.
All Contracts, Performance and Payment Bonds, and respective powers-of-attorney will have the same date.

16. FAILURE TO EXECUTE CONTRACT AND FURNISH BOND

The Bidder who has a Contract awarded to him and who fails to promptly and properly execute the Contract or furnish the required Bonds shall forfeit the bid security that accompanied his bid, and the bid security shall be retained as liquidated damages by the CITY, and it is agreed that this said sum is a fair estimate of the amount of damages the CITY will sustain in case the Bidder fails to enter into a Contract or furnish the required Bonds. Bid security deposited in the form of cash, a certified check, or cashier's check shall be subject to the same requirement as a Bid Bond.

17. TIME OF COMPLETION

The time of completion of the work to be performed under this Contract is the essence of the Contract. Delays and extensions of time may be allowed in accordance with the provisions stated in the General Conditions.

When the Contractor receives a Notice to Proceed, he shall commence work as soon as possible and shall complete all work within the number of calendar days stipulated in this Proposal.

The term of this contract will be **90** days.

* * * * * *

NOTE TO BIDDER: Use preferably BLACK ink for completing this Proposal form.

BID

To:	The City of Key West
Address:	3126 Flagler Street, Key West, Florida 33041
Project Title:	KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENT PROJECT PHASE I

Bidder's contact person for additional information on this Proposal:

Company Name: _____

Contact Name & Telephone #: _____

Email Address: _____

BIDDER'S DECLARATION AND UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein, that this Proposal is, in all respects, fair and without fraud, that it is made without collusion with any official of the Owner, and that the Proposal is made without any connection or collusion with any person submitting another Proposal on this Contract.

The Bidder further declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal.

CONTRACT EXECUTION AND BONDS

The Bidder agrees that if this Proposal is accepted, he will, within 10 days, not including Sundays and legal holidays, after Notice of Award, sign the Contract in the form annexed hereto, and will at that time, deliver to the Owner examples of the Performance Bond and Payment Bond required herein, and evidence of holding required licenses and certificates, and will, to the extent of his Proposal, furnish all machinery, tools, apparatus, and other means of construction and do the work and furnish all the materials necessary to complete all work as specified or indicated in the Contract Documents.

CERTIFICATES OF INSURANCE

Bidder agrees to furnish the Owner, before commencing the work under this Contract, the certificates of insurance as specified in these Documents.

All contractors and subcontractors wishing to perform work for the City of Key West, Florida, will be required to comply with the following minimum insurance requirements:

Commercial General Liability Limits:	$2,000,000 Aggregate $1,000,000 Each Occurrence $2,000,000 Products-Comp / Op Aggregate $1,000,000 Personal & Advertising Injury $300,000 Fire Damage / Legal

Coverage must include the following:

- Contractual Liability
- CG2010 (1185) or Equivalent
- No exclusion for XCU
- Products / Completed Operations
- Personal Injury
- Commercial Form
- Broad Form Property Damage
- Premises / Operations
- Independent Contractors (if any part of the work is to be subcontracted out)

Automobile Liability:	$1,000,000 Combined Single Limit (Include Hired & Non-Owned Liability)
Additional Umbrella Liability:	$2,000,000 Occurrence / Aggregate
Worker's Compensation:	Statutory
Employer's Liability:	$1,000,000 Each Accident $1,000,000 Disease-Policy Limit $1,000,000 Disease-Each Employee

The Contractor will be required to provide Builders Risk insurance for the completed value of the project.

The above reflects the minimum requirements for working with the City of Key West. Any requirements found in a particular job's contract that are of a higher standard will prevail.

The City of Key West must be named as an additional insured under all policies other than worker's compensation. Contractor's or subcontractor's general liability shall be written on a primary and non-contributory basis. Certificates of insurance must be accompanied by a copy of the additional insured endorsement (CG 20101185 or combination of CG20100704 and CG20370704 will be accepted).

Contractors and subcontractors must obtain an endorsement from their carrier that waives and relinquishes any right of subrogation against the City of Key West and its agents, representatives, employees, and affiliates they might possess for any policy of insurance provided under this requirement or under any state or federal worker's compensation or employer's liability act.

Contractor's policies must be endorsed to give no less than thirty (30) day notice to the City in the event of material change or cancellation.

The City of Key West must be given a certificate of insurance showing that the above requirements have been met. The certificate of insurance must remain current and must include copies of the requested endorsements (additional insured, cancellation notice, and waiver of subrogation) in order for the City to issue payments to the contractor or subcontractor.

START OF CONSTRUCTION AND CONTRACT COMPLETION TIME

The Bidder further agrees to begin work within 14 calendar days after the date of the Notice to proceed and to complete the project, in all respects within 90 calendar days after the date of the Notice to Proceed.

LIQUIDATED DAMAGES

In the event the Bidder is awarded the Contract and shall fail to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid to the Owner at the rate of $500.00 per day for all work awarded until the work has been satisfactorily completed as provided by the Contract Documents. Sundays and legal holidays shall be excluded in determining days in default.

ADDENDA

The Bidder hereby acknowledges that he has received Addenda No's. _____, _____,
_____, _____, _____, _____, _____, _____, _____, _____, _____, _____,
(Bidder shall insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that his Proposal(s) includes all impacts resulting from said addenda.

SALES AND USE TAXES

The Bidder agrees that all federal, state, and local sales and use taxes are included in the stated bid prices for the work.

LUMP SUM ITEMS

The Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on the following lump sum amounts. The Bidder agrees that the lump sum represent a true measure of the labor and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

The Bidder shall submit a Schedule of Values with the Bid. It shall be broken down by trade and type of work and it shall be used as a basis for payment.

1. Mobilization, Site Demo, General Conditions, and Demobilization

1 LS $_____

2. Ipe Decking (Includes all labor, equipment, foundations, wood framing & materials for a complete product)

1 LS $_____

3. Concrete Pavers (Includes all labor, equipment, concrete, foundation, stabilization, truncated domes, & materials for a complete product)

1 LS $_____

4. Storm Pipe (Includes all labor, equipment, bedding, foundation, stabilization & materials for a complete product)

1 LS $_____

5. Storm Inlets (Includes all labor, equipment, stabilization & materials for a complete product)

1 LS $_____

6. Concrete Walkways and curbing (Includes all labor, equipment, foundation, stabilization & materials for a complete product)

1 LS $_____

7. Concrete Loading Zone (Includes all labor, equipment, concrete, foundation, stabilization & materials for a complete product)

1 LS $_____

8. Miscellaneous items (signs, bike racks, etc.)

1 LS $_____

9. Site Lighting (Includes all labor, equipment, concrete, foundation, stabilization & materials for a complete product)

1 LS $_____

10. Landscaping (Includes all labor, equipment, & materials for a complete product)

1 LS $_____

11. Traffic Striping (Includes all labor, equipment, & materials for a complete product)

1 LS $_____

12. Irrigation System (Includes all labor, equipment & materials for a complete product)

1 LS $_____

13. Allowance (only to be used with owner's written directive, Permit Fees to be paid for through allowance)

1 LS $**38,000.00**

TOTAL OF ALL EXTENDED LINE ITEMS LISTED ABOVE:

Total of lump sum items 1 - 13 $_____

_____Dollars & _____Cents
(amount written in words)

NOTE: THE TOTAL BID WILL BE THE BASIS OF EVALUATING LOW BIDDER AND BASIS OF AWARD

The Bidder shall submit a Schedule of Values with the Bid. It shall be broken down by trade and type of work and it shall be used as a basis for payment. The Bidder will be considered non-responsive if Schedule of Values not included in Bid package.

Payment for materials and equipment authorized by the ENGINEER in a written Change Order but not listed in the above Bid will be provided at the suppliers invoice plus 10 %.

List items to be performed by CONTRACTOR's own forces and the estimated total cost of these items. (Use additional sheets if necessary.)

SUBCONTRACTORS

The Bidder further proposes that the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the work in the event that the Bidder is awarded the Contract:

_____
Name

_____, _____, _____, _____
Street City State Zip

Name

_____, _____, _____ ,_____
Street City State Zip

_____
Name

_____, _____, _____,_____
Street City State Zip

_____
Name

_____, _____, _____,_____
Street City State Zip

SURETY

_____ whose address is

_____, _____, _____, _____
Street City State Zip

BIDDER

The name of the Bidder submitting this Proposal is

_____ doing business at

_____, _____, _____, _____
Street City State Zip

which is the address to which all communications concerned with this Proposal and with the Contract shall be sent.

The names of the principal officers of the corporation submitting this Proposal, or of the partnership, or of all persons interested in this Proposal as principals are as follows:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

If Sole Proprietor or Partnership

IN WITNESS hereto the undersigned has set his (its) hand this _____ day of _____ 2015.

_____
Signature of Bidder

_____
Title

If Corporation

IN WITNESS WHEREOF the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this _____ day of _____ 2015.

(SEAL)

_____
Name of Corporation

By _____

Title _____

Attest_____
Secretary

EXPERIENCE OF BIDDER

The Bidder states that he is an experienced CONTRACTOR and has completed similar projects within the last 5 years.

(List similar projects, with types, names of OWNERs, construction costs, ENGINEERs, and references with phone numbers. Use additional sheets if necessary.)

_____

_____

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_____

****

FLORIDA BID BOND

BOND NO. _____

AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that _____

_____

hereinafter called the PRINCIPAL, and _____

_____

a corporation duly organized under the laws of the State of _____

having its principal place of business at _____

_____ in the State of _____,

and authorized to do business in the State of Florida, as SURETY, are held and firmly bound unto

_____

hereinafter called the OBLIGEE, in the sum of _____

DOLLARS ($_____) for the payment for which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these present.

THE CONDITION OF THIS BOND IS SUCH THAT:

WHEREAS, the PRINCIPAL is herewith submitting his or its Bid Proposal for Cemetery Mausoleums, said Bid Proposal, by reference thereto, being hereby made a part hereof.

WHEREAS, the PRINCIPAL contemplates submitting or has submitted a bid to the OBLIGEE for

the furnishing of all labor, materials (except those to be specifically furnished by the CITY), equipment, machinery, tools, apparatus, means of transportation for, and the performance of the work covered in the Proposal and the detailed Specifications, entitled:

KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS
PROJECT PHASE I

WHEREAS, it was a condition precedent to the submission of said bid that a cashier's check, certified check, or bid bond in the amount of 5 percent of the base bid be submitted with said bid as a guarantee that the Bidder would, if awarded the Contract, enter into a written Contract with the CITY for the performance of said Contract, within 10 working days after written notice having been given of the award of the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the PRINCIPAL within 10 consecutive calendar days after written notice of such acceptance, enters into a written Contract with the OBLIGEE and furnishes the Performance and Payment Bonds, each in an amount equal to 100 percent of the base bid, satisfactory to the CITY, then this obligation shall be void; otherwise the sum herein stated shall be due and payable to the OBLIGEE and the Surety herein agrees to pay said sum immediately upon demand of the OBLIGEE in good and lawful money of the United States of America, as liquidated damages for failure thereof of said PRINCIPAL.

Signed and sealed this _____ day of _____, 2015.

PRINCIPAL

By_____

_____
SURETY

By _____
Attorney-In-Fact

STATE OF _____)
: SS
COUNTY OF _____)

I, the undersigned hereby duly sworn, depose and say that no portion of the sum herein bid will be paid to any employees of the City of Key West as a commission, kickback, reward or gift, directly or indirectly by me or any member of my firm or by an officer of the corporation.

By: _____

Sworn and subscribed before me this _____day of _____, 2015.

NOTARY PUBLIC, State of _____at Large

My Commission Expires:

* * * * * *

ANTI – KICKBACK AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I, the undersigned hereby duly sworn, depose and say that no portion of the sum herein bid will be paid to any employees of the City of Key West as a commission, kickback, reward or gift, directly or indirectly by me or any member of my firm or by an officer of the corporation.

By: _____

Sworn and subscribed before me this _____day of _____, 2015.

NOTARY PUBLIC, State of _____ at Large

My Commission Expires:

* * * * * *

SWORN STATEMENT UNDER SECTION 287.133(3)(A)
FLORIDA STATUTES, ON **PUBLIC ENTITY CRIMES**

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted with Bid or Proposal for _____

   _____

2. This sworn statement is submitted by _____
   (name of entity submitting sworn statement)

   whose business address is _____

   _____

   and (if applicable) its Federal Employer Identification Number (FEIN) is _____

   _____

   (If the entity has no FEIN, include the Social Security Number of the individual

   signing this sworn statement _____

3. My name is _____
   (please print name of individual signing)

   and my relationship to the entity named above is _____

4. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including but not limited to, any bid or contract for goods or services to be provided to any public or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, material misrepresentation.

5. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(1)(b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication guilt, in any federal or state trial court of record relating to charges brought by indictment information after July 1, 1989, as a result of a jury verdict, nonjury trial, or entry of a plea of guilty or nolo contendere.

6. I understand that an "affiliate" as defined in Paragraph 287.133(1)(a), Florida Statutes, means

a. A predecessor or successor of a person convicted of a public entity crime; or

b. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm's length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.

7. I understand that a "person" as defined in Paragraph 287.133(1)(8), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies).

____Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND (Please indicate which additional statement applies.)

_____There has been a proceeding concerning the conviction before a hearing of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. (Please attach a copy of the final order.)

_____The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of

Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. (Please attach a copy of the final order.)

_____The person or affiliate has not been put on the convicted vendor list. (Please describe any action taken by or pending with the Department of General Services.)

_____
(signature)

_____
(date)

STATE OF_____

COUNTY OF_____

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

_____who, after first being sworn by me, affixed his/her
(name of individual signing)

signature in the space provided above on this_____day of _____ , 2015.

My commission expires:

_____
NOTARY PUBLIC

INDEMNIFICATION

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

CONTRACTOR: _____ SEAL:

_____
Address

_____
Signature

_____
Print Name

_____
Title

DATE: _____

LOCAL VENDOR CERTIFICATION PURSUANT TO CKW ORDINANCE 09-22 SECTION 2-798

The undersigned, as a duly authorized representative of the vendor listed herein, certifies to the best of his/her knowledge and belief, that the vendor meets the definition of a "Local Business." For purposes of this section, "local business" shall mean a business which:

a. Principle address as registered with the FL Department of State located within 30 miles of the boundaries of the city, listed with the chief licensing official as having a business tax receipt with its principle address within 30 miles of the boundaries of the city for at least one year immediately prior to the issuance of the solicitation.

b. Maintains a workforce of at least 50 percent of its employees from the city or within 30 miles of its boundaries.

c. Having paid all current license taxes and any other fees due the city at least 24 hours prior to the publication of the call for bids or request for proposals.

- Not a local vendor pursuant to Ordinance 09-22 Section 2-798
- Qualifies as a local vendor pursuant to Ordinance 09-22 Section 2-798

If you qualify, please complete the following in support of the self-certification & submit copies of your County and City business licenses. Failure to provide the information requested will result in denial of certification as a local business.

Business Name _____ Phone: _____

Current Local Address: _____ Fax: _____
(P.O Box numbers may not be used to establish status)

Length of time at this address: _____

_____ Date: _____
Signature of Authorized Representative

STATE OF _____ COUNTY OF _____

The foregoing instrument was acknowledged before me this _____ day of _____, 2015.

By _____, of _____
(Name of officer or agent, title of officer or agent) (Name of corporation acknowledging)

or has produced identification _____ as identification
(Type of identification)

_____
Signature of Notary

_____
Print, Type or Stamp Name of Notary

Return Completed form with
Supporting documents to:
City of Key West Purchasing

_____
Title or Rank

EQUAL BENEFITS FOR DOMESTIC PARTNERS AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I, the undersigned hereby duly sworn, depose and say that the firm of _____ provides benefits to domestic partners of its employees on the same basis as it provides benefits to employees' spouses per City of Key West Ordinance Sec. 2-799.

By: _____

Sworn and subscribed before me this

_____ day of _____, 2015.

_____
NOTARY PUBLIC, State of _____ at Large

My Commission Expires: _____

CONE OF SILENCE AFFIDAVIT

STATE OF _____)
: SS
COUNTY OF _____)

I the undersigned hereby duly sworn depose and say that all owner(s), partners, officers, directors, employees and agents representing the firm of _____ have read and understand the limitations and procedures regarding communications concerning City of Key West issued competitive solicitations pursuant to City of Key West Ordinance Section 2-773 Cone of Silence (attached).

Sworn and subscribed before me this

_____ Day of _____, 2015.

_____
NOTARY PUBLIC, State of _____ at Large

My Commission Expires: _____

BIDDER'S CHECKLIST

(Note: The purpose of this checklist is to serve as a reminder of major items to be addressed in submitting a bid and is not intended to be all inclusive. It does not alleviate the Bidder from the responsibility of becoming familiar with all aspects of the Contract Documents and proper completion and submission of his bid.)

1.	All Contract Documents thoroughly read and understood.	[ ]
2.	All blank spaces in Proposal filled in, using black ink.	[ ]
3.	Total and unit prices added correctly and attached Schedule of Values	[ ]
4.	Addenda acknowledged.	[ ]
5.	Subcontractors are named as indicated in the Proposal.	[ ]
6.	Experience record included.	[ ]
7.	Proposal signed by authorized officer.	[ ]
8.	Bid Bond completed and executed, including power-of-attorney dated the same date as Bid Bond.	[ ]
9.	Bidder familiar with federal, state, and local laws, ordinances, rules and regulations affecting performance of the work.	[ ]
10.	Bidder, if successful, able to obtain and/or demonstrate possession of required licenses and certificates within (10) ten calendar days after receiving a Notice of Award.	[ ]
11.	BID submitted intact with the volume entitled “Bidding Requirements” and “Contract Forms”, 1 original, 1 copy and 2 flash drives as stated in the invitation to bid.	[ ]
12.	Bid Documents submitted in sealed envelope and addressed and labeled in conformance with the instructions in the Invitation to Bid.	[ ]

PART 2

CONTRACT FORMS

CONTRACT

This Contract, made and entered into this _____ day of _____ 2015,

by and between the Caroline Street and Bahama Village Community Redevelopment Agency

(CRA), hereinafter called the "Owner", and_____

_____

hereinafter called the "Contractor";

WITNESSETH:

The Contractor, in consideration of the sum to be paid him by the Owner and of the covenants and agreements herein contained, hereby agrees at his own proper cost and expense to do all the work and furnish all the materials, tools, labor, and all appliances, machinery, and appurtenances for ITB #15-004 KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I, Key West, Florida to the extent of the Bid made by the Contractor, dated the day of_____ 2015, all in full compliance with the Contract Documents referred to herein.

The CONTRACT DOCUMENTS, including the signed copy of the PROPOSAL, CONTRACT FORMS, PERFORMANCE & PAYMENT BONDS AND SCOPE OF WORK.

In consideration of the performance of the work as set forth in these Contract Documents, the Owner agrees to pay to the Contractor the amount bid in the Proposal as adjusted in accordance with the Contract Documents, or as otherwise herein provided, and to make such payments in the manner and at the times provided in the Contract Documents.

The Contractor agrees to complete the work within ninety (90) days and to accept as full payment hereunder the amounts computed as determined by the Contract Documents and based on the said BID.

The Contractor agrees to remedy all defects appearing in the work or developing in the materials furnished and the workmanship performed under this Contract during the warranty period after the date of final acceptance of the work by the Owner, and further agrees to indemnify and save the Owner harmless from any costs encountered in remedying such defects.

It is agreed that the Contract, based upon the BID, shall be fully complete within the stated number of consecutive calendar days from the date the Notice to Proceed is issued.

In the event the Contractor fails to complete the work within the time limit or extended time limit agreed upon, as more particularly set forth in the Contract Documents, liquidated damages shall be paid at a rate of $500.00 per day. Sundays and legal holidays shall be included in determining days in default.

This contract will automatically expire upon completion of the project. Contractors warranty obligations remain in affect.

IN WITNESS WHEREOF, we, the parties hereto, each herewith subscribe the same this

_____ day of _____, A.D., 2015.

CITY OF KEY WEST

By_____

Title_____

CONTRACTOR

By_____

Title_____

* * * *

FLORDIA PERFORMANCE BOND

BOND NO._____

AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that in accordance with Florida Statutes Section

255.05 _____

with offices at _____
hereinafter called the CONTRACTOR (Principal), and

_____

with offices at_____
a corporation duly organized and existing under and by virtue of the laws of the State of Florida, hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto the **CITY OF KEY WEST,** hereinafter called the CITY (Obligee), in the sum of:

_____DOLLARS ($_____),
lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:
WHEREAS, the CONTRACTOR has executed and entered into a certain Contract hereto attached, with the CITY, dated _____, 2015, to furnish at his own cost, charges, and expense all the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the Contract Documents as defined therein, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein;

NOW THEREFORE, the conditions of this obligation are such that if the above bounden CONTRACTOR:

1. Shall in all respects comply with the terms and conditions of said Contract and his obligation there under, including the Contract Documents (which include the scope of work and conditions as prepared by the CITY, invitation to bid, instructions to bidders, the CONTRACTOR'S bid as accepted by the above CITY, the bid and contract performance and payment bonds, and all addenda, if any, issued prior to the opening of bids), being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying PRINCIPAL with labor, materials, or supplies, used directly or indirectly by PRINCIPAL in the prosecution of the work provided for in the contract; and

3. Pays CITY all losses, costs, expenses, damages, attorney's fees, including appellate proceedings, injury or loss of whatever kind and however arising including, without limitation, delay damages to which said CITY may be subject by reason of any wrongdoing, misconduct, want of care or skill, negligence, failure of performance, breach, failure to petition within the prescribed time, or default, including patent infringements, on the part of said CONTRACTOR, his agents or employees, in the execution or performance of said Contract; and

4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this obligation shall be void; otherwise, to remain in full force and effect for the term of said Contract.

AND, the said Surety for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract Documents, or to the work to be performed, or materials to be furnished there under shall affect said obligation of said Surety on this Bond, and the said Surety does hereby waive notice of any such changes, extension of time, alterations, or additions of the terms of the Contract Documents, or to the work.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

IN WITNESS WHEREOF, the above parties bonded together have executed this instrument

this _____ day of _____, 2015, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

CONTRACTOR

By: _____

(SEAL)

ATTEST

SURETY

By: _____

(SEAL)

ATTEST

FLORIDA PAYMENT BOND

BOND NO._____

AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that in accordance with Florida Statutes Section

255.05,_____

with offices at_____
hereinafter called the CONTRACTOR, (Principal), and

_____

with offices at _____

a corporation duly organized and existing under and by virtue of the laws of the State of _____

_____ , hereinafter called the SURETY, and authorized to transact business within the State of Florida, as SURETY, are held and firmly bound unto CITY OF KEY WEST**,** hereinafter called the City (Obligee), in the sum of:

_____DOLLARS(_____),
lawful money of the United States of America, for the payment of which, well and truly be made to the CITY, and the CONTRACTOR and the SURETY bind themselves and each of their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents as follows:

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT:

WHEREAS, the CONTRACTOR has executed and entered into a certain Contract for **ITB #15-004 KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I** Attached hereto, with the CITY, dated

_____, 2015, to furnish at his own cost, charges, and expense the necessary materials, equipment, and/or labor in strict and express accordance with said Contract and the plans, drawings (if any), and specifications prepared by the CITY, all of which is made a part of said Contract by certain terms and conditions in said Contract more particularly mentioned, which Contract, consisting of the various Contract Documents specifically mentioned herein and relative hereto, is made a part of this Bond as fully and completely as if said Contract Documents were set forth herein.

NOW THEREFORE, the conditions of this obligation are such that if the above bounden CONTRACTOR shall in all respects comply with the terms and conditions of said Contract and his obligation thereunder, including the Contract Documents ,which include Scope of work and conditions prepared by the CITY, invitation to bid, instructions to bidders, the

CONTRACTOR'S bid as accepted by the CITY, the bid and contract and payment bonds, and all addenda, if any, issued prior to the opening of bids), and further that if said CONTRACTOR shall promptly make payments to all persons supplying materials, equipment, and/or labor, used directly or indirectly by said CONTRACTOR or subcontractors in the prosecution of the work for said contract is accordance with Florida Statutes, Section 255.05 or Section 713.23, then this obligation shall be void; otherwise to remain in full force and effect for the term of said contract, including and all guarantee periods as specifically mentioned in said Contract Documents.

AND, the said SURETY for value received, hereby stipulates and agrees that no change involving any extension of time, or addition to the terms of the Contract or to the work to be performed, or materials to be furnished thereunder, or in the Contract Documents and specifications accompanying the said contract shall affect said obligation of said SURETY on this Bond, and the said SURETY does hereby waive notice of any such changes, extension of time, alternations, or additions of the terms of the Contract, or to the work, to the Contract Documents, or to the specifications.

Claimant shall give written notice to the CONTRACTOR and the SURETY as required by Section 255.05 or Section 713.23, Florida Statutes. Any action instituted against the CONTRACTOR or SURETY under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2) or Section 713.23, Florida Statutes.

IN WITNESS WHEREOF, the above parties bounded together have executed this instrument

this _____ day of _____, 2015, the name and corporate seal of each corporate party being hereto affixed and those presents duly signed by its undersigned representative, pursuant to authority of its governing body.

CONTRACTOR

By:_____

(SEAL)

ATTEST

SURETY

By:_____

(SEAL)

ATTEST

PART 3

CONDITIONS OF THE CONTRACT

GENERAL CONDITIONS
CONTENTS

Article

Article

60. LIQUIDATED DAMAGES
61. OTHER CONTRACTS
62. USE OF PREMISES
63. SUBSTANTIAL COMPLETION DATE
64. PERFORMANCE TESTING
65. OWNER'S USE OF PORTION OF THE WORK
66. CUTTING AND PATCHING
67. CLEANING UP

PAYMENT

68. CHANGE ORDERS
    - A. UNIT PRICE
    - B. LUMP SUM
    - C. COST REIMBURSEMENT WORK

69. PARTIAL PAYMENTS
    - A. GENERAL
    - B. ESTIMATE
    - C. DEDUCTION FROM ESTIMATE
    - D. QUALIFICATIONS FOR PARTIAL PAYMENT FOR MATERIALS DELIVERED
    - E. PAYMENT

70. CLAIMS FOR EXTRA WORK
71. RELEASE OF LIENS OR CLAIMS
72. FINAL PAYMENT
73. NO WAIVER OF RIGHTS
74. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

****

DEFINITIONS

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

1. AS APPROVED

The words "as approved", unless otherwise qualified, shall be understood to be followed by the words "by the ENGINEER for conformance with the Contract Document".

2. AS SHOWN, AND AS INDICATED

The words "as shown" and "as Indicated" shall be understood to be followed by the words "on the Drawings".

3. BIDDER

The person or persons, partnership, firm, or corporation submitting a Proposal for the work contemplated.

4. CONTRACT DOCUMENTS

The "Contract Documents" consist of the Bidding Requirements, Contract Forms, Conditions of the Contact, Specifications, Drawings, all modifications thereof incorporated into the Documents before their execution, Change Orders, and all other requirements incorporated by specific reference thereto. These form the Contract.

5. CONTRACTOR

The person or persons, partnership, firm, or corporation who enters into the Contract awarded him by the OWNER.

6. CONTRACT COMPLETION

The "Contract Completion" is the date the OWNER accepts the entire work as being in compliance with the Contract Documents, or formally waives nonconforming work to extent of nonconformity, and issues the final payment in accordance with the requirements set forth in Article, "Final Payment" of these General Conditions.

7. DAYS

Unless otherwise specifically stated, the term "days" will be understood to mean calendar days. Business day or working day means any day other than Saturday, Sunday, or legal holiday.

8. DRAWINGS

The term "Drawings" refers to the official Drawings, Profiles, cross sections, elevations, details, and other working drawings and supplementary drawings, or reproductions thereof, signed by the ENGINEER, which shows the location, character, dimensions, and details of the work to be performed. Drawings may either be bound in the same book as the balance of the Contract Documents, or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

9. ENGINEER

The person or organization identified as such in the Contract Documents. The Term "ENGINEER" means ENGINEER or his authorized representative.

10. NOTICE

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

11. OR EQUAL

The term "or equal" shall be understood to indicate that the "equal" Product is equivalent to or better than the Product named in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the Project design requirements will be made by the ENGINEER. Such equal Products shall not be purchased or installed by the CONTRACTOR without written authorization.

12. OWNER

The person, organization, or public body identified as such in the Contract Documents.

13. PLANS (See Drawings)

14. SPECIFICATIONS

The term "Specifications" refers to those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the work and certain

administrative details applicable thereto. Where standard specifications, such as those of ASTM, AASHTO, etc., have been referred to, the applicable portions of such standard specifications shall become a part of these Contract Documents. If referenced specifications conflict with specifications contained herein, the requirements contained herein shall prevail.

15. NOTICE TO PROCEED

A written notice given by the OWNER to the CONTRACTOR (with a copy to the ENGINEER) fixing the date on which the Contract time will commence to run and on which the CONTRACTOR shall start to perform his obligation under the Contract Documents. The Notice to Proceed will be given within 30 days following the execution of the Contract by the OWNER.

16. SUBSTANTIAL COMPLETION

"Substantial Completion" shall be that degree of completion of the Project or a defined portion of the Project, as evidenced by the ENGINEER's written notice of Substantial Completion, sufficient to Provide the OWNER, at his discretion, the full-time use of the Project or defined portion of the Project for the purposes for which it was intended. "Substantial Completion" of an operating facility shall be that degree of completion that has Provided a minimum of 7 continuous days of successful, trouble-free, operation, which period shall begin after all performance and acceptance testing has been successfully demonstrated to the ENGINEER. All equipment contained in the work, plus all other components necessary to enable the OWNER to operate the facility in a manner that was intended, shall be complete on the substantial completion date.

17. WORK

The word "work" within these Contract Documents shall include all material, labor, tools, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good Practice to Provide a complete and satisfactory system or structure. As used herein, "Provide" shall be understood to mean "furnish and install, complete in-place ".

CONTRACT DOCUMENTS

18. INTENT OF CONTRACT DOCUMENTS

The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all. The intent of the Documents is to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any work, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials, or equipment, such words shall be interpreted in accordance with that meaning.

Reference to standard specifications, manuals, or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect on the first published date of the Invitation to Bid, except as may be otherwise specifically stated. However, no Provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ENGINEER, or any ENGINEER's consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of Article LIMITATIONS ON ENGINEER'S RESPONSIBILITIES.

19. DISCREPANCIES AND OMISSIONS

Any discrepancies or omissions found in the Contract Documents shall be reported to the ENGINEER immediately. The ENGINEER will clarify discrepancies or omissions, in writing, within a reasonable time.

In resolving inconsistencies among two or more sections of the Contract Documents, Precedence shall be given in the following order:

A. CONTRACT
B. PROPOSAL
C. SUPPLEMENTARY CONDITIONS
D. INVITATION TO BID
E. INSTRUCTIONS TO BIDDERS
F. GENERAL CONDITIONS
G. SPECIFICATIONS
H. DRAWINGS

Addenda shall take Precedence over all sections referenced therein. Figure dimensions on Drawings shall take precedence over scale dimensions. Detailed Drawings shall take precedence over general Drawings.

20. CHANGES IN THE WORK

The OWNER, without notice to the Sureties and without invalidating the Contract, may order changes in the work

within the general scope of the Contract by altering, adding to, or deducting from the work, the Contract being adjusted accordingly. All such work shall be executed under the conditions of the original Contract, except as specifically adjusted at the time of ordering such change.

In giving instructions, the ENGINEER may order minor changes in the work not involving extra cost and not inconsistent with the purposes of the Project, but otherwise, except in an emergency endangering life and Property, additions or deductions from the work shall be performed only in pursuance of an approved Change Order from the OWNER, countersigned by the ENGINEER.

If the work is reduced by alterations, such action shall not constitute a claim for damages based on loss of anticipated Profits.

21. EXAMINATION AND VERIFICATION OF CONTRACT DOCUMENTS

The CONTRACTOR shall thoroughly examine and become familiar with all of the various parts of these Contract Documents and determine the nature and location of the work, the general and local conditions, and all other matters, which can in any way affect the work under this Contract. Failure to make an examination necessary for this determination shall not release the CONTRACTOR from the obligations of this Contract. No verbal agreement or conversation with any officer, agent, or employee of the OWNER or with the ENGINEER either before or after the execution of this Contract shall affect or modify any of the terms or obligations herein contained.

22. DOCUMENTS TO BE KEPT ON THE JOBSITE

The CONTRACTOR shall keep one copy of the Contract Documents on the job- site, in good order, available to the ENGINEER and to his representatives.

The CONTRACTOR shall maintain on a daily basis at the jobsite, and make available to the ENGINEER on request, one current record set of the Drawings which have been accurately marked to indicate all modifications in the completed work that differ from the design information shown on the Drawings. Upon Substantial completion of the work, the CONTRACTOR shall give the ENGINEER one complete set of these marked up record Drawings.

23. ADDITIONALCONTRACT DOCUMENTS

Copies of Contract Documents or Drawings may be obtained on request from the ENGINEER and by paying the actual cost of reproducing the Contract Documents or Drawings.

24. OWNERSHIP OF CONTRACT DOCUMENTS

All portions of the Contract Documents, and copies thereof furnished by the ENGINEER are instruments of service for this Project. They are not to be used on other work and are to be returned to the ENGINEER on request at the completion of the work. Any reuse of these materials without specific written verification or adaptation by the ENGINEER will be at the risk of the user and without liability or legal expense to the ENGINEER. Such user shall hold the ENGINEER harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adaptation shall entitle the ENGINEER to further compensation at rates to be agreed upon by the user and the ENGINEER.

THE ENGINEER

25. AUTHORITY OF THE ENGINEER

The ENGINEER will be the OWNER's representative during the construction period. His authority and responsibility will be limited to the Provisions set forth in these Contract Documents. The ENGINEER will have the Authority to reject work that does not conform to the Contract Documents. However, neither the ENGINEER's authority to act under this Provision, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, any SUBCONTRACTOR, their respective Sureties, any of their agents or employees, or any other person performing any of the work.

26. DUTIES AND RESPONSIBILITIES OF THE ENGINEER

The ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the Progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He will not make comprehensive or continuous review or observation to check quality or quantity of the work, and he will not be responsible for construction means, methods, techniques, sequences, or Procedures, or for safety Precautions and Programs in connection with the work. Visits and observations made by the ENGINEER shall not relieve the CONTRACTOR of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

The ENGINEER will make recommendations to the OWNER, in writing, on all claims of the OWNER or the CONTRACTOR arising from interpretation or execution of

the Contract Documents. Such recommendations will be of factual and/or technical nature, and will not include the legal interpretation of the Contract Documents. Any necessary legal interpretation of the Contract Document will be made by the OWNER. Such recommendation shall be necessary before the CONTRACTOR can receive additional money under the terms of the Contract. Changes in work ordered by the ENGINEER shall be made in compliance with Article CHANGES IN THE WORK.

One or more Project representatives may be assigned to observe the work. It is understood that such Project representatives shall have the authority to issue notice of nonconformance and make decisions within the limitations of the authority of the ENGINEER. The CONTRACTOR shall furnish all reasonable assistance required by the ENGINEER or Project representatives for Proper observation of the work. The above-mentioned Project representatives shall not relieve the CONTRACTOR of his obligations to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety Precautions, in conformance with the intent of the Contract.

27. LIMITATIONS ON ENGINEER'S RESPONSIBILITIES

ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences, or Procedures of construction, or the safety Precautions and Programs incident thereto, and ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the work in accordance with the Contract Documents.

ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any SUBCONTRACTOR, any supplier, or of any other person or organization performing or furnishing any of the work.

Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "Proper", or "satisfactory", or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the work or any duty or authority to undertake responsibility contrary to the Provisions of this Article.

28. REJECTED WORK

Any defective work or nonconforming materials or equipment that may be discovered at any time prior to expiration of the warranty period shall be removed and replaced by work which shall conform to the Provisions of the Contract Documents. Any material condemned or rejected shall be removed at once from the Project site.

Failure on the part of the ENGINEER to condemn or reject bad or inferior work or to note nonconforming materials or equipment on CONTRACTOR submittals shall not be construed to imply acceptance of such work. The OWNER shall reserve and retain all of its rights and remedies at law against the CONTRACTOR and its Surety for correction of any and all latent defects discovered after the guarantee period.

29. LINES AND GRADES

Lines and grades shall be established as provided in the supplementary conditions. All stakes, marks, and other reference information shall be carefully preserved by the CONTRACTOR, and in case of their careless or unnecessary destruction or removal by him or his employees, such stakes, marks, and other information shall be replaced at the CONTRACTOR's expense.

30. SUBMITTALS

After checking and verifying all field measurements and after complying with applicable Procedures specified in Division I, GENERAL REQUIREMENTS, CONTRACTOR shall submit to ENGINEER, in accordance with the schedule for submittals for review, shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment), which shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submittal. All submittals shall be identified as ENGINEER may require. The data shown shall be complete with respect to quantities, dimensions specified, performance and design criteria, materials, and similar data to enable ENGINEER to review the information. CONTRACTOR shall also submit to ENGINEER for review, with such Promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended.

Before submission of each submittal, CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements,

materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the work and the Contract Documents.

At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the submittal may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each shop drawing submitted to ENGINEER for review and approval of each variation.

ENGINEER will review submittals with reasonable Promptness, but ENGINEER's review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or Procedures of construction (except where a specific means, method, technique, sequence, or Procedure of construction is indicated in or required by the Contract Documents) or to safety Precautions or Programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of shop drawings and submit as required new samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on Previous submittals.

ENGINEER's review of submittals shall not relieve CONTRACTOR from the responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission and ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated therein or accompanying the shop drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the shop drawings or from responsibility for having complied with the Provisions herein.
Where a shop drawing or sample is required by the specifications, any related work performed Prior to ENGINEER's review and approval of the pertinent submission shall be at the sole expense and responsibility of the CONTRACTOR.

31. DETAIL DRAWINGS AND INSTRUCTIONS

The ENGINEER will furnish, with reasonable Promptness, additional instructions by means of Drawings or otherwise, if, in the ENGINEER's opinion, such are required for the Proper execution of the work. All such Drawings and instructions will be consistent with the Contract Documents, true developments thereof, and reasonably inferable there from.

THE CONTRACTOR AND HIS EMPLOYEES

32. CONTRACTOR, AN INDEPENDENT AGENT

The CONTRACTOR shall independently perform all work under this Contract and shall not be considered as an agent of the OWNER or of the ENGINEER, nor shall the CONTRACTOR's SUBCONTRACTORS or employees be subagents of the OWNER or of the ENGINEER.

32. (a) ASSIGNMENT OF CONTRACT

Assignment of any part or the whole of this Contract shall be subject to review and approval of the City Commission.

33. SUBCONTRACTING

Unless modified in the Supplementary Conditions, within 10 days after the execution of the Contract, the CONTRACTOR shall submit to the ENGINEER the names of all SUBCONTRACTORS Proposed for the work, including the names of any SUBCONTRACTORS that were submitted with the Proposal. The CONTRACTOR shall not employ any SUBCONTRACTORS to which the OWNER may object to as lacking capability to properly perform work of the type and scope anticipated.

The CONTRACTOR is as fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

Nothing contained in the Contract Documents shall create any contractual relationship between any SUBCONTRACTOR and the OWNER or ENGINEER.

34. INSURANCE AND LIABILITY

A. GENERAL

The CONTRACTOR shall provide (from insurance companies acceptable to the OWNER) the insurance coverage designated hereinafter and pay all costs before commencing work under this Contract. The CONTRACTOR shall furnish the OWNER with certificates of insurance specified herein showing the type, amount class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:

"The insurance covered by this certificate shall not be canceled or materially altered, except after 30 days' written notice has been received by the OWNER."

In case of the breach of any Provision of this Article, the OWNER, at his option, may take out and maintain, at the expense of the CONTRACTOR, such insurance as the OWNER may deem Proper and may deduct the cost of such insurance from any monies which may be due or become due the CONTRACTOR under this Contract.

B. CONTRACTOR AND SUBCONTRACTOR INSURANCE

The CONTRACTOR shall not commence work under this Contract until he has obtained all the insurance required hereunder and such insurance has been reviewed by the OWNER, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence work on his subcontract until insurance specified below has been obtained. Review of the insurance by the OWNER shall not relieve or decrease the liability of the CONTRACTOR hereunder.

C. COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

The CONTRACTOR shall maintain during the life of this Contract the statutory amount of Workmen's Compensation Insurance, in addition, Employer's Liability Insurance in an amount as specified in the Supplementary Conditions, for each occurrence, for all of his employees to be engaged in work on the Project under this Contract. In case any such work is subcontracted, the CONTRACTOR shall require the SUBCONTRACTOR to provide similar Workmen's Compensation and Employer's Liability Insurance for all of the SUBCONTRACTOR's employees to be engaged in such work.

D. GENERAL LIABILITY INSURANCE (INCLUDING AUTOMOBILE)

The CONTRACTOR shall maintain during the life of this Contract such general liability, completed operations and Products liability, and automobile liability insurance as will Provide coverage for claims for damages for personal injury, including accidental death, as well as for claims for Property damage, which may arise directly or indirectly from performance of the work under this Contract. The general liability policy shall include contractual liability assumed by the CONTRACTOR under Article **INDEMNITY.** Coverage for Property damage shall be on a "broad form" basis with no exclusions for "X, C & U". The amount of insurance to be provided shall be as specified in the Supplementary Conditions.

In the event any work under this Contract is performed by a SUBCONTRACTOR, the CONTRACTOR shall be responsible for any liability directly or indirectly arising out of the work performed by the SUBCONTRACTOR; to the extent such liability is not covered by the SUBCONTRACTOR's insurance.

The OWNER and ENGINEER, their officers, agents, and employees shall be named as Additional Insured's on the CONTRACTOR's and any SUBCONTRACTOR's general liability and automobile liability insurance policies for any claims arising out of work performed under this Contract.

E. BUILDERS RISK ALL RISK INSURANCE

Unless otherwise modified in the Supplementary Conditions, the CONTRACTOR shall secure and maintain during the life of this Contract, Builders Risk All Risk Insurance coverage in an amount equal to the full value of the facilities under construction. Such insurance shall include coverage for earthquake, landslide, flood, collapse, loss due to the results of faulty workmanship or design, and all other normally covered risks, and shall provide for losses to be paid to the CONTRACTOR, OWNER, and ENGINEER as their interests may appear.

The OWNER and ENGINEER, their officers, agents, and employees shall be named as additional insured's on the CONTRACTOR's and any SUBCONTRACTOR's Builders Risk All Risk insurance policies for any claims arising out of work performed under this Contract.

This insurance shall include a waiver of subrogation as to the ENGINEER, the OWNER, the CONTRACTOR, and their respective officers, agents, employees and SUBCONTRACTORS.

F. NO PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the Provisions hereof in exercising any authority granted by the Contract, there will be no personal liability upon any public official.

35. INDEMNITY

To the maximum extent permitted by law, the CONTRACTOR shall indemnify and defend the OWNER and the ENGINEER, and their officers, employees, agents, and sub-consultants, from all claims and losses, including attorney's fees and litigation costs arising out of Property losses or health, safety, personal injury, or death claims by the CONTRACTOR, its SUBCONTRACTORS of any tier, and their employees, agents, or invitees regardless of the fault, breach of Contract, or negligence of the OWNER or ENGINEER, excepting only such claims or losses that have been adjudicated to have been caused solely by the negligence of the OWNER or the ENGINEER and regardless of whether or not the CONTRACTOR is or can be named a party in a litigation.

36. EXCLUSION OF CONTRACTOR CLAIMS

In performing its obligations, the ENGINEER and its consultants may cause expense for the CONTRACTOR or its SUBCONTRACTORS and equipment or material suppliers. However, those parties and their sureties shall maintain no direct action against the ENGINEER, its officers, employees, agents, and consultants for any claim arising out of, in connection with, or resulting from the engineering services performed or required to be performed.

37. TAXES AND CHARGES

The CONTRACTOR shall withhold and pay any and all sales and use taxes and all withholding taxes, whether State or Federal, and pay all Social Security charges and also all State Unemployment Compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

38. REQUIREMENTS OF STATE LAW FOR PUBLIC WORKS PROJECTS

When the Contract Documents concern public works of the state or any county, municipality, or political subdivision created by its laws, the applicable statutes shall apply. All parties to this Contract shall determine the contents of all applicable statutes and comply with their Provisions throughout the performance of the Contract.

39. CODES, ORDINANCES, PERMITS AND LICENSES

The CONTRACTOR shall keep himself fully informed of all local codes and ordinances, as well as state and federal laws, which in any manner affect the work herein specified. The CONTRACTOR shall at all times comply with said codes and ordinances, laws, and regulations, and Protect and indemnify the OWNER, the ENGINEER and their respective employees, and its officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses and inspection fees necessary for Prosecution and completion of the work shall be secured and paid for by the CONTRACTOR, unless otherwise specified.

40. SUPERINTENDENCE

The CONTRACTOR shall keep at the project site, competent supervisory personnel. The CONTRACTOR shall designate, in writing, before starting work, a Project superintendent who shall be an employee of the CONTRACTOR and shall have complete authority to represent and to act for the CONTRACTOR. ENGINEER shall be notified in writing prior to any change in superintendent assignment. The CONTRACTOR shall give efficient supervision to the work, using his best skill and attention. The CONTRACTOR shall be solely responsible for all construction means, methods, techniques, and Procedures, and for providing adequate safety Precautions and coordinating all portions of the work under the Contract. It is specifically understood and agreed that the ENGINEER, its employees and agents, shall not have control or charge of and shall not be responsible for the construction means, methods, techniques, Procedures, or for providing adequate safety Precautions in connection with the work under Contract.

41. RECEPTION OF ENGINEER'S COMMUNICATIONS

The superintendent shall receive for the CONTRACTOR all communications from the ENGINEER. Communications of major importance will be confirmed in writing upon request from the CONTRACTOR.

The ENGINEER may schedule Project meetings for the purposes of discussing and resolving matters concerning the various elements of the work. Time and place for these meetings and the names of persons required to be Present shall be as determined by the ENGINEER. CONTRACTOR shall comply with these attendance requirements and shall also require his SUBCONTRACTORS to comply.

42. SAFETY

The CONTRACTOR shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees) and Property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety Provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. The CONTRACTOR's failure to thoroughly familiarize himself with the aforementioned safety Provisions shall not relieve him from compliance with the obligations and penalties set forth therein.

The CONTRACTOR shall develop and maintain for the duration of this Contract, a safety Program that will effectively incorporate and implement all required safety Provisions. The CONTRACTOR shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the safety Program. The duty of the ENGINEER to conduct construction review of the work does not include review or approval of the adequacy of the CONTRACTOR's safety Program, safety supervisor, or any safety measures taken in, on, or near the construction site. The CONTRACTOR, as a part of his safety Program, shall maintain at his office or other

well-known place at the jobsite, safety equipment applicable to the work as Prescribed by the aforementioned authorities, all articles necessary for giving first-aid to the injured, and shall establish the Procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the jobsite.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the ENGINEER and the OWNER. In addition, the CONTRACTOR must promptly report in writing to the ENGINEER all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses.

If a claim is made by anyone against the CONTRACTOR or any SUBCONTRACTOR on account of any accident, the CONTRACTOR shall promptly report the facts in writing to the ENGINEER, giving full details of the claim.

43. PROTECTION OF WORK AND PROPERTY

The CONTRACTOR shall at all times safely guard and Protect from damage the OWNER's Property, adjacent Property, and his own work from injury or loss in connection with this Contract. All facilities required for Protection by federal, state, or municipal laws and regulations and local conditions must be provided and maintained.

The CONTRACTOR shall Protect his work and materials from damage due to the nature of the work, the elements, carelessness of other CONTRACTORs, or from any cause whatever until the completion and acceptance of the work. All loss or damages arising out of the nature of the work to be done under these Contract Documents, or from any unforeseen obstruction or defects which may be encountered in the Prosecution of the work, or from the action of the elements, shall be sustained by the CONTRACTOR.

44. RESPONSIBILITY OF CONTRACTOR TO ACT IN AN EMERGENCY

In case of an emergency which threatens loss or injury of Property, and/or safety of life, the CONTRACTOR shall act, without previous instructions from the OWNER or ENGINEER, as the situation may warrant. The CONTRACTOR shall notify the ENGINEER thereof immediately thereafter. Any claim for compensation by the CONTRACTOR, together with substantiating documents in regard to expense, shall be submitted to the OWNER through the ENGINEER and the amount of compensation shall be determined by agreement.

45. MATERIALS AND APPLIANCES

Unless otherwise stipulated, the CONTRACTOR shall Provide and pay for all materials, labor, water, tools, equipment, heat, light, fuel, power, transportation, construction equipment and machinery, appliances, telephone, sanitary facilities, temporary facilities and other facilities and incidentals necessary for the execution and completion of the work.

Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The CONTRACTOR shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

In selecting and/or approving equipment for installation in the Project, the OWNER and ENGINEER assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable federal, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

46. CONTRACTORS' AND MANUFACTURERS' COMPLIANCE WITH STATE SAFETY, OSHA, AND OTHER CODE REQUIREMENTS

The completed work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items required by the state and federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the work subject to such safety regulations shall be fabricated, furnished, and installed (including OWNER-furnished equipment) in compliance with these requirements. CONTRACTORs and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. CONTRACTORs shall notify all equipment suppliers and SUBCONTRACTORS of the Provisions of this Article.

47. SUBSTITUTION OF MATERIALS

Except for OWNER-selected equipment items, and items where no substitution is clearly specified, whenever any material, article, device, Product, fixture, form, type of construction, or Process is indicated or specified by patent or Proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or Process desired. This Procedure

is not to be construed as eliminating from competition other Products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or equal". The CONTRACTOR may, in such cases, submit complete data to the ENGINEER for consideration of another material, type, or Process that shall be substantially equal in every respect to that so indicated or specified. Substitute materials shall not be used unless

approved in writing. The ENGINEER will be the sole judge of the substituted article or material.

48. TESTS, SAMPLES, AND OBSERVATIONS

The CONTRACTOR shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the ENGINEER. When required, the CONTRACTOR shall furnish certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory.

The OWNER, ENGINEER, and authorized government agents, and their representatives shall at all times be Provided safe access to the work wherever it is in Preparation or Progress, and the CONTRACTOR shall Provide facilities for such access and for observations, including maintenance of temporary and permanent access.

If the Specifications, laws, ordinances, or any public authority require any work, to be specially tested or approved, the CONTRACTOR shall give timely notice of its readiness for observations. If any work should be covered up without approval or consent of the ENGINEER, it shall, if required by the ENGINEER, be uncovered for examination at the CONTRACTOR's expense.
Reexamination of questioned work may be ordered by the ENGINEER, and, if so ordered, the work shall be uncovered by the CONTRACTOR. If such work is found to be in accordance with the Contract Documents, the OWNER will pay the cost of uncovering, exposure, observation, inspection, testing and reconstruction. If such work is found to be not in accordance with the Contract Documents, the CONTRACTOR shall correct the defective work, and the cost of reexamination and correction of the defective work shall be paid by the CONTRACTOR.

49. ROYALTIES AND PATENTS

The CONTRACTOR shall pay all royalty and licenses fees, unless otherwise specified. The CONTRACTOR shall defend all suits or claims for infringement of any patent rights and shall save the OWNER and the ENGINEER harmless from any and all loss, including reasonable attorneys' fees, on account thereof.

50. CONTRACTOR'S RIGHT TO TERMINATE CONTRACT

If the work should be stopped under an order of any court or other public authority for a period of more than 3 months, through no act or fault of the CONTRACTOR, its SUBCONTRACTORS, or respective employees or if the ENGINEER should fail to make recommendation for payment to the OWNER or return payment request to CONTRACTOR for revision within 30 days after it is due, or if the OWNER should fail to pay the CONTRACTOR within 30 days after time specified in Article PARTIAL PAYMENTS, any sum recommended by the ENGINEER, then the CONTRACTOR may, upon 15 days' written notice to the OWNER and the ENGINEER, stop work or terminate this Contract and recover from the OWNER payment for all acceptable work performed and reasonable termination expenses, unless said default has been remedied.

51. CORRECTION OF DEFECTIVE WORK DURING WARRANTY PERIOD

The CONTRACTOR hereby agrees to make, at his own expense, all repairs or replacements necessitated by defects in materials or workmanship, Provided under terms of this Contract, and pay for any damage to other works resulting from such defects, which become evident within 2 years after the date of final acceptance of the work or within 2 years after the date of substantial completion established by the ENGINEER for specified items of equipment, or within such longer period as may be Prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. Un-remedied defects identified for correction during the warranty period but remaining after its expiration shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the work to an extended warranty period of 2 years after the defect has been remedied.

The CONTRACTOR further assumes responsibility for a similar guarantee for all work and materials provided by SUBCONTRACTORS or manufacturers of packaged equipment components. The effective date for the start of the guarantee or warranty period for equipment qualifying as substantially complete is defined in Article SUBSTANTIAL COMPLETION, AND Article SUBSTANTIAL COMPLETION DATE, in these General Conditions.

The CONTRACTOR also agrees to hold the OWNER and the ENGINEER harmless from liability of any kind arising from damage due to said defects. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order for same from the OWNER. If the CONTRACTOR fails to make the repairs and replacements promptly, or in an emergency where delay would cause serious risk, or loss, or damage, the OWNER may have the defective work corrected or the rejected work removed and replaced, and the CONTRACTOR and his Surety shall be liable for the cost thereof.

PROGRESS OF THE WORK

52. BEGINNING OF THE WORK

Following execution of the Contract, the CONTRACTOR

shall meet with the OWNER and ENGINEER relative to his arrangements for prosecuting the work.

53. SCHEDULES AND PROGRESS REPORTS

Prior to starting the construction, the CONTRACTOR shall Prepare and submit to the ENGINEER, a Progress schedule showing the dates on which each part or division of the work is expected to be started and finished, and a Preliminary schedule for submittals. The Progress schedule for submittals shall be brought up to date and submitted to the ENGINEER at the end of each month or at such other times the ENGINEER may request.

The CONTRACTOR shall forward to the ENGINEER, at the end of each month, an itemized report of the delivery status of major and critical items of purchased equipment and material, including shop drawings and the status of shop and field fabricated work. These Progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery, and cause of delay, if any.

If the completion of any part of the work or the delivery of materials is behind the submitted Progress schedule, the CONTRACTOR shall submit in writing a plan acceptable to the OWNER and ENGINEER for bringing the work up to schedule.

The OWNER shall have the right to withhold Progress payments for the work if the CONTRACTOR fails to update and submit the Progress schedule and reports as specified.

54. PROSECUTION OF THE WORK

It is expressly understood and agreed that the time of beginning, rate of Progress, and time of completion of the work are the essence of this Contract. The work shall be prosecuted at such time, and in or on such part or parts of the Project as may be required, to complete the Project as contemplated in the Contract Documents and the Progress schedule.

If the CONTRACTOR desires to carry on work at night or outside the regular hours, he shall give timely notice to the ENGINEER to allow satisfactory arrangements to be made for observing the work in Progress.

55. OWNER'S RIGHT TO RETAIN IMPERFECT WORK

If any part or portion of the work completed under this Contract shall Prove defective and not in accordance with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, the OWNER shall have the right and authority to retain such work but will make such deductions in the final payment therefore as may be just and reasonable.

56. OWNER'S RIGHT TO DO WORK

Should the CONTRACTOR neglect to Prosecute the work in conformance with the Contract Documents or neglect or refuse at his own cost to remove and replace work rejected by the ENGINEER, then the OWNER may notify the Surety of the condition, and after 10 days' written notice to the CONTRACTOR and the Surety, or without notice if an emergency or danger to the work or public exists, and without Prejudice to any other right which the OWNER may have under Contract, or otherwise, take over that portion of the work which has been improperly or non timely executed, and make good the deficiencies and deduct the cost thereof from the payments then or thereafter due the CONTRACTOR.

57. OWNER'S RIGHT TO TRANSFER EMPLOYMENT

If the CONTRACTOR should abandon the work or if he should persistently or repeatedly refuse or should fail to make prompt payment to SUBCONTRACTORS for material or labor, or to persistently disregard laws, ordinances, or to prosecute the work in conformance with the Contract Documents, or otherwise be guilty of a substantial violation of any Provision of the Contract or any laws or ordinance, then the OWNER may, without Prejudice to any other right or remedy, and after giving the CONTRACTOR and Surety 10 days' written notice, transfer the employment for said work from the CONTRACTOR to the Surety. Upon receipt of such notice, such Surety shall enter upon the Premises and take possession of all materials, tools, and appliances thereon for the purpose of completing the work included under this contract and employ by Contract or otherwise, any qualified person or persons to finish the work and Provide the materials therefore, in accordance with the Contract Documents, without termination of the continuing full force and effect of this contract. In case of such transfer of employment to such Surety, the Surety shall be paid in its own name on estimates according to the terms hereof without any right of the CONTRACTOR to make any claim for the same or any part thereof.

If, after the furnishing of said written notice to the Surety, the CONTRACTOR and the Surety still fail to make reasonable Progress on the performance of the work, the OWNER may terminate the employment of the CONTRACTOR and take possession of the Premises and of all materials, tools, and appliances thereon and finish the work by whatever method he may deem expedient and charge the cost thereof to the CONTRACTOR and the Surety. In such case, the CONTRACTOR shall not be entitled to receive any further

payment until the work is finished. If the expense of completing the Contract, including compensation for additional managerial and administrative services, shall exceed such unpaid balance, the CONTRACTOR and the Surety shall pay the difference to the OWNER.

58. DELAYS AND EXTENSION OF TIME

If the CONTRACTOR is delayed in the Progress of the work by any act or neglect of the OWNER or the ENGINEER, or by any separate CONTRACTOR employed by the OWNER, or by strikes, lockouts, fire, adverse weather conditions not reasonably anticipated, or acts of Nature, and if the CONTRACTOR, within 48 hours of the start of the occurrence, gives written notice to the OWNER of the cause of the potential delay and estimate of the possible time extension involved, and within 10 days after the cause of the delay has been remedied, the CONTRACTOR gives written notice to the OWNER of any actual time extension requested as a result of the aforementioned occurrence, then the Contract time may be extended by change order for such reasonable time as the ENGINEER determines. It is agreed that no claim shall be made or allowed for any damages, loss, or expense which may arise out of any delay caused by the above referenced acts or occurrences other than claims for the appropriate extension of time. No extension of time will be granted to the CONTRACTOR for delays occurring to parts of the work that have no measurable impact on the completion of the total work under this Contract. No extension of time will be considered for weather conditions reasonably anticipated for the area in which the work is being performed. Reasonably anticipated weather conditions will be based on official records of monthly Precipitation and other historical data. Adverse weather conditions, if determined to be of a severity that would impact Progress of the work, may be considered as cause for an extension of Contract completion time.

Delays in delivery of equipment or material purchased by the CONTRACTOR or his SUBCONTRACTORS, including OWNER-selected equipment shall not be considered as a just cause for delay, unless the OWNER determines that for good cause the delay is beyond the control of the CONTRACTOR. The CONTRACTOR shall be fully responsible for the timely ordering, scheduling, complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs, which may be accrued by the OWNER after the expiration of the time of completion. It is expressly under- stood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the CONTRACTOR or Surety.

59. DIFFERING SITE CONDITIONS

The CONTRACTOR shall promptly, and before the conditions are disturbed, give a written notice to the OWNER and ENGINEER of:

A. subsurface or latent physical conditions at the site which differ materially from those indicated in this contract,

B. unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The ENGINEER will investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or the time required for, performing any part of the work under this Contract, whether or not changed as a result of the conditions, and equitable adjustment shall be made under this Article and the Contract modified in writing accordingly.

No request by the CONTRACTOR for an equitable adjustment to the Contract under this Article will be allowed, unless the CONTRACTOR has given the written notice required; Provided that the time prescribed above for giving written notice may be extended by the OWNER.

No request by the CONTRACTOR for an equitable adjustment to the Contract for differing site conditions will be allowed if made after final payment under this Contract.

60. LIQUIDATED DAMAGES

Should the CONTRACTOR fail to complete the work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as Provided in the Contract, the CONTRACTOR shall reimburse the OWNER for the additional expense and damage for each calendar day, Sundays and legal holidays included, that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per-diem rate, as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the OWNER after the expiration of the time of completion. It is expressly under- stood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the CONTRACTOR. The OWNER shall have the right to deduct such damages from any amount due, or that may become due the CONTRACTOR, or the amount of such damages shall be due and collectible from the

CONTRACTOR or Surety.

61. OTHER CONTRACTS

The OWNER reserves the right to let other Contracts in connection with the work. The CONTRACTOR shall afford other CONTRACTORs reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

If any part of the work under this Contract depends for Proper execution or results upon the work of any other CONTRACTOR, utility service company or OWNER, the CONTRACTOR shall inspect and Promptly report to the ENGINEER in writing any patent or apparent defects to deficiencies in such work that render it unsuitable for such Proper execution and results. The CONTRACTOR's failure to so report shall constitute and acceptance of the work by others as being fit and Proper for integration with work under this Contract, except for latent or non apparent defects and deficiencies in the work.

62. USE OF PREMISES

The CONTRACTOR shall confine his equipment, the storage of materials and the operation of his workers to limits shown on the Drawings or indicated by law, ordinances, permits, or directions of the ENGINEER, and shall not unreasonably encumber the Premises with his materials. The CONTRACTOR shall provide, at his own expense, the necessary rights-of-way and access to the work, which may be required outside the limits of the OWNER's Property and shall furnish the ENGINEER copies of permits and agreements for use of the Property outside that provided by the OWNER.

The CONTRACTOR shall not load nor permit any part of the structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the work or adjacent Property to stresses or Pressures that will endanger it.

63. SUBSTANTIAL COMPLETION DATE

The ENGINEER may issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees, and to establish the date that the OWNER will assume the responsibility for the cost of operating such equipment. Said notice shall not be considered as final acceptance of any portion of the work or relieve the CONTRACTOR from completing the remaining work within the specified time and in full compliance with the Contract Documents. See SUBSTANTIAL COMPLETION under DEFINITIONS of these General Conditions.

64. PERFORMANCE TESTING

Operating equipment and systems shall be performance tested in the Presence of the ENGINEER to demonstrate compliance with the specified requirements. Performance testing shall be conducted under the specified design operating conditions or under such simulated operating conditions as recommended or approved by the ENGINEER. Schedule such testing with the ENGINEER at least one week in advance of the planned date for testing.

65. OWNER'S USE OF PORTIONS OF THE WORK

Following issuance of the written notice of Substantial Completion, the OWNER may initiate operation of the facility. Such use shall not be considered as final acceptance of any portion of the work, nor shall such use be considered as cause for an extension of the Contract completion time, unless authorized by a Change Order issued by the OWNER.

66. CUTTING AND PATCHING

The CONTRACTOR shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together Properly and fit it to receive or be received by work of other CONTRACTORs shown upon or reasonably implied by the Drawings.

67. CLEANING UP

The CONTRACTOR shall, at all times, keep Property on which work is in Progress and the adjacent Property free from accumulations of waste material or rubbish caused by employees or by the work. Upon completion of the construction, the CONTRACTOR shall remove all temporary structures, rubbish, and waste materials resulting from his operations.

PAYMENT

68. PAYMENT FOR CHANGE ORDERS

The OWNER's request for quotations on alterations to the work shall not be considered authorization to proceed with the work expediting, delivery, and installation of all equipment and materials. Within a reasonable period after the CONTRACTOR submits to the OWNER a written request for an extension of time, the ENGINEER will Present his written opinion to the OWNER as to whether an extension of time is justified, and, if so, his recommendation as to the number of days for time extension. The OWNER will make the final decision on all requests for extension of time.

Prior to the issuance of a formal Change Order, nor shall such request justify any delay in existing work. Quotations for

alterations to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and profit. OWNER may require detailed cost data in order to substantiate the reasonableness of the proposed costs.

Any compensation paid in conjunction with the terms of a Change Order shall comprise total compensation due the CONTRACTOR for the work or alteration defined in the Change Order. By signing the Change Order, the CONTRACTOR acknowledges that the stipulated compensation includes payment for the work or alteration plus all payment for the interruption of schedules, extended overhead, delay, or any other impact claim or ripple effect, and by such signing specifically waives any reservation or claim for additional compensation in respect to the subject Change Order.

At the OWNER's option, payment or credit for any alterations covered by a Change Order shall be determined by one or a combination of the methods set forth in A, B, or C below, as applicable:

A. UNIT PRICES

Those unit Prices stipulated in the Proposal shall be utilized where they are applicable. In the event the Change Order results in a change in the original quantity that is materially and significantly different from the original bid quantity, a new unit Price shall be negotiated upon demand of either party. Unit Prices for new items included in the Change Order shall be negotiated and mutually agreed upon.

B. LUMP SUM

A total lump sum for the work negotiated and mutually acceptable to the CONTRACTOR and the OWNER. Lump sum quotations for modifications to the work shall include substantiating documentation with an itemized breakdown of CONTRACTOR and SUBCONTRACTOR costs, including labor, material, rentals, approved services, overhead, and Profit, all calculated as specified under "C" below.

C. COST REIMBURSEMENT WORK

The term "cost reimbursement" shall be understood to mean that payment for the work will be made on a time and expense basis, that is, on an accounting of the CONTRACTOR's forces, materials, equipment, and other items of cost as required and used to do the work.

If the method of payment cannot be agreed upon Prior to the beginning of the work, and the OWNER directs by written Change Order that the work be done on a cost reimbursement basis, then the CONTRACTOR shall furnish labor, and furnish and install equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual cost of the following:

1. Labor including foremen for those hours they are assigned and participating in the cost reimbursement work (actual payroll cost, including wages, fringe benefits as established by negotiated labor agreements, labor insurance, and labor taxes as established by law). No other fixed labor burdens will be considered, unless approved in writing by the OWNER.
2. Material delivered and used on the designated work, including sales tax, if paid by the CONTRACTOR or his SUBCONTRACTOR.
3. Rental or equivalent rental cost of equipment, including necessary transportation for items having a value in excess of $100. Rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances shall not exceed the current rental rates prevailing in the locality. The rentals allowed for equipment will, in all cases, be understood to cover all fuel, supplies, repairs, and renewals, and no further allowances will be made for those items, unless specific agreement to that effect is made.
4. Additional bond, as required and approved by the OWNER.
5. Additional insurance (other than labor insurance) as required and approved by the OWNER.

In addition to items 1 through 5 above, an added fixed fee for general overhead and Profit shall be negotiated and allowed for the CONTRACTOR (or approved SUBCONTRACTOR) actually executing the Cost Reimbursement work.

An additional fixed fee shall be negotiated and allowed the CONTRACTOR for the administrative handling of portions of the work that are executed by an approved SUBCONTRACTOR. No additional fixed fee will be allowed for the administrative handling of work executed by a SUBCONTRACTOR of a SUBCONTRACTOR, unless by written permission from the OWNER.

The added fixed fees shall be considered to be full compensation, covering the cost of general supervision, overhead, Profit, and any other general expense. The CONTRACTOR's records shall make clear distinction between the direct costs of work paid for on a cost reimbursement basis and the costs of other work. The CONTRACTOR shall furnish the ENGINEER report sheets in duplicate of each day's cost reimbursement work no later than the working day following the performance of said work. The daily report sheets shall itemize the materials used, and shall

cover the direct cost of labor and the charges for equipment rental, whether furnished by the CONTRACTOR, SUBCONTRACTOR or other forces. The daily report sheets shall provide names or identifications and classifications of workers, the hourly rate of pay and hours worked, and also the size, type, and identification number of equipment and hours operated.

Material charges shall be substantiated by valid copies of vendors' invoices. Such invoices shall be submitted with the daily report sheets, or, if not available, they shall be submitted with subsequent daily report sheets. Said daily report sheets shall be signed by the CONTRACTOR or his authorized agent.

The OWNER reserves the right to furnish such materials and equipment as he deems expedient and the CONTRACTOR shall have no claim for profit or added fees on the cost of such materials and equipment. To receive partial payments and final payment for cost reimbursement work, the CONTRACTOR shall submit to the ENGINEER, detailed and complete documented verification of the CONTRACTOR's and any of his SUBCONTRACTORS' actual costs involved in the cost reimbursement work. Such costs shall be submitted within 30 days after said work has been performed.

69. PARTIAL PAYMENTS

A. GENERAL

Nothing in this Article shall be construed to affect the right, hereby reserved, to reject the whole or any part of the aforesaid work, should such work be later found not to comply with the Provisions of the Contract Documents. All estimated quantities of work for which partial payments have been made are subject to review and correction on the final estimate. Payment by the OWNER and acceptance by the CONTRACTOR of partial payments based on periodic estimates of quantities of work performed shall not, in any way, constitute acceptance of the estimated quantities used as a basis for computing the amounts of the partial payments.

B. ESTIMATE

At least 30 days before each Progress payment falls due, as specified in the Supplementary Conditions, the CONTRACTOR shall submit to the ENGINEER a detailed estimate of the amount earned during the Preceding month for the separate portions of the work, and request payment. As used in this Article, the words "amount earned" means the value, on the date of the estimate for partial payment, of the work completed in accordance with the Contract Documents, and the value of approved materials delivered to the Project site suitable stored and Protected Prior to incorporation into the work.

ENGINEER will, within 7 days after receipt of each request for payment, either indicate in writing a recommendation of payment and present the request to OWNER, or return the request to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may, within 7 days, make the necessary corrections and resubmit the request.

ENGINEER may refuse to recommend the whole or any part of any payment if, in his opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such an extent as may be necessary in ENGINEER's opinion to protect the OWNER from loss because:

1. The work is defective, or completed work has been damaged requiring correction or replacement;

2. Written claims have been made against OWNER or Liens have been filed in connection with the work;

3. The Contract Price has been reduced because of Change Orders;

4. OWNER has been required to correct defective work or complete the work in accordance with Article OWNER'S RIGHT TO DO WORK;

5. Of CONTRACTOR's unsatisfactory Prosecution of the work in accordance with the Contract Documents; or

6. CONTRACTOR's failure to make payment to SUBCONTRACTORS or for labor, materials, or equipment.

C. DEDUCTION FROM ESTIMATE

Unless modified in the Supplementary Conditions,
deductions from the estimate will be as described below:

1. The OWNER will deduct from the estimate, and retain as part security, 10 percent of the amount earned for work satisfactorily completed. A deduction and retainage of 10 percent will be made on the estimated amount earned for approved items of material delivered to and properly stored at the jobsite but not incorporated into the work. When the work is 50 percent complete, the OWNER may reduce the retainage to 5 percent of the dollar value of all work satisfactorily completed to date provided the CONTRACTOR is making satisfactory progress and there is no specific cause for a greater retainage.

The OWNER may reinstate the retainage up to 10 percent if the OWNER determines, at his discretion, that the CONTRACTOR is not making satisfactory progress or where there is other specific cause for such withholding.

D. QUALIFICATION FOR PARTIAL PAYMENT FOR MATERIALS DELIVERED

Unless modified in the Supplementary Conditions, qualification for partial payment for materials delivered but not yet incorporated into the work shall be as described below:

1. Materials, as used herein, shall be considered to be those items which are fabricated and manufactured material and equipment. No consideration shall be given to individual purchases of less than $200 for any one item.

2. To receive partial payment for materials delivered to the site, but not incorporated in the work, it shall be necessary for the CONTRACTOR to include a list of such materials on the Partial Payment Request. At his sole discretion, the ENGINEER may approve items for which partial payment is to be made. Partial payment shall be based on the CONTRACTOR's actual cost for the materials as evidenced by invoices from the supplier. Proper storage and Protection shall be provided by the CONTRACTOR, and as approved by the ENGINEER. Final payment shall be made only for materials actually incorporated in the work and, upon acceptance of the work, all materials remaining for which advance payments had been made shall revert to the CONTRACTOR, unless otherwise agreed, and partial payments made for these items shall be deducted from the final payment for the work.

3. CONTRACTOR warrants and guarantees that title to all work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER at the time of payment free and clear of all liens, claims, security interests, and encumbrances.

4. If requested by the ENGINEER, the CONTRACTOR shall provide, with subsequent pay requests, invoices receipted by the supplier showing payment in full has been made.

E. PAYMENT

After deducting the retainage and the amount of all previous partial payments made to the CONTRACTOR from the amount earned, the amount due will be made payable to the CONTRACTOR. Recommendations for payment received by the OWNER less than 9 days Prior to the scheduled day for payment will not be Processed or paid until the following month.

70. CLAIMS FOR EXTRA WORK

In any case where the CONTRACTOR deems additional time or compensation will become due him under this Contract for circumstances other than those defined in Article DELAYS AND EXTENSION OF TIME, the CONTRACTOR shall notify the ENGINEER, in writing, of his intention to make claim for such time or compensation before he begins the work on which he bases the claim, in order that such matters may be settled, if possible, or other appropriate action taken. The notice of claim shall be in duplicate, in writing, and shall state the circumstances and the reasons for the claim, but need not state the amount. If such notification is not given or if the ENGINEER is not afforded proper facilities by the CONTRACTOR for keeping strict account of actual cost, then the CONTRACTOR hereby agrees to waive the claim for such additional time or compensation. Such notice by the CONTRACTOR, and fact that the ENGINEER has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim.

No extension of time will be granted to the CONTRACTOR for delays resulting from extra work that have no measurable impact on the completion of the total work under this Contract. Claims for additional time or compensation shall be made in itemized detail and submitted, in writing, to the OWNER and ENGINEER within 10 days following completion of that portion of the work for which the CONTRACTOR bases his claim. Failure to make the claim for additional compensation in the manner and within the time specified above shall constitute waiver of that claim. In case the claim is found to be just, it shall be allowed and paid for as provided in Article PAYMENT FOR CHANGE ORDERS.

71. RELEASE OF LIENS OR CLAIMS

The CONTRACTOR shall indemnify and hold harmless the OWNER from all claims for labor and materials furnished under this Contract. Prior to the final payment, the CONTRACTOR shall furnish to the OWNER, as part of his final payment request, a certification that all of the CONTRACTOR's obligations on the project have been satisfied and that all monetary claims and indebtedness have been paid. The CONTRACTOR shall furnish complete and legal effective releases or waivers, satisfactory to the OWNER, of all liens arising out of or filed in connection with the work.

72. FINAL PAYMENT

Upon completion of all the work under this Contract, the CONTRACTOR shall notify the ENGINEER, in writing, that

he has completed his part of the Contract and shall request final payment. Upon receipt of such notice the ENGINEER will inspect and, if acceptable, submit to the OWNER his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the CONTRACTOR. Upon approval of this final estimate by the OWNER and compliance by the CONTRACTOR with Provisions in Article **RELEASE OF LIENS OR CLAIMS,** and other Provisions as may be applicable, the OWNER shall pay to the CONTRACTOR all monies due him under the Provisions of these Contract Documents.

73. NO WAIVER OF RIGHTS

Neither the inspection by the OWNER, through the ENGINEER or any of his employees, nor any order by the OWNER for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the OWNER or ENGINEER, nor any extension of time, nor any possession taken by the OWNER or its employees, shall operate as a waiver of any Provision of this Contract, or any power herein reserved to the OWNER, or any right to damages herein Provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regards to latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the OWNER's rights under the warranty.

74. ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the CONTRACTOR of the final payment shall release the OWNER and the ENGINEER, as representatives of the OWNER, from all claims and all liability to the CONTRACTOR for all things done or furnished in connection with the work, and every act of the OWNER and others relating to or arising out of the work except claims Previously made in writing and still unsettled. No payment, however, final or otherwise, shall operate to release the CONTRACTOR or his Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds and warranties, as herein provide

SUPPLEMENTARY CONDITIONS

The General Conditions are hereby revised as follows:

ARTICLE 9 "ENGINEER"

Delete Article "ENGINEER" in its entirety and substitute the following:

The person or organization identified as such in the Contract Documents. The Term "ENGINEER" means ARCHITECT or his authorized representative.

ARTICLE 34 "INSURANCE & LIABILITY"

Contractor shall maintain limits no less than those stated below:

CONTRACTOR is to secure, pay for, and file with the City of Key West, prior to commencing any work under the Contract, all certificates for workers' compensation, public liability, and property damage liability insurance, and such other insurance coverages as may be required by specifications and addenda thereto, in at least the following minimum amounts with specification amounts to prevail if greater than minimum amounts indicated. Notwithstanding any other provision of the Contract, the CONTRACTOR shall provide the minimum limits of liability insurance coverage as follows:

Auto Liability	$1,000,000	Combined Single Limit
General Liability	$2,000,000	Aggregate (Per Project)
	$2,000,000	Products Aggregate
	$1,000,000	Any One Occurrence
	$1,000,000	Personal Injury
	$ 300,000	Fire Damage/Legal
Additional Umbrella Liability	$2,000,000	Occurrence / Aggregate

CONTRACTOR shall furnish an original Certificate of Insurance indicating, and such policy providing coverage to, City of Key West named as an additional insured on a PRIMARY and NON CONTRIBUTORY basis utilizing an ISO standard endorsement at least as broad as CG 2010 (11/85) or its equivalent, (combination of CG 20 10 07 04 and CG 20 37 07 04, providing coverage for completed operations, is acceptable) including a waiver of subrogation clause in favor of City of Key West on all policies. CONTRACTOR will maintain the General Liability and Umbrella Liability insurance coverages summarized above with coverage continuing in full force including the additional insured endorsement until at least 3 years beyond completion and delivery of the work contracted herein.

Notwithstanding any other provision of the Contract, the CONTRACTOR shall maintain complete workers' compensation coverage for each and every employee, principal, officer, representative, or agent of the CONTRACTOR who is performing any labor, services, or material under the Contract. Further, CONTRACTOR shall additionally maintain the following minimum limits of coverage:

Bodily Injury Each Accident	$1,000,000
Bodily Injury by Disease Each Employee	$1,000,000
Bodily Injury by Disease Policy Limit	$1,000,000

If the work is being done on or near a navigable waterway, CONTRACTOR's workers compensation policy shall be endorsed to provide USL&H Act (WC 00 01 06 A) and Jones Act (WC 00 02 01 A) coverage if specified by the City of Key West. CONTRACTOR shall provide the City of Key West with a Certificate of Insurance verifying compliance with the workman's compensation coverage as set forth herein and shall provide as often as required by the City of Key West such certification which shall also show the insurance company, policy number, effective and expiration date, and the limits of workman's compensation coverage under each policy.

CONTRACTOR's insurance policies shall be endorsed to give 30 days written notice to the City of Key West in the event of cancellation or material change, using form CG 02 24, or its equivalent.

Certificates of Insurance submitted to the City of Key West will not be accepted without copies of the endorsements being requested. This includes additional insured endorsements, cancellation/material change notice endorsements, and waivers of subrogation. Copies of USL&H Act and Jones Act endorsements will also be required if necessary. PLEASE ADVISE YOUR INSURANCE AGENT ACCORDINGLY.

CONTRACTOR will comply with any and all safety regulations required by any agency or regulatory body including but not limited to OSHA. CONTRACTOR will notify City of Key West immediately by telephone at (305) 809-3963 any accident or injury to anyone that occurs on the jobsite and is related to any of the work being performed by the CONTRACTOR.

Add the following Article:

G. SURETY AND INSURER QUALIFICATIONS

All bonds, insurance contracts, and certificates of insurance shall be either executed by or countersigned by a licensed resident agent of the Surety or insurance company, having his place of business in the State of Florida, and in all ways complying with the insurance laws of the State of Florida. Further, the said Surety or Insurance Company shall be duly licensed and qualified to do business in the State of Florida. If requested, Contractor shall Provide Proof of Florida Licensure for all insurance companies. The City of Key West shall be named as Additional Insured on the insurance certificates.

ARTICLE 35 "INDEMNITY"

Delete Article "INDEMNITY" in its entirety and substitute the following:

INDEMNITY

To the fullest extent permitted by law, the CONTRACTOR expressly agrees to indemnify and hold harmless the City of Key West, their officers, directors, agents, and employees (herein called the "indemnitees") from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees and court costs, such legal expenses to include costs incurred in establishing the indemnification and other rights agreed to in this Paragraph, to persons or property, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR, its Subcontractors or persons employed or utilized by them in the performance of the Contract. Claims by indemnitees for indemnification shall be limited to the amount of CONTRACTOR's insurance or $1 million per occurrence, whichever is greater. The parties acknowledge that the amount of the indemnity required hereunder bears a reasonable commercial relationship to the Contract and it is part of the project specifications or the bid documents, if any.

The indemnification obligations under the Contract shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the CONTRACTOR or of any third party to whom CONTRACTOR may subcontract a part or all of the Work. This indemnification shall continue beyond the date of completion of the work.

ARTICLE 39 "CODES, ORDINANCES, PERMITS, AND LICENSES"

Add the following:

A. PERMIT FOR WORK WITHIN LOCAL RIGHTS-OF-WAY

The Contractor shall obtain from the City of Key West the necessary permits for work within the rights-of-way. The Contractor shall abide by all regulations and conditions, including maintenance of traffic.

B. NOISE ORDINANCE

City of Key West has a noise ordinance that allows working hours between 8:00 AM to 7:00 PM, Monday through Friday. No work should be performed during weekends or City Holidays, State Holidays and National Holidays. Any construction operations outside these hours and these days will require a variance from the City of Key West Commission.

D. "LICENSES"

THE BIDDER MUST BE A LICENSED CONTRACTOR BY THE STATE OF FLORIDA AND SUBMIT PROOF OF SUCH WITH THE BID.

1. Within 10 days of Notice of Award, the successful Bidder must represent that he holds all applicable, county, and City of Key West licenses and permits required to do business as a contractor with respect to the work described in the Contract Documents.

2. Further, the successful Bidder must, within 10 days of Notice of Award, furnish documentation showing that, as a minimum, he has complied with the provisions of Chapter 18 of the Code of Ordinances of the City of Key West in order to enter into the Agreement contained in the Contract Documents.

3. Specifically, within 10 days after Notice of Award, the successful Bidder must demonstrate that he holds, as a minimum, the following licenses and certificates:

   a.) City of Key West Tax License Receipt;
   b.) A valid Certificate of Competency issued by the Chief Building Official of Key West, Florida
   c.) A valid occupational license issued by the City of Key West, Florida.

E. WORK DURING HOLIDAYS

There shall be no work during City Holidays, State Holidays and National Holidays. Any construction operations during these days shall be approved by the City of Key West.

ARTICLE 42 "SAFETY"

Add the following sub article:

OCCUPATIONAL SAFETY AND HEALTH

The Contractor shall observe and comply with all applicable local, state, and federal occupational safety and health regulations during the prosecution of work under this Contract. In addition, full compliance by the Contractor with the U.S. Department of Labor's Occupational Safety and Health Standards, as established in Public Law 91-596, will be required under the terms of this Contract.

ARTICLE 43 "PROTECTION OF WORK AND PROPERTY"

Add the following Article:

HISTORIC PRESERVATION

The Contractor shall comply with Florida's Archives and Historic Act (Florida Statutes, Chapter 267) and the regulations of the local historic

preservation board as applicable and protect against the potential loss or destruction of significant historical or archaeological data, sites, and properties in connection with the project.

ARTICLE 57 “OWNERS RIGHT TO TRANSFER EMPLOYMENT”

Add the following Article:

TERMINATION FOR CONVENIENCE AND RIGHT OF SUSPENSION

A. Owner shall have the right to terminate this Contract without cause by written notice of Termination to the Contractor. In the event of such termination for convenience, the Contractor’s recovery against the Owner shall be limited to that portion of the Contract amount earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred. Contractor shall not be entitled to any other or further recovery against the Owner, including, but not limited to, damages or any anticipated profit on portions of the Work not performed.

B. The Owner shall have the right to suspend all or any portions of the Work upon giving the Contractor prior written notice of such suspension. If all or any portion of the Work is so suspended, the Contractor shall be entitled to reasonable costs, expenses and time extension associated with the suspension.

ARTICLE 60 "LIQUIDATED DAMAGES"

Delete Article "LIQUIDATED DAMAGES" in its entirety and substitute the following:
LIQUIDATED DAMAGES

Should the Contractor fail to complete the work or any part thereof in the time agreed upon in the Contract Documents or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day, Sundays and legal holidays included, that project outlined in Contract Documents remains uncompleted after the completion date. Liquidated damages shall be assessed. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the work is the per diem rate as stipulated in the Proposal. The said amount is hereby agreed upon as a reasonable estimate of the costs which may be accrued by the Owner after the expiration of the time of completion. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty but as liquidated damages, which have accrued against the

Contractor. The Owner shall have the right to deduct such damages from any amount due or that may become due the Contractor or the amount of such damages shall be due and collectible from the Contractor or Surety.

ARTICLE 69 "PARTIAL PAYMENTS"

Delete the first paragraph of Article "PARTIAL PAYMENTS" and substitute the following:

No more than once each month the Contractor shall submit to the Engineer a detailed estimate of the amount earned during the preceding month for the separate portions of the work and request payment. As used in this Article the words "amount earned" means the value, on the date of the estimate, for partial payment of the work completed in accordance with the Contract Documents and the value of approved materials delivered to the project site suitably stored and protected prior to incorporation into the work.

ARTICLE 69 "PARTIAL PAYMENTS"

Add the following:

Payment will be made by the Owner to the Contractor within 40 days receipt of the written recommendation of payment from the Engineer.

ARTICLE 69 "PARTIAL PAYMENT"

Delete Subarticle E "PAYMENT" in its entirety and substitute the following:

PAYMENT

After deducting the retainage and the amount of all previous partial payments made to the Contractor from the amount earned the amount due will be made payable to the Contractor. Recommendations for payment received by the Owner less than 40 days prior to the scheduled day for payment will not be processed or paid until the following month.

The OWNER will withhold progress payments until the Contractor has satisfied the above conditions.

ARTICLE 72 "FINAL PAYMENT"

Delete Article "FINAL PAYMENT" in its entirety and substitute the following:

FINAL PAYMENT

Upon completion of the work the Contractor shall notify the Engineer, in writing, that he has completed it and shall request final payment. The Contractor shall be responsible for keeping an accurate and detailed record of his actual construction. Upon completion of construction and before final acceptance and payment the Contractor shall furnish the Engineer as-built drawings of his construction. Upon receipt of a request for final payment and the as-built drawings the Engineer will inspect and, if acceptable, submit to the Owner his recommendation as to acceptance of the completed work and as to the final estimate of the amount due the Contractor. Upon approval of this final estimate by the Owner and compliance by the Contractor with provisions in Article RELEASE OF LIENS OR CLAIMS, and other provisions as may be applicable, the Owner shall pay to the Contractor all monies due him under the provisions of these Contract Documents.

ARTICLE 72 "FINAL PAYMENT"

Add the following;

A. Acceptance and Final Payment.

Whenever the Contractor has completely performed the work provided for under the Contract and the Engineer has performed a final inspection and made final acceptance and subject to the terms of the Engineer will prepare a final estimate showing the value of the work as soon as the Engineer makes the necessary measurements and computations. The Engineer will correct all prior estimates and payments in the final estimate and payment. The OWNER will pay the estimate, less any sums that the OWNER may have deducted or retained under the provisions of the Contract, as soon as practicable after final acceptance of the work, provided the Contractor has met the requirements of (1) through (8) below.

1 The Contractor has agreed in writing to accept the balance due or refund the overpayment, as determined by the OWNER, as full settlement of his account under the Contract and of all claims in connection therewith, or the Contractor, accepted the balance due or refunded the overpayment, as determined by the OWNER, with the stipulation that his acceptance of such payment or the making of such refund does not constitute any bar, admission, or estoppel, or have any effect as to those payments in dispute or the subject of a pending claim between the Contractor and the OWNER. To receive payment based on a FINAL PAYMENT CERTIIFCATE, The Contractor further agrees, by submitting a FINAL PAYMENT CERTIFICATE that any pending or future arbitration claim or suit is limited to those particulars, including the itemized amounts, defined in the original FINAL PAYMENT CERTIFICATE , and that he will commence with any such arbitration claim or suit within 15 calendar days from and after the time of final PAYMENT of the work and that his failure to file a formal claim within this period constitutes his full acceptance of the Engineer’s final estimate

and payment. The overpayment refund check from the Contractor, if required, will be considered a part of any Acceptance Letter executed.

2 The Contractor has properly maintained the project, as specified hereinbefore.

3 The Contractor has furnished a sworn affidavit to the effect that the Contractor has paid all bills and no suits are pending (other than those exceptions listed, if any) in connection with work performed under the Contract and that the Contractor has not offered or made any gift or gratuity to, or made any financial transaction of any nature with, any employee of the OWNER in the performance of the Contract.

4 The surety on the contract bond consents, by completion of their portion of the affidavit and surety release subsequent to the Contractor's completion of his portion, to final payment to the Contractor and agrees that the making of such payment does not relieve the surety of any of its obligations under the bond.

5 The Contractor has furnished all required mill tests and analysis reports to the Engineer.

6 Final payment will not be released until the City receives Certified As-built drawings in AutoCAD & Adobe format as well as:

As-Built Drawing Standards:

All supplied data collections, as-builts, drawings and files to be compatible with esri ArcGIS 10.2.2 Software. The current computing environment consists of:

- Microsoft SQL Server - Windows 7/Server 2008 - ESRI GIS Platform

Interfaces and Integrations:

The City of Key West uses a number of software applications critical to its core op eration and mission. The proposed mobile asset data collection solution will need t o interface or integrate with theseexisting platforms. - Arc Collector-ArcGIS Online - ArcMap 10.2

If there are any questions or concerns on whether your files meet this request. Please contact the City of Key West GIS department. 305-809-3721.

* * * * *

PART 4

TECHNICAL SPECIFICATIONS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01001
GENERAL REQUIREMENTS

1. PROJECT DESCRIPTION

1.1 GENERAL

A. The following information though not all-inclusive, is given to assist Contractors in the evaluation of the work required to meet the project objectives.

B. A brief description of the work is stated in the Invitation to Bid. To determine the full scope of the project or of any particular part of the project, coordinate the applicable information in the several parts of these Contract Documents.

1.2 FDOT SPECIFICATIONS

A. Portions of The Florida Department of Transportation Standard Specifications for Road and Bridge Construction and their Roadway and Traffic Design Standards, hereinafter referred to as the DOT Specifications, are referred to herein and amended, in part, and the same are hereby made a part of this Contract to the extent of such references and shall be as binding upon the Contract as though reproduced herein. Such reference shall mean the current edition, including all supplements. In case of a conflict in the requirements of the DOT Specifications and the requirements stated herein, the requirements herein shall prevail.

2. SEQUENCE OF OPERATIONS

2.1 MOBILIZATION AND DEMOBILIZATION

A. Contractor shall be responsible for mobilization and demobilization of labor, materials and equipment. Payment for mobilization and demobilization will be included in the unit price indicated in the BID.

B. DAILY REPORTS
   1) The CONTRACTOR shall submit daily reports of construction activities for each site, including non-work days. The report shall include:
      a) Manpower, number of men by craft
      b) Quality Control
      c) Equipment on the Project;
      d) Major deliveries
      e) Activities worked with reference to the CPM schedule activity numbers
      f) New problems
      g) Other pertinent information
   2) A similar report shall be submitted for/by each Subcontractor.
   3) The reports shall be submitted to the ENGINEER each month.

2.2 SCHEDULING

A. Plan the work and carry it out with minimum interference to the operation of the existing facilities. Prior to starting the work, confer with the Engineer and Owner's representative to develop an approved work schedule, which will permit the facilities to function as normally as practical. It may be necessary to do certain parts of the work outside normal working hours in order to avoid undesirable conditions. The Contractor shall do this work at such times and at no additional cost to the Owner.

B. SPECIAL EVENTS: Contractor may be asked to stop work during special events. No work will be allowed for intersections (TBD) on days corresponding to the events and schedule listed below. All material and equipment shall be totally off all streets by 5:00 P.M. the day before these dates:

No work on roads and streets shall be allowed to interfere with polling locations open on election days. Monroe County Precincts (as of June 2012)

PRECINCT#	**ADDRESS**		**CITY**
Prec. #1	Jaycee Clubhouse, 3825 Flagler Avenue.		Key West
Prec. #2	Key West High School Auditorium, 2100 Flagler Ave		Key West
Prec. #3	Key West High School Auditorium, 2100 Flagler Ave.		Key West
Prec. #4	Martin Luther King Community Pool, 300 Catherine St.		Key West
Prec. #5	Old City Hall, 510 Greene Street.		Key West
Prec. #6	St. Mary's Convent, 724 Truman Avenue.		Key West
Prec. #7	Moose Club, 700 Eisenhower Dr.		Key West
Prec. #8	Glad Tiding Tabernacle Assembly of God1209 United St (Georgia St Entrance).		Key West
Prec. #9	Senior Citizens Plaza Auditorium(Rear Entrance), 1400 Kennedy Dr.		Key West
Prec. #10	Church of Jesus Christ of Latter Day Saints, 3424 Northside Dr.		Key West

2.3 COORDINATION

A. Contractors shall cooperate in the coordination of their separate activities in a manner that will provide the least interference with the Owner's operations and other contractors and

utility companies working in the area, and in the interfacing and connection of the separate elements of the overall project work.

B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the Engineer.

2.4 WORK TO BE PERFORMED BY OTHERS

A. During the construction period for this project, the Owner (either with his own forces or under a separate contract) may be performing work that may require the cooperation of the Contractors in scheduling and coordination to avoid conflicts.

B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the Engineer.

C. All Contractors working on this site are subject to this requirement for cooperation, and all shall abide by the Engineer's decision in resolving project coordination problems without additional cost to the Owner.

3. SITE CONDITIONS

3.1 SITE INVESTIGATION AND REPRESENTATION

A. The Contractor acknowledges satisfaction as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, access to the site, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during the prosecution of the work, and all other matters which can any way affect the work or the cost thereof under this Contract.

B. The Contractor further acknowledges satisfaction as to character, quality, and quantity of surface and subsurface materials to be encountered from his inspection of the site and from reviewing any available records of exploratory work furnished by the Owner or included in these Documents. Failure by the Contractor to become acquainted with the physical conditions of the site and all available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the work.

C. The Contractor warrants that as a result of examination and investigation of all the aforesaid data, the contractor can perform the work in a good and workmanlike manner and to the satisfaction of the Owner.

D. The Owner assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of this Contract, unless (1) such representations are expressly stated in the Contract, and (2) the Contract expressly provides that the responsibility therefore is assumed by the Owner.

3.2 INFORMATION ON SITE CONDITIONS

A. General: Any information obtained by the Engineer regarding site conditions, subsurface information, water level, existing construction of site facilities as applicable, and similar data will be available for inspection at the office of the Engineer upon request. Such information is offered as supplementary information only. Neither the Engineer nor the Owner assumes any responsibility for the completeness or interpretation of such supplementary information.

3.3 DIFFERING SUBSURFACE CONDITIONS

A. The Engineer shall investigate such conditions promptly and following this investigation, the Contractor shall proceed with the work, unless otherwise instructed by the Engineer. If the Engineer finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for performing the work, the Engineer will recommend to the Owner the amount of adjustment in cost and time he considers reasonable. The Owner will make the final decision on all Change Orders to the Contract regarding any adjustment in cost or time for completion.

3.4 UTILITIES

A. During excavation the Contractor shall be responsible for determining, at his cost, the locations of all known utilities in the project area.

B. Contractor shall notify utility location service (e.g. Call Sunshine 1-800-432-4770) a minimum for 48 hours prior to work order mobilization. Assigned notification number shall be maintained at the job site at all times and recorded in the daily reports.

3.5 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

A. Where the Contractor's operations could cause damage or inconvenience to telephone, television, gas, water, sewer, or irrigation systems, the operations shall be suspended until all arrangements necessary for the protection of these utilities and services have been made by the Contractor.

B. Notify all utility offices, which are affected by the construction operation at least 48 hours in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for all existing underground utilities.

C. The Contractor shall be solely and directly responsible to the Owner and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the construction operations under this Contract

D. Neither the Owner nor its Officers or agents shall be responsible to the Contractor for damages as a result of the Contractor's failure to protect utilities encountered in the work.

E. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is granted.

F. In the event the Contractor encounters water service lines that interfere with trenching, he may, by obtaining prior approval of the property owner, Water Department, or Fire Department as applicable, and the Engineer, cut the service dig through, and restore service with similar and equal materials at the Contractor's expense.

G. The Contractor shall replace, at his own expense, all existing utilities or structures removed or damaged during construction, unless otherwise provided for in these Contract Documents or ordered by the Engineer.

4. TEMPORARY CONSTRUCTION UTILITIES AND FACILITIES

4.1 TEMPORARY WATER

A. The Contractor shall make his own arrangements to obtain suitable water for any need and shall pay all costs.

4.2 TEMPORARY ELECTRIC POWER

A. The Contractor shall make his own arrangements to obtain and pay for electrical power used until final acceptance by the Owner.

4.3 SAFETY REQUIREMENTS FOR TEMPORARY ELECTRIC POWER

A. Temporary electric power installation shall meet the construction Safety requirements of OSHA, State, and other governing agencies.

4.4 SANITARY FACILITIES

A. The Contractor shall provide and maintain sanitary facilities for his employees and his subcontractor's employees that will comply with the regulations of the local and State Departments of Health and as directed by the Owner.

4.5 STORAGE OF MATERIALS

A. Materials shall be so stored as to ensure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other clean hard surfaces and not on the ground. Stored materials shall be located so as to

facilitate prompt inspection. Stored materials in the right –of –way shall be fully barricaded, with bottom height of 47" or lower and top height of 36" min., also they must be fitted and should have lights at night. Private property shall not be used for storage purposes without the written permission of the owner or lessee. Materials shall not be stored where access to any structure, plot, or road is blocked. Any material the Contractor wishes to store on the site must be approved by the Engineer or his designee, and must be stored at the location designated by him.

B. Delicate instruments and materials subject to vandalism shall be placed under lock cover and, if necessary, provided with temperature control as recommended by the manufacturer.

5. SAFETY AND CONVENIENCE

5.1 CONSTRUCTION SAFETY PROGRAM

A. The Contractor shall develop and maintain for the duration of this Contract, a safety program that will effectively incorporate and implement all required safety provisions. The Contractor shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the safety program.

B. The duty of the Engineer to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, the safety program or any safety measures taken in, on, or near the construction site.

C. The Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities, or unramped grade changes in pedestrian sidewalk or roadway. Barricades, lights, and proper signs shall be furnished in sufficient amount to safeguard the public and the work.

D. The performance of all work and all completed construction, particularly with respect to ladders, platforms, structure openings, scaffolding, shoring, lagging, machinery guards and the like, shall be in accordance with the applicable governing safety authorities.

E. During construction, the Contractor shall construct and at all times maintain satisfactory and substantial temporary chain link fencing, solid fencing, railing, barricades or steel plates, as applicable, at all openings, obstructions, or other hazards in streets, sidewalks, floors, roofs, and walkways. All such barriers shall have adequate warning lights as necessary, or required for safety. Also all barriers shall have a lower horizontal continuous frame member at a maximum of 17" above grade.

5.2 ACCIDENT REPORTS

A. If death or serious injuries or serious damages are caused; the Contractor must promptly report by telephone or messenger to the Engineer. In addition, the Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of or in

connection with, the performance of the work whether on, or adjacent, to the site, giving full details and statements of witnesses.

B. If a claim is made against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

5.3 TRAFFIC MAINTENANCE AND SAFETY

A. Comply with all rules and regulations of the state, county, and city authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by express permission of the owner. Conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. Protect all obstructions within traveled roadways by installing approved signs, barricades, and lights where necessary for the safety of the public. The convenience of the general public and residents adjacent to the project and the protection of persons and property are of prime importance and shall be provided for in an adequate and satisfactory manner.

B. Maintenance of Traffic shall be maintained at all construction sites until the work is either completed or any open trenches have been properly covered and all equipment is properly stored. Contractor shall maintain Maintenance of Traffic (MOT) signs in good repairs and required MOT lights should be operative at all times. The Owner shall stop work if MOT is not properly maintained; there shall not be any additional cost to the Owner for this downtime.

C. When flagmen and guards are required by regulation, permits, or when deemed necessary for safety, they shall be furnished with approved orange wearing apparel and other regulation traffic-control devices. Flaggers shall be certified by State approved agency.

5.4 STREET MAINTENANCE

A. CONTRACTOR shall notify all residents and proprietors adjacent to construction site of work to be performed, more specifically the notice shall state the day and time construction will begin, the name and phone number of the Contractor's representative responsible for the completion of the proposed improvements. Notice shall also include the Owner's representative for the project.

5.5 FIRE PREVENTION AND PROTECTION

A. The Contractor shall perform all work in a fire-safe manner and shall supply and maintain on the site adequate fire-fighting equipment capable of extinguishing incipient fires. The Contractor shall comply with applicable federal, state, and local fire-prevention regulations. Where these regulations do not apply, applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241) shall be followed.

5.6 HURRICANE PREPAREDNESS PLAN

A. Within 30 days of the date of Notice to Proceed, the CONTRACTOR shall submit to the ENGINEER and City Representative a Hurricane Preparedness Plan. The plan should outline the necessary measures which the CONTRACTOR proposes to perform at no additional cost to the OWNER in case of a hurricane warning.

B. In the event of inclement weather, or whenever Owners Representative shall direct, CONTRACTOR will, and will cause Subcontractors to protect carefully the Work and materials against damage or injury from the weather. If, in the opinion of Owner's Representative, any portion of Work or materials shall have been damaged or injured by reason of failure on the part of CONTRACTOR or any Subcontractors to so protect the Work, such Work and materials shall be removed and replaced at the expense of the CONTRACTOR.

6. PRESERVATION, RESTORATION AND CLEANUP

6.1 SITE RESTORATION AND CLEANUP:

A. At all times during the work keep the premises clean and orderly and upon completion of daily work repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.

B. Stockpile excavated materials in a manner that will cause the least damage to adjacent lawns, grassed areas, gardens, shrubbery, or fences regardless of whether these are on private property, or State, County, or City rights-of-way. Remove all excavated materials from grassed and planted areas, and leave these surfaces in a condition equivalent to their original condition.

6.2 FINISHING OF SITE, BORROW, AND STORAGE AREAS

A. Upon completion of the project, all areas used by the Contractor shall be properly cleared of all temporary structures, rubbish and waste materials and properly graded to drain and blend in with the abutting property. Areas used for the deposit of waste materials shall be finished to properly drain and blend in with the surrounding terrain.

6.3 AREA CLEANUP DURING CONSTRUCTION

A. Thoroughly clean all spilled dirt, gravel, sand, concrete, or other foreign materials caused by the construction operations from all streets and roads, grass, pathways, or concrete walkways and from adjacent areas at the conclusion of each day's operation. Wet concrete is not to be stored, dumped, or placed on the ground or other structures on any City property at any time. Truck or equipment wash down is not to be performed on City Property.

6.4 DUST PREVENTION

A. Give all unpaved areas used in the construction area an approved dust-preventive treatment or periodically water to prevent dust during construction. Applicable environmental regulations for dust prevention shall be strictly adhered to.

7. SUBMITTALS

A. See Submittals section of the specifications

8. PAYMENT

8.1 GENERAL

A. The cost of the work in this section is considered incidental to the contract.

****

SECTION 01010
SCOPE OF WORK

PART 1 - SCOPE OF WORK

1.1 DESCRIPTION

A. Work Included: The design and furnishing of all materials, equipment and labor for the construction of KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I and all necessary appurtenances and record drawings, surveys, and incidental work to provide a complete and serviceable project identified as:

KEY WEST HISTORIC SEAPORT COMMON AREA ENHANCEMENTS PROJECT PHASE I

B. Related requirements in other parts of the Contract Documents: General and Supplementary Conditions of the Contract for Construction.

C. Contractor's Duties:

1. In addition to provisions stipulated in other portions of the Contract Documents, the Contractor shall:

a. Secure permits as necessary for proper execution and completion of the work.

b. Notify (in writing) all residents and proprietors adjacent to construction site of work to be performed, more specifically the notice shall state the day and time construction will begin, hours of work, the name and phone number of the Contractor's Superintendent and an end date for the project.

D. The Contractor shall be totally responsible for all permits required and shall ensure that construction complies with all applicable local, state, and federal codes.

E. Provide an experienced, qualified, and competent Superintendent to oversee the Work and perform quality assurance inspections. Prior to starting construction, the proposed Superintendent's qualifications shall be submitted in writing to the City for approval. The approved Superintendent shall be expected to remain for the duration of the Project, unless the City or Engineer deem him/her inadequate and requests his/her removal or the Contractor cannot continue his services to the Project for a reason or reasons that shall be communicated in writing to the City.

F. A replacement Superintendent shall be required to follow the same approval process as required for the original. The Superintendent shall provide to the City Inspector Construction Reports for each day of construction, the reports shall be in English, legible,

and signed. Contractor shall provide PDF copies monthly. Reports shall include quantity control checks done daily

G. It shall be the Contractor's responsibility to request approval for entrance to the site for work on Saturdays, Sundays, holiday, and weekday hours other than 7:00 AM until 7:00 PM. No construction can commence before 8:00 AM on weekdays.

H. The Contractor shall provide material safety data sheets (2 copies) for chemicals, paints, coatings and materials used on-site prior to initiation of work.

1.2 CONTRACTOR'S USE OF PREMISES

A. Work shall be scheduled as to not interfere with on-going area activities.

B. Coordinate use of premises and requirements for security under direction of City.

C. Assume full responsibility for the protection and safekeeping of products, under this Contract, stored on the site.

D. Obtain and pay for the use of additional storage or work areas needed for operation.

E. Contractor shall provide drinking water and toilet facilities for construction personnel; The City will not provide.

1.3 MAINTENANCE OF EXISTING UTILITIES OPERATION

A. Provide at least three weeks notice prior to interruption of utility services for temporary or permanent connections.

B. Keep interruption of utility services, and utility outages during disconnection, moving, and reconnection to a minimum.

C. Keys Energy shall be notified two weeks in advance in writing by the contractor for any KEYS support equipment required by the Contractor during any excavation. (e.g., Power poles next to excavations requiring support, etc.) No additional payment will be paid for this coordination.

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SECTION 01014
PROTECTION OF THE ENVIRONMENT

PART 1 GENERAL

A. The Contractor shall maintain all work areas within and outside the project boundaries free from environmental pollution, which would be in violation to any federal, state, or local regulations.

B. The work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary.

C. Temporary erosion controls include, but are not limited to, grassing, mulching, watering, and reseeding on-site surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the OWNER.

D. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the OWNER.

E. CONTRACTOR is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

PART 2 PROTECTION OF AIR QUALITY

A. The air pollution likely to occur due to construction operations shall be minimized by wetting down bare soils during windy periods, requiring the use of properly operating combustion emission control devices on construction vehicles and equipment used by contractors, and by encouraging the shutdown of motorized equipment not actually in use.

B. Trash burning will not be permitted on the construction site.

C. Contractor shall provide dust control for any asphalt / concrete removal and during the asphalt milling operations.

PART 3 CONSTRUCTION NOISE CONTROL

1 GENERAL

A. The Contractor shall conduct all his work, use appropriate construction methods and equipment, and furnish and install acoustical barriers, all as necessary so that no noise emanating from the process or any related tool or equipment will exceed legal noise levels, as set forth in the Code of Ordinances, City of Key West, Florida.

2. MITIGATION OF CONSTRUCTION NOISE IMPACT

A. The Contractor shall submit to the Engineer his plans to mitigate the construction noise impacts and to comply with the noise criteria specified herein, including the method of construction, the equipment to be used, and acoustical treatments if necessary.

PART 4 PAYMENT

7.1 GENERAL

A. Payment for the work will be incidental to the contract.

* * * * *

SECTION 01050
FIELD ENGINEERING

PART 1 GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. Provide field-engineering services required for the Project, including but not limited to:
a. Survey work required in execution of the Work.
b. Civil, Structural, or other professional engineering services specified or required to execute the Contractor's construction methods.

B. Related Work:

1. General and Supplementary Conditions of the Contract.
2. Section 01010 Scope of Work.

1.02 QUALITY ASSURANCE:

A. Qualifications of Surveyor or Engineer: Professional Engineer and/or Surveyor currently licensed in the State of Florida.

1.03 SUBMITTALS:

A. Submit name and address of proposed Surveyor and/or Contractor’s Engineer to the City.

B. Upon request of the City’s Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificates signed by the Surveyor or Engineer certifying that elevations and locations of the work of this Project are in conformance, or non-conformance, with the Contract Documents.

PART 2 EXECUTION

2.01 EXAMINATION AND PREPARATION OF SITE

A. Before starting operations, Contractor shall examine site of work to acquaint himself with conditions to be encountered.

B. Compare actual site with drawings and specifications.

C. Report discrepancies affecting work or cost thereof to the City.

D. Verify exact locations of sewers, water mains, gas mains, above or below ground electrical wires and conduits and structures which may interfere with work.

E. No extra compensation will be allowed for any extra work made necessary due to conditions or obstacles encountered during progress of work, which could have been determined by examination of site or by contacting Owners of utilities, pipelines and conduits before starting operations.

F. Comply with State law concerning Sunshine State One Call of Florida, State Statute Title 33, Chapter 556.

2.02 LINES AND GRADES

A. Prior to staking out work, Contractor shall verify established base line, benchmarks, and control points provided.

B. Contractor shall furnish and maintain lines and grades.

C. Contractor shall take immediate steps to correct errors or inconsistencies in lines and grades of work to be in conformity with Contract Documents.

D. Contractor shall be fully responsible for accuracy of lines and grades of work and control and checking and immediate correction of it.

2.03 RESTORATION

A. Items to remain which are disturbed, damaged, or removed when performing required work or for convenience of Contractor or to expedite his operations shall be restored, repaired, reinstalled, or replaced with new work and refinished, as appropriate, so as to be left in as good condition as existed before work commenced and such restoration shall be considered incidental to the work.

B. Any sidewalks or pavement replaced or installed shall meet ADA requirements.

C. Existing items to be altered, extended, salvaged, or relocated and reused, if found to be defective in any way, shall be reported to the City before items are disturbed.

D. Materials and workmanship used in restoring work shall conform in type and quality to original existing construction.

PART 4 - PAYMENT

4.1 GENERAL

A. Payment for work specified in this section will be incidental to the contract.

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SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 GENERAL

A. Inquiries: Direct to ENGINEER regarding procedure, purpose, or extent of Submittal.

B. Submittal Submission Procedures: As provided in General Conditions, as specified herein, and as may otherwise be established during the preconstruction conference.

C. OWNER's Authorization: At any time, OWNER may authorize changes to procedures and requirements for Submittals, as necessary to accomplish specific purpose of each Submittal. Such authorization will be by Field Order or Work Change Directive.

D. Timeliness: Make submissions in accordance with requirements of individual Specification sections, as shown on the current accepted schedule of Submittals submissions, and in such sequence as to cause no delay in Work or in work of other contractors.

E. Identification of Submittals:

1. Complete, sign, and transmit with each Submittal package, one Transmittal of CONTRACTOR's Submittal Form attached at the end of this section.
2. Identify each Submittal with numbering and tracking system reviewed by ENGINEER:
   a. Sequentially number each Submittal.
   b. Resubmission of a Submittal will have original number with sequential alphabetic suffix.
3. Show date of submission and dates of previous submissions.
4. Show Project title and OWNER's contract identification and contract number.
5. Show names of CONTRACTOR, Subcontractor or Supplier, and manufacturer as appropriate.
6. Identify, as applicable, Contract Document section and paragraph to which Submittal applies.
7. Clearly identify revisions from previous submissions.

F. Incomplete Submittal Submissions:

1. At ENGINEER's sole discretion, ENGINEER will either (i) return the entire Submittal for CONTRACTOR's revision/correction and resubmission, or (ii) retain portions of the Submittal and request submission/resubmission of specified items or as noted thereon.

2. Submittals which do not clearly bear CONTRACTOR's specific written indication of CONTRACTOR review and approval of Submittal or which are transmitted with an unsigned or uncertified submission form or as may otherwise be required under Contract Documents, will be returned to

CONTRACTOR unreviewed for resubmission in accordance with Contract Documents.

3. Delays, resequencing or other impact to Work resulting from CONTRACTOR's submission of unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming Submittals, which will require CONTRACTOR's resubmission of a Submittal for ENGINEER's review, shall not constitute a basis of claim for adjustment in Contract Price or Contract Times.

F. Non-specified Submissions: Submissions not required under these Contract Documents and not shown on schedule of Submittals submissions will not be reviewed and will be returned to CONTRACTOR.

G. Transmit Submittals in accordance with current accepted schedule of Submittal submissions, and deliver as follows:

1. Submittals to: Designated Engineer by the General Service Department of the City of Key West.

H. Disposition of Submittals: As specified herein for administrative Submittals. ENGINEER will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:

1.

2. Reviewed as Noted:
   a. Reference the General Conditions for intent.
   b. CONTRACTOR may proceed to perform Submittal related Work.
   d. One copy for ENGINEER’s file.
   e. One copy returned to CONTRACTOR.

3. Revise and Resubmit (Revise/Correct or Develop Replacement and Resubmit):
   a. Revise/correct in accordance with ENGINEER's comments and resubmit.
   b. One copy to ENGINEER's file.
   c. One copy returned to CONTRACTOR appropriately annotated.

I. ENGINEER's Review: ENGINEER will act upon CONTRACTOR's Submittal and transmit response to CONTRACTOR not later than 30 days after receipt, unless: (i) specified otherwise or (ii) accepted by ENGINEER as set forth in Paragraph ENGINEER's Duties below and identified on current accepted schedule of Submittals submissions. Re-submittals will be subject to the same review time.

1.02 SHOP DRAWINGS

A. Description: Reference the General Conditions.

B. Excessive Shop Drawing Review: Review of the first submission and two resubmissions of Shop Drawings will be performed by ENGINEER at no cost to CONTRACTOR. Subsequent additional resubmissions of that Shop Drawing will be reviewed by ENGINEER, however, ENGINEER will document work hours and other expenses required to perform such additional review(s). OWNER shall deduct these costs from Contractor's contract for reimbursement to the ENGINEER.

C. Copies: Submit two (2) copies.

D. Submit Shop Drawings to ENGINEER in accordance with the General Conditions and as specifically required by individual Specification sections for equipment and materials to be furnished under these Contract Documents.

E. Identify and Indicate:

1. Pertinent Drawing sheet(s) and detail number(s), products, units and assemblies, and system or equipment identification or tag numbers.
2. Critical field dimensions and relationships to other critical features of Work.
    a. Each deviation or variation from Contract Documents.

F. Resubmissions: Clearly identify each correction or change made.

G. Foreign Manufacturers: When proposed, include following additional information:

1. Names and addresses of at least two companies closest to Project that maintain technical service representatives.
2. Complete inventory of spare parts and accessories for each piece of equipment.

H. Preparation:

1. Format: Whenever possible, schedule for and combine Shop Drawings required for submission in each Specification section into a single Submittal package.
2. Present in a clear and thorough manner and of sufficient detail to show kind, size, arrangement, and function of components, materials, and devices and compliance with Contract Documents. Identify details by reference to sheet and detail, and schedule or room numbers shown on Drawings.

PART 4 PAYMENT

B. Payment for the work in this section will be incidental

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SECTION 01390
PRECONSTRUCTION AUDIO-VIDEO RECORDINGS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The Contractor shall provide a color audio-video recording showing the entire preconstruction site. All videos shall be taken by a professional commercial video photographer. The video photographer shall be an established enterprise that routinely provides these services. The videos shall be in DVD format or .wav files on removable USB drive, indicating the date, project name, and a brief description of the location where the video was taken. The Contractor shall submit one (1) copy of the preconstruction audio-video to the OWNER.

B. No construction shall begin prior to the review and approval of the preconstruction audio-video tape by the OWNER.

1.02 RELATED REQUIREMENTS

Section 01300 Submittals

PART 2 - PRODUCTS

2.01 GENERAL

The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright sharp, and clear pictures with accurate colors and shall be free from distortion, and any other form of picture imperfection. All video recordings shall, by electronic means, display on the screen the time of day, the month, day, and year of the recording.

PART 3 - EXECUTION

3.01 GENERAL

A. The following shall be included with the audio-video documentation:

1. Coverage is required within and adjacent to the right of way, easements, storage, and staging areas where the work is to be constructed.

2. Documentation of the conditions of the adjacent properties or any affected structures as a result of the impending construction.

3. Videos shall be properly identified by project name. Video shall include direction of coverage, the name of the streets or easements, engineering station numbers, date and time of coverage.

4. Provide a written video log to aid in locating any section of the construction site that may be in question.

B. There will be no separate payment for this preconstruction audio-video recording. The cost will be incidental to the contract.

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SECTION 01500
TESTING SERVICES

PART 1 GENERAL

1.1 WORK INCLUDED

A. The Contractor shall employ and pay for the services of a qualified commercial independent testing laboratory acceptable to the Owner to perform specified services.

B. Inspection, sampling, and testing is required for:

1. Backfill
2. Paving and surfacing
3. Concrete
3. Additional quality checks as required by the Engineer

C. Employment of a testing laboratory shall in no way relieve the Contractor of his obligation to perform work in accordance with the Contract.

PART 2 PRODUCTS

2.1 SUBMITTALS

A. Submit two copies of reports of inspections and tests to Engineer promptly upon completion of inspections and tests, including: Provide one copy in PDF.

1. Date issued.
2. Project title and Engineer's job number.
3. Testing laboratory name and address.
4. Name and signature of inspector.
5. Date of inspection or sampling.
6. Record of temperature and weather.
7. Date of test.
8. Location of inspection or test.
9. Identification of product and specification section.
10. Type of inspection or test.
11. Observation regarding compliance with the Contract Documents.

B. This report shall be signed and sealed by a Registered Professional Engineer Licensed in the State of Florida, and qualified to perform such service.

PART 3 EXECUTION

3.1 LABORATORY DUTIES - LIMITATIONS OF AUTHORITY

A. Cooperate with the Owner and Contractor; provide qualified personnel promptly on notice.

B. Perform specified inspections, sampling, and testing of materials and methods of construction:

1. Comply with specified standards; ASTM, other recognized standards, authorized and as specified.
2. Ascertain compliance with requirements of Contract Documents.

C. Notify the Engineer and Contractor immediately of irregularities or deficiencies of work that are observed during performance of services.

D. Perform additional services as required by the Engineer.

3.2 ON SITE TESTING

A. On site testing must be performed by certified staff, by state approved agencies and must be approved by a professional engineer.

B. Testing as required by other sections of this document.

PART 4 PAYMENT

A. Payment for the work in this section will be incidental.

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SECTION 01530
BARRIERS

PART 1 - GENERAL

1.01 REQUIREMENTS

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

1.02 RELATED REQUIREMENTS

A. Section 01010 Scope of Work.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 FENCING

Minimum fence height shall be four feet. Open-mesh orange plastic fence shall be used to prohibit entry to the construction zone.

2.03 BARRIERS

Materials are Contractor's option, as appropriate to serve required purpose.

PART 3 - EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonably uniform appearance, structurally adequate for the required purposes.

B. Maintain barriers during entire construction period.

C. Relocate barriers as required by the progress of construction.

3.02 FENCES

A. Provide and maintain fences necessary to assure security of the site during construction to keep unauthorized people and animals from the site when construction is not in progress.

B. Provide additional security measures as deemed necessary and approved by the OWNER.

3.03 TREE AND PLANT PROTECTION

A. Preserve and protect existing trees and plants at site which are designated to remain, and those adjacent to site.

B. Consult with the OWNER, and remove agreed-on roots and branches which interfere with construction. Employ a qualified tree surgeon to remove branches and treat cuts.

B. Protect root zones of trees and plants:

1. Do not allow vehicular traffic or parking.
2. Do not store materials or products.
3. Prevent dumping of refuse or chemically injurious materials or liquids.
4. Prevent puddling or continuous running water.

D. Carefully supervise excavating, grading and filling, and other construction operations, to prevent damage.

E. Replace, or suitably trim trees and plants designated to remain which are damaged or destroyed due to construction operations.

3.04 REMOVAL

A. Completely remove barricades when construction has progressed to the point that they are no longer needed and when approved by the OWNER.

B. Repair damage caused by construction. Fill and grade areas of the site to the required evaluations, and clean up the area.

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SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS

Contract completion includes substantial completion, final inspection after completion, final cleaning, contractor's closeout submittals, and final adjustment of accounts.

1.02 SUBSTANTIAL COMPLETION

A. When Contractor considers work has reached substantial completion, he shall submit to the OWNER the following:

a. Written notice that the work is substantially complete in accordance with Contract Documents.

b. A list of items yet to be completed or corrected and explanations thereof.

B. Within a reasonable time upon receipt of such notice, the OWNER will make an inspection, if necessary, to determine the status of completion.

C. Should the OWNER determine that the work is not substantially complete:

a. The OWNER will promptly notify the Contractor in writing, giving the reasons thereof.

b. Contractor shall remedy the deficiencies in the work and send a second written notice of Substantial Completion to the
OWNER.

c. Upon receipt of the second notice, the OWNER will review the work.

D. When the OWNER finds that the Work is substantially complete he will issue a Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final inspection.

1.03 FINAL INSPECTION AFTER COMPLETION

A. When Contractor considers the Work is complete with all minor deficiencies completed or corrected, he shall submit written certification that:

a. Contract Document requirements have been met.

b. Work has been inspected for compliance with Contract Documents.

c. Work has been completed in accordance with Contract Documents.

d. All minor deficiencies have been corrected or completed and the Work is ready for final inspection.

e. Project record documents are complete and submitted.

B. Within a reasonable time upon receipt of such certification, the OWNER will make an inspection to verify the status of completion.

C. Should the OWNER determine that the work is incomplete or defective:

a. The OWNER will promptly notify the Contractor in writing, listing the incomplete or defective work.
b. Contractor shall remedy the deficiencies in the work and send a second written certification to the OWNER that the work is complete.
c. Upon receipt of the second certification, the OWNER will review the Work.

D. When the OWNER determines that the work is acceptable, under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean site; sweep paved areas, rake clean other surfaces.

C. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Project Record Documents

a. At Contract Closeout, submit documents with transmittal letter containing date, project title, Contractor's name and address, list of documents, and signature of Contractor.
b. Changes made by Field Order or by Change Order.

B. Evidence of payment and Release of Liens.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the OWNER.

B. Statement shall reflect all adjustments to the Contract Sum.
a. The original Contract sum.
b. Additions and deductions resulting from:
- Previous change orders or written amendment.
- Allowances
- Unit prices
- Deductions for uncorrected work.
- Deductions for liquidated damages
- Other adjustments

c. Total contract sum as adjusted
d. Previous payments
e. Sum remaining due

PART 2 - PRODUCTS (not used)
PART 3 - EXECUTION (not used)

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PART 5

SPECIFICATIONS AND DRAWINGS

SECTION 02221 – DEMOLITION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:

a. Demolition and removal of structures.

b. Removing below-grade construction.

c. Disconnecting, capping or sealing, and abandoning in place site utilities.

B. Related Sections include the following:

a. Division 1 Section "Summary" for use of the premises and phasing requirements. Note: Demolition will be phased to allow continued use of portions of the site through the construction process.
b. Division 1 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
c. Division 1 Section "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
d. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of building demolition.
e. Division 16 Sections for demolishing or relocating site electrical items.

1.3. DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-siteunless indicated to be removed and salvaged or recycled.

B. Remove: Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.4. MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects or other items of interest or value to Owner that may be encountered during the course of construction shall remain the Owner's

property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

a. Coordinate with Owner's historical adviser, who will establish special procedures for removal and salvage

1.5. SUBMITTALS

A. Qualification Data: For demolition firm (Not applicable).

B. Proposed Environmental-Protection Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6. QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7. PROJECT CONDITIONS

A. Owner assumes no responsibility for structures to be demolished.

a. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

a. Hazardous materials will be removed by Owner before start of the Work.

b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

C. Storage or sale of removed items or materials on-site is not permitted.

1.8. COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1. EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.

B. Inventory and record the condition of items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element. Promptly submit a written report to Architect.

3.2. PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

a. Arrange to shut off indicated utilities with utility companies.
b. If utility services are required to be removed, relocated, or abandoned, before proceeding with building demolition provide temporary utilities that bypass buildings and structures to be demolished and that maintain service to the site.
c. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

B. Existing Utilities: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

C. Temporary Shoring: Provide and maintain exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

a. Strengthen or add new supports when required during progress of demolition.

3.3. PROTECTION

A. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.

B. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."

a. Protect existing site improvements, appurtenances, and landscaping to remain.

b. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
c. Provide temporary barricades and other protection required to prevent injury to people .

3.4. DEMOLITION, GENERAL

A. General: Demolish indicated existing structures and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

a. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

b. Maintain adequate ventilation when using cutting torches.

c. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

a. Do not close or obstruct streets, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
b. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as flooding, and pollution.

3.5. MECHANICAL DEMOLITION

A. Remove structures and site improvements intact when permitted by authorities having jurisdiction.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished then break up and remove.

C. Equipment: Disconnect equipment at nearest fitting connection to services, complete with service valves. Remove as whole units, complete with controls.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

a. Remove below-grade construction.

E. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

a. Piping: Disconnect piping at unions, flanges, valves, or fittings.
b. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.6. SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7. RECYCLING DEMOLISHED MATERIALS

A. General: Separate recyclable demolished materials from other demolished materials to the maximum extent possible. Separate recyclable materials by type

a. Provide containers or other storage method for controlling recyclable materials until they are removed from Project site.
b. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
c. Stockpile materials away from demolition area. Do not store within drip line of remaining trees.
d. Store components off the ground and protect from the weather.
e. Transport recyclable materials off Owner's property and legally dispose of them.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling building demolition materials shall accrue to Contractor.

3.8. DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

a. Do not allow demolished materials to accumulate on-site.
b. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.9. CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 02221

SECTION 02222 - TRENCH EXCAVATION AND BACKFILL

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the work necessary for the trench excavation and backfill, complete.

B. Trenches in existing paved areas shall be backfilled to the level of the bottom of the base course. Installation of base course and pavement shall be as specified in Section 02575, SURFACE RESTORATION.

C. Concrete encasement will be used where, in the opinion of the ENGINEER, there is insufficient cover over the pipe for proper cover and protection.

1.2 TRENCH EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type of materials encountered. The CONTRACTOR shall make own estimate of the kind and extent of the various materials which will be encountered in the excavation.

1.3 RELATIVE COMPACTION

A. "Relative compaction" is defined as the ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the ENGINEER.

1.4 OPTIMUM MOISTURE CONTENT

A. "Optimum moisture content" shall be determined by the ASTM standard specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

1.5 SUBMITTALS

A. Submittals shall be made in accordance with the requirements specified in Section 01001, GENERAL REQUIREMENTS.

PART 2 PRODUCTS

2.1 FOUNDATION STABILIZATION

A. Foundation stabilization shall be 2-1/2 inches minus crushed rock, with reasonably well gradation from coarse to fine, and free from excessive dirt or other organic material with no more than 2 percent by weight passing the No. 200 sieve. The material shall be nonplastic.

2.2 TRENCH BACKFILL

A. Back-fill above the pipe zone shall be pipe bedding and pipe zone material as specified in the drawings.

2.3 WATER FOR TRENCH BACKFILL

A. The CONTRACTOR shall make all arrangements for a source of water and bear all costs for the delivery of the water to the trench side.

2.4 COMPACTION EQUIPMENT

A. Compaction equipment shall be of suitable type and adequate to obtain the amount of compaction specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort.

2.5 GRASSING

A. All grassed areas that have been damaged by trench excavation shall be sodded as specified in Section 02900, LANDSCAPING.

2.6 DETECTION TAPE

A. As specified in on the plans.

2.7 GEOTEXTILE

A. Geotextile shall be a needlepunched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. The geotextile shall have the following minimum standards:

Property	Test Method	Units	Elongation ≥50%
Grab Tensile Strength	ASTM D4632	lbs (N)	120 (534)
Tear Strength	ASTM D4533	lbs (N)	50 (223)
CBR Puncture Strength	ASTM D6241	lbs (N)	310 (1380)
Permittivity	ASTM D4991	sec^{-1}	1.7
Apparent Opening Size	ASTM D4751	U.S. Sieve (mm)	70 (0.212 max)
Ultraviolet Stability[1]	ASTM D4355	%	70

[1] After 500 hrs

PART 3 EXECUTION

3.1 PREPARATION OF RIGHT-OF-WAY

A. The CONTRACTOR shall perform all clearing necessary for the proper installation of all utility lines, structures, and appurtenances in the locations shown on the Drawings. All utility poles or structures subject to damage resulting from excavation shall be protected during construction and restored to original condition upon completion of the work. The CONTRACTOR shall be responsible for all coordination and payment.

3.2 DISPOSAL OF CLEARED MATERIAL

A. The CONTRACTOR shall bear all costs of disposing of trees, stumps, brush, roots, limbs, and other waste materials from the clearing operation. Material shall be disposed of in such a manner as to meet all requirements of state, county, and local regulations regarding health, safety, and public welfare.

B. In no case shall any material be left on the project, shoved onto abutting private properties, or be buried in embankments or trenches on the project.

3.3 OBSTRUCTIONS

A. This item refers to obstructions which may be removed and do not require replacement. Remove obstructions within the trench area or adjacent thereto such as tree roots, stumps, abandoned piling, buildings and concrete structures, logs, and debris of all types. The ENGINEER may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes

can be made within the easement or right-of-way without adversely affecting the intended function of the facility. Compensation will be made in accordance with the GENERAL CONDITIONS.

B. Dispose of obstructions removed from the excavation in accordance with Paragraph DISPOSAL OF EXCESS EXCAVATED MATERIAL.

3.4 PAVEMENT, CURB, AND SIDEWALK REMOVAL

A. Saw cut all bituminous and concrete pavements, regardless of the thickness, and all curbs and sidewalks, prior to excavation of the trenches with an approved pavement saw, hydrohammer, or approved pavement cutter. Width of the pavement cut shall be at least equal to the required width of the trench at ground surface. Pavement and concrete materials removed shall be hauled from the site and not used for trench backfill.

3.5 TRENCH WIDTH

A. Minimum width of unsheeted trenches in which pipe is to be laid shall be 18 inches greater than the outside diameter of the pipe for sizes up to 15-inch diameter and 24 inches greater than the outside diameter of pipe 15 inches and larger, or as approved. Sheeting requirements shall be independent of trench widths.

B. The maximum width at the top of the trench will not be limited, except where excess width of excavation would cause damage to adjacent structures or property.

C. Confine trench widths to dedicated rights-of-way or construction easements, unless special written agreements have been made with the affected property owner.

3.6 GRADE

A. Excavate the trench to the lines and grades shown or as established by the ENGINEER with proper allowance for pipe thickness and for pipe base or special bedding when required. If the trench is excavated below the required grade, correct any part of the trench excavated below the grade at no additional cost to the OWNER, with lime rock of the type specified for pipe bedding. Place the lime rock over the full width of trench in compacted layers not exceeding 6 inches deep to the established grade with allowance

for the pipe base or special bedding.

B. It shall be the CONTRACTOR's responsibility to make exploratory excavations as required to verify location, size, and elevation of existing utilities that may interfere with repairs of the sewer lines. CONTRACTOR shall perform this Work well in advance of trenching and pipe laying for the repair. The CONTRACTOR shall call "48 hours before digging" the underground utilities location center at 1-800-432-4770.

3.7 SHORING, SHEETING, AND BRACING OF TRENCHES

A. Sheet and brace the trench when necessary to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public. Increase trench widths accordingly by the thickness of the sheeting. Maintain sheeting in-place until the pipe has been placed and backfilled at the pipe zone. Shoring and sheeting shall be removed, as the backfilling is done, in a manner that will not damage the pipe or permit voids in the backfill. All sheeting, shoring, and bracing of trenches shall conform to the safety requirements of the federal, state, or local public agency having jurisdiction. The most stringent of these requirements shall apply.

3.8 LOCATION OF EXCAVATED MATERIALS

A. During trench excavation, place the excavated material only within the construction easement, right-of-way, or approved working area. Do not obstruct any private- or public-traveled roadways or streets. Conform to all federal, state, and local codes governing the safe loading of all trenches with excavated material.

3.9 REMOVAL OF WATER

A. Provide and operate equipment adequate to keep all excavations and trenches free of water. Remove all water during periods when concrete is being deposited, when pipe is being laid, during the placing and compaction of backfill, and at such other times as required for efficient and safe execution of the work. Avoid settlement or damage to adjacent property. Dispose of water in a manner that will not damage adjacent property. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation when possible. Design and operate dewatering systems to prevent removal of fines from existing ground.

B. Drainage of trench water through the pipeline under construction is prohibited.

C. The CONTRACTOR shall dispose of all water removed from the dewatering systems and excavations in a manner that is acceptable to the OWNER and to all regulatory agencies. The CONTRACTOR shall be responsible to obtain at his expense all permits required for dewatering and disposal of water.

D. Prior to beginning work, the CONTRACTOR shall develop a dewatering method and submit it to the ENGINEER and the OWNER. The CONTRACTOR's dewatering method shall take into account limitations in the existing operating conditions of the OWNER's sewage collection and pumping facilities and storm drainage system. Final acceptance of the CONTRACTOR's dewatering method will be based on demonstrated performance of the system to satisfy the requirements of dewatering as specified herein.

F. The CONTRACTOR shall be responsible and bear the cost for any breakdowns and associated repair costs if they are directly attributed to his dewatering operation.

G. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation material, instability of the slopes, or damage to the foundations or structures may occur, or other additional work or handling of materials may be required of the CONTRACTOR. The supply of all labor, materials, and equipment, and the performance of all work necessary to carry out additional work resulting from such inadequacy, premature shutdown, or failure of the dewatering system shall be undertaken by the CONTRACTOR to the satisfaction of the ENGINEER, and at no additional expense to the OWNER.

H. Dewatering shall be considered incidental to the construction and included in the applicable unit prices stated in the Proposal.

3.10 FOUNDATION STABILIZATION

A. When, in the opinion of the ENGINEER, the existing material in the bottom of the trench is unsuitable for supporting the pipe, excavate below the flow line of the pipe, as directed by the ENGINEER. Backfill the trench to subgrade of pipe bedding with foundation stabilization material specified hereinbefore. Place the foundation stabilization material over the full width of the trench

and compact in layers not exceeding 6 inches deep to the required grade.

3.11 PIPE BEDDING AND PIPE ZONE BACKFILL

A. Pipe bedding and pipe zone material shall be as specified in the drawings.

3.12 TRENCH BACKFILL ABOVE PIPE ZONE

A. In trenches under all structures, sidewalks, roads, parking areas, piping, and similar facilities, except where specifically shown, deposit backfill material conforming to Paragraph TRENCH BACKFILL. Repair any subsequent damage caused by settlement of trenches at the CONTRACTOR's sole expense. Under no circumstances allow sharp, heavy pieces of material to drop directly onto the pipe or the tamped material around the pipe.

B. Under no circumstances place backfill material in water. Backfill all trenches to elevation 2.5 feet NGVD with crushed gravel or crushed rock backfill in accordance with Paragraph PIPE BEDDING AND PIPE ZONE MATERIAL in paragraph 3.11, at no additional cost to the OWNER.

3.13 TRENCH BACKFILL BELOW THE PIPE BEDDING

A. When replacing existing pipe at a higher elevation, backfill below the new sewer pipe bedding shall be pipe bedding and pipe zone material as specified in paragraph 3.12. Grade the bottom of the trench to achieve even distribution as required.

3.14 UTILITY LINE CROSSINGS

A. Crushed stone backfill in accordance with Paragraph PIPE BEDDING AND PIPE ZONE MATERIAL in paragraph 3.11, shall be used under all culverts, water, gas, gravity sewerlines, force mains, buried telephone conduit, and any other miscellaneous buried pipelines that cross the excavated trench. Crushed stone backfill shall be carried a minimum of 2 feet beyond the edge of the buried utility. Crushed stone backfill beneath these facilities shall be considered incidental to the work and no additional payment will be made to the CONTRACTOR.

3.15 MAINTENANCE OF TRENCH BACKFILL

A. Maintain the backfilled trench surface until the following operations have been completed and approved by the ENGINEER:

1. Service connections installed and backfilled.
2. Valves, valve boxes, and hydrants installed.
3. Cleanup and restoration of all physical features.
4. Utilities restored to their original condition or better.

B. This maintenance shall include, but not be limited to, the addition of crushed rock backfill material and temporary pavement to keep the surface of backfilled trenches reasonably smooth, free from ruts and potholes, and suitable for normal traffic flow.

C. No additional payment will be made for the maintenance of the trench backfill prior to completion of the work outlined above.

D. No pavement replacement shall be undertaken until all items outlined above have been completed and approved by the ENGINEER.

3.16 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. Dispose of all excess excavated materials. Make arrangements for the disposal and bear all costs or retain any profit incidental to such disposal.

3.17 BLASTING

A. No blasting of any kind will be permitted.

3.18 SETTLEMENT

A. Any settlement noted in backfill, fill, or in structures built over the backfill or fill within the 1-year warranty period in accordance with the General Conditions will be considered to be caused by improper compaction methods and shall be corrected at no cost to the OWNER. Structures damaged by settlement shall be restored to their original condition by the CONTRACTOR at no cost to the OWNER.

3.19 MOISTURE CONTROL

A. During all compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of

fill. Maintain moisture content uniform throughout the lift. At the time of compaction, the water content of the material shall be at optimum moisture content, plus or minus 2 percentage points.

B. Insofar as practicable, add water to the material at the site of excavation. Supplement, if required, by sprinkling the fill.

C. Do not attempt to compact fill material that contains excessive moisture. Aerate material by blading, discing, harrowing, or other methods, to hasten the drying process.

3.20 TESTING

A. Maximum Dry Density and Optimum Moisture: The CONTRACTOR shall also be responsible to have determined at his expense the maximum dry density and optimum moisture for each type of soil and backfill material encountered, in accordance with ASTM D1557. Such tests shall be made well in advance of excavation and backfilling.

B. Field Density and Moisture Tests: The Independent Testing Laboratory will determine in-place density and moisture content by any one or combination of the following methods:

1. ASTM D2922, D1556, D2216, or other methods selected by the ENGINEER. Cooperate with this testing work by leveling small test areas as designated. Backfill test areas at CONTRACTOR's sole expense. The frequency and location of testing shall be one test per pipe run. However, any lift of fill may be tested at any time, location, or elevation. ENGINEER will select test locations.

END OF SECTION

SECTION 02230 - SITE CLEARING

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this

1.2. SUMMARY

A. This Section includes the following:
   a. Protecting existing trees shrubs groundcovers plants and grass to remain.
   b. Removing existing trees shrubs groundcovers plants and grass.
   c. Clearing and grubbing.
   d. Stripping and stockpiling topsoil.
   e. Temporary erosion and sedimentation control measures.

B. Related Sections include the following:

   a. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and temporary erosion and sedimentation control procedures.
   b. Division 01 Section "Execution Requirements" for verifying utility locations and for recording field measurements.
   c. Division 02 Section "Building Demolition" for demolition of buildings, structures, and site improvements.
   d. Division 02 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3. DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of

individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4. MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5. SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Division 01 Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6. QUALITY ASSURANCE

A. Pre installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7. PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

a. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

b. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 PRODUCTS

2.1. SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 02 Section "Earthwork."

a. Obtain approved borrow soil materials off-site.

PART 3 EXECUTION

3.1. PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

a. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2. TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3. TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

a. Do not store construction materials, debris, or excavated material within fenced area.
b. Do not permit vehicles, equipment, or foot traffic within fenced area.
c. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

a. Cover exposed roots with burlap and water regularly.
b. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
c. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

a. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
b. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4. UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

a. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

a. Arrange with utility companies to shut off indicated utilities.

b. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Excavate for and remove underground utilities indicated to be removed.

3.5. CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
   a. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   b. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   c. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed grade.
   d. Use only hand methods for grubbing within tree protection zone.
   e. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

   a. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6. TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.
B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

   a. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

   a. Do not stockpile topsoil within tree protection zones.

   b. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7. SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

3.8. DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

a. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

b. Contractor shall make all reasonable efforts to recycle materials that are removed.

END OF SECTION 02230

SECTION 02240 - DEWATERING

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. This Section includes construction dewatering.

Unless specifically authorized by the Owner, all pipe, and structures shall be installed "in the dry". The contractor shall dewater trench excavation as required for the proper execution of the work, using one or more of the following approved methods: well point system, and or pumps with silt box and filtering system.

Contractor shall design and provide a 920 GPM ground water treatment system plan comprised of the following:

a. A large settling tank (silt box) with baffles for the removal of large solids and free product

b. Sock Bag filters shall be attached to the discharge hose into the settling tank and sewer manholes for the removal of suspended solids. Contractor responsible for determining number of discharge hose's required from the settling tank to the manhole to maintain adequate flow.

Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining a high vacuum, and at the same time, of handling large volumes of air as well as of water.

Pumps shall be capable of handling the water the contractor need removed to perform the work. Sock filters shall be provided on the pump discharge at the silt box and manhole discharge. Filter cloth draped in manhole shall not be used except for temporary basis of less than 4 hours.

Silt boxes shall be capable of handling the water the contractor needs removed to perform the work. Silt box discharged into the sewer systems shall have filter socks on the discharge hose. The contractor shall provide multiple discharge hose with filtering sock if required to remove the water from the silt box. Silt boxes shall be cleaned daily. Socks shall be replaced as needed. Sock(s) with holes or cuts shall be replaced immediately.

The Contractor shall be responsible for disposing into the city sewer system of all water resulting from trench dewatering operations, and shall dispose of the water without damage or undue inconvenience to the work, the surrounding area, or the general public. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements or other structures: and to do this he may be required to conduct the water to a suitable place of discharge may be determined by the Owner.

The contractor shall be responsible for payment to the city for the clean up of the sewers system and any repairs that are determined to have been caused by the project dewatering.

1.3. SUBMITTALS

A. General: As specified in:

a. General Conditions;

b. Division 1;

B. Submit copy of dewatering permit prior to installing dewatering system, or systems.

C. Submit dewatering plan, or plans, prior to installing dewatering system, or systems.

a. Contractor is responsible for the de-watering plan; should the contractor require additional de-watering requirement this shall be done at no additional cost to the owner.
b. Dewatering shall be done to the city's sewer system.

1.4. QUALITY ASSURANCE

A. Regulatory Requirements

a. Obtain Dewatering Permit from South Florida Water Management District prior to dewatering of any areas. Make application and arrangements and pay fees and charges for dewatering and disposal of discharge from dewatering

b. Submit copy of dewatering permit.

c. Comply with requirements of dewatering permit. Meet regulatory requirements relative to dewatering and disposal of discharge water from dewatering.

1.5. PROJECT/SITE CONDITIONS

A. Noise Limitations.

a. Dewatering systems and equipment shall comply with ordinances regulating noise.

b. Provide "residential" mufflers on engines.

c. Provide sound attenuating enclosures over dewatering system equipment if necessary to meet noise limit requirements of ordinances and regulations.

d. Do not shut off dewatering systems to meet noise limitations during non-work hours. Provide sound attenuating measures to meet noise limit requirements.

e. Provide sound attenuating equipment, devices, and measures at no additional cost to the Owner.

f. Modify dewatering system, or systems, as required to comply with ordinances regulating noise.

B. Damage Prevention

a. Dewatering shall not cause settlement of existing or new structures. Repair or replace structures damaged by settlement caused by dewatering. Repair or replace structures at no additional cost to the Owner.

b. Discharge from dewatering systems shall not cause erosion of turf or soil. Replace turf damaged by dewatering discharge. Replace soil displaced by dewatering discharge. Replace turf and soil at no additional cost to the Owner.

c. Discharge from dewatering systems shall not damage landscaping. Replace landscaping damaged by dewatering discharge. Replace landscaping at no additional cost the Owner.

d. Modify dewatering system, or systems, as required to eliminate conditions that cause damage.

C. Access

a. Dewatering systems and dewatering system operations shall not prevent emergency access or prevent persons living in the vicinity of construction from completing their normal daily pursuits.

b. Provide temporary access over dewatering system piping for vehicular and pedestrian traffic.

PART 2 – PRODUCTS

2.1. DEWATERING SYSTEMS

A. Contractor shall be responsible for the sizing and selection of dewatering systems, dewatering equipment, dewatering system piping, and appurtenances.

PART 3 – EXECUTION

3.1. GROUNDWATER

A. Contractor shall be responsible for evaluating and determining groundwater conditions.

3.2. DEWATERING PLAN

A. Contractor shall prepare and submit dewatering plan for each dewatering system

B. Ground water plan shall include the following:

a. Groundwater data and assumptions relating to groundwater conditions.

b. Description of proposed dewatering system with drawings, diagrams, and system component data as applicable.

c. Proposed measures to insure dewatering system reliability.

d. Description of discharge water disposal methods.

e. Identification and location of private water supply wells, public water supply wells, lakes, and ponds that may be affected by dewatering.

f. Anticipated affect upon private water supply wells, public water supply wells, lakes, and ponds that may be impacted by dewatering. Proposed measures to ameliorate effects of dewatering upon private water supply wells, public water supply wells, lakes, and ponds.

g. Other data pertinent to the dewatering system.

3.3. DEWATERING SYSTEMS

A. Provide, operate, and maintain dewatering systems including well points, wells, chemical grouting, water tight sheeting, ground freezing, tremie wall, or any other technology as may be necessary to accomplish dewatering in a safe and proper manner.

B. Provide dewatering systems that control groundwater level in conformance with the requirements of this Section. Provide dewatering systems that lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide dewatering systems that continuously maintain groundwater level at, or below, level shown, specified, or shown and specified until backfilling and compaction have been completed to level shown, specified, or shown and specified.

C. Provide automatic starting devices, standby pumps, and other equipment and controls required to provide continuous dewatering in the event of an outage of dewatering pump or other dewatering system component.

D. Provide headers, suction piping, and discharge piping as required to convey water from well points, dewatering wells, and caissons to dewatering system discharge point designated in permit and accepted dewatering plan.

E. Modify dewatering system during the course of construction as conditions that affect dewatering change.

3.04 DEWATERING OPEN EXCAVATIONS

A. Lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide monitoring wells or other means to measure groundwater level prior to starting excavation.

B. Dewater excavation from outside the limits of excavation. Dewater excavation from below the bottom of excavation. Do not dewater excavation from sumps within excavation.

C. Dewatering measures shall provide the following:

a. Prevent instability of excavation due to groundwater.

b. Prevent the disturbance of subgrade bearing materials due to groundwater.

c. Keep excavation free from standing water and running water.

d. Prevent tanks, pipes, and other structures from being displaced by hydrostatic pressures.

D. Do not install or operate dewatering systems that allow movement of soil through excavation or excavation subgrade.

E. Do not install or operate dewatering systems that allow movement of soil from beneath existing or previously installed structures or pipes.

3.5. DEWATERING TRENCHES

A. Lower groundwater to level shown, specified, or shown and specified in advance of excavation. Provide monitoring wells or other means to measure groundwater level prior to starting excavation.

B. Dewater trench from outside the limits of trench. Dewater trench from below the excavated trench bottom. Do not dewater trench from sumps within trench.

C. Dewater trench to a minimum level of 24 inches below excavated trench bottom. Maintain water level a minimum of 24 inches below excavated trench bottom until backfill meets the following requirements:

a. Backfilling and compaction have progressed as to a depth that installed piping will not be displaced by hydrostatic pressure.

b. Backfilling and compaction have been completed above natural water table to a level that remaining backfill can be placed and compacted.

D. Dewatering measures shall provide the following:

a. Prevent instability of trench due to groundwater.

b. Prevent the disturbance of subgrade bearing materials due to groundwater.

c. Keep trench free from standing water and running water.

d. Prevent tanks, pipes, and other structures from being displaced by hydrostatic pressures.

E. Do not install or operate dewatering systems that allow movement of soil through trench or trench subgrade.

F. Do not install or operate dewatering systems that allow movement of soil from beneath existing or previously installed structures or pipes.

3.6. SURFACE WATER CONTROL

A. Do not allow surface runoff to flow into excavations and trenches.

a. Grade top perimeter of excavation to prevent surface water run-off to flow into excavation.

b. Grade sides and ends of trench to prevent surface water run-off to flow into trench.

B. Do not allow storm water to puddle or pond on construction site except in designated storm water retention areas. Grade construction areas so that storm water drains to storm water system.

C. Do not allow storm water to flow off construction site except through permitted discharge structures and through permitted storm water pipes, conduits, and channels.

D. Do not allow storm water to flow into or through stored fill and backfill materials.

3.7. DEWATERING DISCHARGE CONTROL

A. Discharge water from dewatering system to storm drain systems in accordance with dewatering permit and as specified in this Section. Provide silting basins and other discharge treatment systems in accordance with dewatering permit and to meet discharge permit requirements.

B. Do not allow discharge from dewatering system to puddle or pond on construction site except in areas designated and approved to receive discharge from dewatering system.

C. Do not allow to discharge from dewatering system to flow off construction site except through permitted discharge structures and through pipes, conduits, and channels that have been designated and approved for discharge flow from dewatering systems.

E. Do not use sanitary sewers for disposal of water from water control systems. Do not use sanitary sewer system under construction as conduit to remove ground water from trench.

F. Do not use storm sewer under construction as conduit to remove ground water from trench. Do not use new storm water system for dewatering system discharge unless new storm water system has been approved for dewatering system discharge.

G. Do not discharge water containing settleable solids into storm sewers.

H. Do not contaminate or disturb the environment of properties adjacent to the Work.

I. Do not contaminate streams or other surface waters.

J. Provide temporary facilities and controls for dewatering system discharge. Temporary facilities and controls shall be appropriate to the project, including, but not limited to:

a. Silting basin, or basins, of adequate size.

b. Filters.

c. Coagulants.

d. Screens.

H. Discharge onto pavement shall not damage pavement.

3.8. DEWATERING SYSTEM REMOVAL AND CLEANUP

A. Completely remove dewatering systems installed for construction.

B. Plug and seal dewatering wells after dewatering operations are concluded. Plug and seal dewatering wells in accordance with permit requirements.

C. Remove and dispose of solids, including sand, mud, and other material, discharged from dewatering systems.

3.9. GENERAL ADDITIONAL REQUIREMENTS

A. Contractor shall design and provide a ground water treatment system plan comprised of the following:

a. A large settling tank (silt box) with baffles for the removal of large solids and free product

b. Sock Bag filters shall be attached to the discharge hose into the sewer manholes for the removal of suspended solids. Contractor responsible for determining number of discharge hose's required from the settling tank to the manhole to maintain adequate flow.

B. Well point systems must be efficient enough to lower the water level in advance of the excavation and maintain it continuously in order that the trench bottom and sides shall remain firm and reasonably dry. The well points shall be designed especially for this type of service, and the pumping unit used shall be capable of maintaining a high vacuum, and at the same time, of handling large volumes of air as well as of water. Pumps shall be capable of handling the water the contractor need removed to perform the work. Sock filters shall be provided on the pump discharge at the silt box and manhole discharge. Filter cloth draped in manhole shall not be used except for temporary basis of less than 4 hours.

C. Silt boxes shall be capable of handling the water the contractor needs removed to perform the work. Silt box discharged into the sewer systems shall have filter socks on the discharge hose. The contractor shall provide multiple discharge hose with filtering sock if required to remove the water from the silt box. Silt boxes shall be cleaned daily. Socks shall be replaced as needed. Sock(s) with holes or cuts shall be replaced immediately. He shall not dam, divert, or cause water to flow in excess in existing gutters, pavements or other structures: and to do this he may be required to conduct the water to a suitable place of discharge may be determined by the Owner.

END OF SECTION 02240

SECTION 02275 - NPDES REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section describes the required documentation to be prepared and signed by the CONTRACTOR and all subcontractors before conducting construction operations, in accordance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit, as required by Florida Administrative Code (F.A.C.) Chapter 62-621.

B. The CONTRACTOR shall be responsible for implementation, maintenance and inspection of stormwater pollution prevention control measures in accordance with F.A.C. Chapter 62-621 including, but not limited to, erosion and sediment control, stormwater management plans, waste collection and disposal, off-site vehicle tracking, and other practices shown on the Drawings and/or specified elsewhere in this or other specifications. The stormwater pollution prevention control measures shall include protection of all public and private stormsewer facilities potentially impacted during construction. Stormwater facilities include, but are not limited to, streets, inlets, pipes, ditches, swales, canals, culverts, control structures, and detention/retention areas.

C. The CONTRACTOR shall review the implementation schedule of the Stormwater Pollution Prevention Plan (SWPPP) in a meeting with the owner prior to start of construction.

D. Unless indicated in the Unit Price Schedule as a pay item, no separate payment will be made for work performed under this Section. Include cost of work to be performed under this Section in pay items of which this work is a component. This includes removal of temporary erosion control items when it is agreed by the county that they are no longer necessary.

1.3 REFERENCE DOCUMENTS

A. ASTM D3786 – Standard Test Method for Hydraulic Bursting Strength for Knitted Goods and Nonwoven Fabrics

B. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1 NOTICE OF INTENT (NOI)

A. Fill out, sign and date a Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities, (FDEP Form 62-621.300(4)(b)). Submit the signed copy of the NOI to the county. Submit the completed form to the FDEP along with the required permit fee.

3.2 CERTIFICATION REQUIREMENTS

A. On the approved OPERATOR'S INFORMATION form, fill out the name, address and telephone number for the CONTRACTOR, persons or firms responsible for maintenance and inspection of erosion and sediment control measures, and all Subcontractors, as required by F.A.C. 62-621.

B. The CONTRACTOR and Subcontractors named in the Operator's Information form shall read, sign and date the approved CONTRACTOR's / SUBCONTRACTOR's CERTIFICATION form, as required by F.A.C. 62-621..

C. The persons or firms responsible for maintenance and inspection of erosion and sediment control measures shall read, sign and date the approved EROSION CONTROL CONTRACTOR'S INSPECTION AND MAINTENANCE CERTIFICATION form, as required by F.A.C. 62-621..

D. Submit a copy of all forms to the owner Stormwater Division before beginning construction.

3.3 RETENTION OF RECORDS

A. Retain a copy of the SWPPP at the construction site and at the Contractor's office from the date that it became effective to the date of project completion.

B. At project closeout, submit to the CITY all NPDES forms and certifications, as well as a copy of the SWPPP. Stormwater pollution prevention records will be retained by the county for a period of three (3) years from the date of project completion.

3.4 REQUIRED NOTICES

A. The following notices shall be posted from the date that the SWPPP goes into effect until the date of final site stabilization:

1. A copy of the submitted NOI and a brief project description, as given in the SWPPP, shall be posted at the construction site and at the CONTRACTOR's office in a prominent place for public viewing.

2. Notice to drivers of equipment and vehicles, instructing them to stop, check and clean tires of debris and mud before driving onto traffic lanes. Post such notices at every stabilized construction exit area.

3. Post a notice of waste disposal procedures in an easily visible location on site.

4. Notice of hazardous material handling and emergency procedures shall be posted with the NOI on site. Keep copies of Material Safety Data Sheets at a location on site that is known to all personnel.

5. Keep a copy of each signed certification at the construction site and at the CONTRACTOR's office.

6. Compliance with F.A.C. 62-621 is the CONTRACTOR's responsibility for the life of the project.

7. The NOI is not to be submitted to FDEP until agreed upon by both the CONTRACTOR and the owner.

Submittal of the NOI to FDEP after final stabilization is approved.

END OF SECTION 02275

SECTION 02300 – EARTHWORK

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:
   a. Preparing subgrades for slabs-on-grade and walks
   b. Excavating and backfilling for buildings and structures.
   c. Subbase course for concrete walks.

B. Related Sections include the following:
   a. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities.
   b. Division 02 Section "Drilled Piers" for excavation of shafts and disposal of surplus excavated material.
   c. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor barrier and beneath the slab-on-grade.
   d. Divisions Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3. DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   a. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   b. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   a. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

b. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4. SUBMITTALS

A. Product Data: For the following:

a. Controlled low-strength material, including design mixture.

1.5. QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.6. PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

B. Notify Architect not less than two days in advance of proposed utility interruptions.
Do not proceed with utility interruptions without Owner or Architect's written permission.
Contact utility-locator service for area where Project is located before excavating.

C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 PRODUCTS

2.1. SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 1½" in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or a combination of these groups.

   a. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 EXECUTION

3.1. PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

3.2. DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

   a. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3. EXPLOSIVES

A. Explosives: Do not use explosives.

3.4. EXCAVATION, GENERAL

C. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

   a. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5. EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   a. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   b. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6. EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7. EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.

   a. Clearance: As indicated.

D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells,

joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

3.8. SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

   a. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9. UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

   a. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10. STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11. BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   a. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   b. Surveying locations of underground utilities for Record Documents.
   c. Testing and inspecting underground utilities.
   d. Removing concrete formwork.
   e. Removing trash and debris.
   f. Removing temporary shoring and bracing, and sheeting.

C. Place backfill on subgrades free of mud, or standing water.

3.12. SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   a. Under grass and planted areas, use satisfactory soil material.
   b. Under walks and pavements, use satisfactory soil material.
   c. Under steps and ramps, use engineered fill.
   d. Under building slabs, use engineered fill.
   e. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, or standing water.

3.13. SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

B. Do not place backfill or fill soil material on surfaces that are muddy.
Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14. COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

   a. Under structures, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

b. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

c. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

d. For utility trenches, compact each layer of initial and final backfill soil material at percent.

3.15. GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Provide a smooth transition between adjacent existing grades and new grades.
Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding.

3.16. SUBBASE AND BASE COURSES

A. Place subbasecourse on subgrades free of mud, or standing water.

B. On prepared subgrade, place subbasecourse under pavements and walks as follows:

a. Shape subbasecourse to required crown elevations and cross-slope grades.

b. Place subbasecourse in a single layer.

c. Compact subbasecourse at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17. PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

E. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18. DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

B. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

C. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

SECTION 02466 - DRILLED PIERS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:
   a. Dry-installed or slurry displacement-installed drilled piers, at Contractor's choice.

B. Related Sections include the following:

   a. Division 1 Section "Unit Prices" for list of unit prices.
   b. Division 1 Section "Temporary Facilities and Controls."
   c. Division 3 Section "Cast-in-Place Concrete" for general structural and building applications of concrete.

1.3. UNIT PRICES

A. Basis of Bids: Base bids on indicated number of drilled piers; design length from top elevation to bottom of shaft and diameter of shaft.

   a. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, dewatering, reinforcement, concrete fill, and other items for complete drilled-pier installation.
   b. See Division 1 Section "Unit Prices" for list of unit prices.

1.4. SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For concrete reinforcement detailing fabricating, bending, and placing.

C. Design Mixes: For each class of concrete. Include revised mix proportions when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

   a. Laboratory Test Reports: For evaluation of concrete materials and mix design.

D. Qualification Data: For Installer and testing agency.

E. Record drawings at Project closeout according to Division 1 Section "Closeout Procedures."

1.5. QUALITY ASSURANCE

A. Drilled-Pier Standard: Comply with provisions in ACI 336.1, "Reference Specifications for the Construction of Drilled Piers," unless modified in this Section.

B. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

a. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 to perform material evaluation tests and to design concrete mixes, as documented according to ASTM E 548.

1.6. PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.

a. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.

B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

PART 2 PRODUCTS

2.1. STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

2.2. CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or II.

a. Fly Ash Admixture: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, 3/4-inch maximum aggregate size.

C. Water: Potable, complying with ASTM C 94/C 94M requirements.

D. Admixtures: Certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

a. Water-Reducing Admixture: ASTM C 494, Type A.
b. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
c. High-Range, Water-Reducing Admixture: ASTM C 494, Type G.
d. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.3. SLURRY

A. Slurry: Pulverized sodium bentonite, pulverized attapulgite, or polymers, mixed with water to form stable colloidal suspension; complying with ACI 336.1 for density, viscosity, sand content, and pH.

2.4. CONCRETE MIX

A. Prepare design mixes according to ACI 211.1 and ACI 301 for each type and strength of concrete determined by either laboratory trial mix or field test data bases.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:

a. Compressive Strength (28 Days): Per Plans
b. Minimum Slump: Capable of maintaining the following slump until completion of placement:
- 4 inches for dry, uncased, or permanent-cased drilling method.
- 7 inches for slurry displacement method.

c. Do not air entrain concrete for drilled piers.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 limits as if concrete were exposed to deicing chemicals.

D. Limit water-soluble, chloride-ion content in hardened concrete to [**0.15**] percent by weight of cement.

E. Concrete-mix design adjustments may be considered if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant. Resubmit and obtain approval of proposed changes to concrete-mix proportions.

2.5. CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

a. Do not add water to concrete mix after mixing.
b. Maintain concrete temperature to not exceed 90 deg F.

PART 3 EXECUTION

3.1. PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2. EXCAVATION

A. Unclassified Excavation: Excavation is unclassified and includes excavation to bearing elevations regardless of character of materials or obstructions encountered.

a. Obstructions: Unclassified excavation includes removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions.

B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

C. Excavate shafts for drilled piers to indicated elevations. Remove loose material from bottom of excavation.

a. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
b. Remove water from excavated shafts before concreting.

D. Notify and Monroe County Building Inspector to inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.

a. Do not excavate shafts deeper than elevations indicated, unless approved by Architect.

E. Excavate shafts for closely spaced drilled piers and those occurring in fragile or sand strata, only after adjacent drilled piers are filled with concrete and allowed to set.

F. Slurry Displacement Method: Stabilize excavation with slurry maintained a minimum of 60 inches above ground-water level and above unstable soil strata to prevent caving or sloughing of shaft. Maintain slurry properties before concreting.

a. Excavate and complete concreting of drilled pier on same day, if possible, or redrill, clean, and test slurry in excavation before concreting.
b. Clean bottom of each shaft before concreting.

G. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.

a. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

H. Inspection: Each drilled pier must be inspected and tested by Owner's testing and inspecting agency before placing concrete.

a. Provide and maintain facilities with equipment required for testing and inspecting excavations. Cooperate with testing and inspecting personnel to expedite the Work.
b. Notify Architect and testing agency at least six hours before excavations are ready for tests and inspections.

3.3. STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.

D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover to reinforcement.

E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.

F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4. CONCRETE PLACEMENT

A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.

B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.

a. Where concrete cannot be directed down shaft without striking reinforcing, place concrete with chutes, tremies, or pumps.
b. Vibrate top 60 inches of concrete.

C. Slurry Displacement Method: Place concrete in slurry-filled shafts by tremie methods or pumping. Control placement operations to ensure that tremie or pump pipe is embedded no fewer than 60 inches into concrete, and flow of concrete is continuous from bottom to top of drilled pier.

D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.

E. When hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no greater than 90 deg F.

a. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

F. Concrete: Sampling and testing of concrete for quality control may include the following:

a. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94/C 94M.

- Slump: ASTM C 143/C 143M; one test at point of placement for each compressive-strength test, but no fewer than one test for each concrete load.
- Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens, unless field-cured test specimens are required.
- Compressive-Strength Tests: ASTM C 39; one set for each drilled pier, but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and one specimen will be retained in reserve for later testing if required.

b. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
c. Test results will be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests will contain Project

identification name and number, date of concrete placement, name of concrete testing and inspecting agency, concrete type and class, location of concrete batch in drilled pier, design compressive strength at 28 days, concrete-mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

d. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate concrete strengths or other requirements have not been met.

3.4. DISPOSAL OF MATERIALS

A. Remove surplus excavated material and slurry and legally dispose of it off Owner's property.

END OF SECTION 02466

SECTION 02511 - ASPHALTIC CONCRETE SURFACE COURSE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: This section covers the work necessary for the construction of the Asphalt / Pavement.
   1. Type SP- 9.5 ..... 9.5 mm

1.02 REFERENCES; FDOT STANDARD SPECIFICATIONS

A. The term "Standard Specifications" is used; such reference shall mean the most current edition of Florida Department of Transportation Standard Specification for Road and Bridge Construction. The Standard Specifications shall be considered as part of this section of the Specifications; below are Listed references for the contractor's convenience; the contractor shall be responsible for obtaining and incorporation in the contract all of the Standard Specification's and the most current revisions that apply to this contract scope of work. The contractor shall document in his daily reports the required Standard Specifications that are used.

B. Reference(s):

1. SECTION 334 HOT MIX ASPHALT FOR LOCAL AGENCIES
2. SECTION 120 EARTHWORH AND RELATED OPERATIONS FOR LOCAL AGENCIES
3. SECTION 710 PAINTED PAVEMENT MARKINGS
4. SECTION 711 THERMOPLASTIC TRAFFIC STRIPES AND MARKINGS
5. SECTION 911 LIMEROCK MATERIAL FOR BASE AND STABILIZED BASE
6. SECTION 971 TRAFFIC MARKING MATERIALS

1.03 DEFINITIONS

A. The phrase "FDOT Specifications" shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

1.04 SYSTEM DESCRIPTION

A. Furnish and install asphaltic concrete pavement as shown on the Drawings and specified in this Section. Furnish and install asphaltic concrete pavement in accordance with the lines, grades and typical section as indicated on the Drawings.

B. Furnish and install new asphaltic concrete pavement required to complete the paving work.

C. Furnish and install asphaltic concrete topping as indicated on the Drawings.

D. Repair asphaltic concrete pavement damaged as a result of completing Work and damaged by construction operations.

1.05 SUBMITTALS

A. General: As specified in:

1. Division 1;

2. This Section

B. Submit proposed formula for asphaltic concrete paving prior to starting pavement work.

1.06 QUALITY ASSURANCE

A. FDOT Specifications referred to in this Section are made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as through reproduced herein in their entirety.

1.07 DELIVERY, STORAGE, AND HANDLING

A. General

1. Product Delivery: As specified in Section 01650 Product Delivery Requirements.

2. Product Storage and Handling: As specified in Section 01660 Product Storage and Handling.

B. Asphaltic Concrete Pavement Materials: Delivery, storage, and handling of asphaltic concrete pavement materials shall meet the requirements of FDOT LAP / Specifications.

1.08 PROJECT/SITE CONDITIONS

A. Environmental Requirements

1. Do not place base, prime coat, tack coat, or asphaltic concrete when rain is falling or when there is water on the surface to be covered.

2. Monitor climatic conditions and anticipate conditions producing rainfall.

3. Remove and replace materials damaged by rainfall or standing water.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Lime Rock Base: Lime Rock base shall be in accordance with Section 911 of the FDOT Specifications.

B. Soil-Cement Base: Soil Cement base shall be in accordance with Section 270 of the FDOT Specifications.

C. Prime Coat: Material used for prime coat shall be cut-back Asphalt Grade RC-70 conforming to Sections 300 and 916 of the FDOT Specifications for prime to be used on Miami Oolite formation lime rock.

D. Tack Coat: Material used for tack coat shall be Emulsified Asphalt Grade RS-2 conforming to Sections 300 and 916 of the FDOT Specifications. All areas to be paved shall receive a final tack coat that provides a uniform finish for new and existing paving.

E. Asphaltic Concrete: Materials and construction of asphaltic concrete patch and surface courses shall be Type SP-9.5

PART 3 – EXECUTION

3.01 INSTALLATION

A. Subgrade

1. Stabilize roadway subgrades to the minimum depth shown on the Drawings to a Limerock Bearing Ratio of not less than 40. Stabilizing shall be Type B as defined in Section 160 of the FDOT Specifications. Stabilization may require addition and thorough mixing in of crushed limerock, course limerock screenings, or any other stabilizing material acceptable to the Engineer. Apply stabilizing material in such quantity that, after mixing and blending, the subgrade will have a LBR of not less than 40. Mix, blend, or mix and blend stabilizing material into subgrade material by plowing, scarifying, disking, harrowing, blading and mixing with rotary tillers until mixed materials are of uniform bearing value throughout width and depth of layer being processed.

2. Make not less than three density determinations on each day's final compaction operations on each course. Make density determinations at more frequent intervals if deemed necessary by the Engineer.

B. Base

1. Construct Base in accordance with Section 230 of the FDOT Specifications, to the thickness and width indicated on the Drawings.

2. After spreading of the base material is completed, scarify entire surface and shape surface to produce the exact grade and cross section after compaction. For double course base, extend scarifying to a depth sufficient to penetrate slightly the surface of the first course. The maximum depth of each lift shall be 8 inches.

3. When the material does not have the proper moisture content to insure the required density, wetting or drying shall be required.

   a. If the material is deficient in moisture, add and uniformly mix in water by disking the base course to the full depth of the base course.

   b. If the material contains an excess of moisture, allow the material to dry to proper moisture content before compacting material.

4. As soon as proper conditions of moisture are attained, compact material to an average density not less than 98 percent maximum density as determined in more than one course, the density shall be obtained in each lift of the base.

5. During final compacting operations, if blading of any areas is necessary to obtain true grade and cross section, complete compacting operations for such areas prior to making density determination on finished base.

6. Unless otherwise directed by the Engineer, "hard-plane" the surface with a blade grader immediately prior to the application of the prime coat to remove the thin glaze or cemented surface and to allow free penetration of the prime material. Materials planed from the base shall be removed from base area.

7. If cracks or checks appear in the base, either before or after priming, which in the opinion of the Engineer, would impair the structural efficiency of the base course, remove such cracks or checks by rescarifying, reshaping, adding base material where necessary and recompacting, at no additional cost to the Owner.

8. If at any time the subgrade material shall become mixed with the base course material, dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean base material. Shape and compact clean base material as specified in this Article. Remove, replace, shape, and compact material at no additional cost to the Owner.

C. Prime Coat: Apply prime coat at a rate of 0.15 gallons per square yard, and perform the Work in accordance with Section 300 of the FDOT Specifications.

D. Tack Coat: Apply tack coat at a rate between 0.02 and 0.10 gallons per square yard, and perform the Work in accordance with Section 300 of the FDOT Specifications.

E. Asphaltic Concrete: Spreading, compact, and joint the wearing surface in accordance with Sections 330, 332, 333 of the FDOT Specifications to the thickness indicated on the Drawings.

3.02 PAVEMENT REPAIR

A. Repair damage to pavement as a result of Work under this Contract. Repair damage to pavement in a manner satisfactory to the Engineer and at no additional cost to the Owner. Pavement repair shall include preparation of the subgrade, placing and compacting of the limerock base, priming of the base, and placing and maintaining of surface treatment, as specified in this Section.

B. Width of repairs shall extend at least 12 inches beyond the limit of damage. Edge of pavement to be left in place shall be cut to a true edge with a saw or other acceptable method that provides a clean edge to abut repair. Line of the repair shall be reasonably uniform with no unnecessary irregularities.

END OF SECTION

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the work necessary to construct all asphalt, curbs, sidewalks, rock surfacing, and other site features.

B. Where the materials, construction procedures, degree of compaction of materials, and the method of control and testing, as required in these Specifications differ from the FDOT requirements, the more stringent requirements shall apply.

PART 2 PRODUCTS

2.1 GENERAL

A. The CONTRACTOR will be responsible for furnishing satisfactory materials that meet the Specifications and shall make such tests during the course of the work as are necessary to assure that the quality of the material used meets the Specifications.

2.2 RELATIVE COMPACTION

A. "Relative compaction" is defined as the ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the ENGINEER.

2.3 OPTIMUM MOISTURE CONTENT

A. "Optimum moisture content" shall be determined by the ASTM standard specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

2.4 LIME ROCK BASE COURSE

A. Aggregate quality and gradation shall confirm to Section 911 of the FDOT Specifications.

2.5 FLOWABLE FILL

A. Provide flowable fill with a minimum/maximum bearing strength of 500 psi.

2.6 CONCRETE

A. Concrete shall be in conformance with Section 345 of the FDOT Specifications.

B. Concrete Forms: All forms for curbs and sidewalks shall be either 2-inch dimensioned lumber, plywood, or metal forms. Forms on the face of the curb shall have no horizontal form joints within 7 inches of the top of the curb.

C. Curing Compound: Conforming to Section 925 of FDOT Specifications.

D. Reinforcing Steel: Conform to ASTM A615, Grade 60.

2.7 TRAFFIC STRIPING MARKINGS

A. All traffic striping markings (i.e., lane, edge of pavement, directional, informational, etc.) shall be in conformance with Section 971 of the FDOT Specifications.

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURE

A. The ENGINEER reserves the right to vary the type of resurfacing as best serves the interest of the OWNER. Trench backfill shall be as specified in Section 02222, TRENCH EXCAVATION AND BACKFILL.

B. In addition to the requirements set forth herein, the work shall conform to the applicable workmanship requirements of the state highway or municipal specifications.

3.2 STREET MAINTENANCE

A. Maintain all trenches as specified under Section 02222, TRENCH EXCAVATION AND BACKFILL.

3.3 SUBGRADE

A. Backfill and compaction of trenches shall be as specified in Section 02222, TRENCH EXCAVATION AND BACKFILL. Shape subgrade to required line, grade, and cross section. Remove all soft or otherwise unsuitable material disclosed by rolling the subgrade and replace with suitable material from the excavation. Fill holes and depressions, which develop under the roller, to the required grade and cross sections with material from the excavation. The finished subgrade shall be within a tolerance of plus or minus 0.08 of a foot of the grade and cross section, and shall be smooth and free from irregularities and at the density of 95 percent ASTM D1557.

3.4 CONSTRUCTION OF BASE COURSE

A. Obtain ENGINEER's acceptance of the subgrade prior to placing any base course material on the subgrade. Place base course in maximum 6-inch loose lifts and compact to not less than 98 percent ASTM D1557.

3.5 BASE COURSE REPAIR

A. General:

1. The base course repair work shall consist of constructing a compacted lime rock base course, of the thickness and width in accordance with the details for the respective application, as shown on the Drawings.
2. All base course repair work shall conform to the grades and cross sections of the existing pavement. The finished grade of the lime rock base shall be level with the existing base course. The lime rock for base course construction shall be Miami Limerock, in accordance with Section 911, FDOT Specifications. The base course shall be constructed in accordance with all applicable provisions of Section 200, FDOT Specifications.
3. If at any time the subgrade material becomes mixed with the base course materials, the CONTRACTOR shall, without additional compensation, dig out and remove the mixture, reshape, and recompact the subgrade and replace the materials removed with the clean rock which shall be watered and rolled until satisfactorily compacted.

3.6 DEPTH OF LAYERS

A. The base course shall be constructed in lifts of not more than 6 inches in thickness prior to compaction.

3.7 SPREADING MATERIALS

A. The base course material may be spread by any method that will result in an even distribution of the material upon the roadway without perceptible separation in gradation.

B. Should there occur during any stage of the surfacing or stockpiling, a separation of the coarser from the finer materials causing serious lack of uniformity in the grading, the CONTRACTOR shall immediately make changes in the method of handling such as will prevent separation and meet acceptance of the ENGINEER.

C. Equipment such as scrapers and other equipment essentially used for earth excavation will not be permitted.

3.8 ROLLING

A. Compaction of each layer of base shall be performed in accordance with Section 200 of the FDOT Specifications.

B. Compaction equipment shall be adequate in design to provide compaction and obtain the specified density for each layer. Water shall be applied as needed to obtain the specified densities at the CONTRACTOR's sole expense.

C. In-place density and moisture content will be determined by any one or combination of the following methods: ASTM D2922, D1556, D2216, or other methods selected by the ENGINEER. Cooperate with this testing work by leveling small test areas designated. Backfill test areas at CONTRACTOR's sole expense.

D. Each layer of base course shall be placed and compacted to the specified density before a succeeding layer is placed.

E. The CONTRACTOR shall construct the base course in an orderly manner so that a reasonable length of trench will be ready for testing and a reasonable amount of time will be allowed for the ENGINEER to perform tests and obtain the test results during normal working hours.

F. Prior to testing any completed base course, the CONTRACTOR shall show reasonable proof that the completed section meets the requirements specified.

3.9 CORRECTION OF SURFACE DEFECTS

A. Should irregularities develop in any surface during or after rolling, they shall be remedied by loosening the surface and correcting the defects, after which the entire area, including the surrounding surface, shall be rerolled until thoroughly compacted. The finished surface shall be true to the proper grade and crown before proceeding with the surfacing.

3.10 SURFACE TOLERANCES

A. The finished surface of the base course at any point shall be within plus or minus 0.04 foot of the grade required to provide the specified pavement thickness.

3.11 SURFACE TOLERANCE

A. Tests for conformity with the specified grade shall be made by the CONTRACTOR immediately after initial compression. Any variation shall be immediately corrected by the removal or addition of materials and by continuous rolling.

B. The completed surface of the pavement shall be of uniform texture, smooth, uniform as to grade, and free from defects of all kinds. The completed surface shall not vary more than 1/8 inch from the lower edge of a 10-foot straightedge placed on the surface along the centerline or across the trench.

C. After completion of the final rolling, the smoothness and grade of the surface shall again be tested by the CONTRACTOR.

D. When deviations in excess of the above tolerances are found, the pavement surface shall be corrected as stated in Section 330-12.4 of the FDOT Standard Specifications for Road and Bridge Construction.

E. All areas in which the surface of the completed pavement deviates more than twice the allowable tolerances described above shall be removed and replaced to the satisfaction of the ENGINEER.

F. All costs involved in making the corrections of defects described above shall be borne by the CONTRACTOR and no compensation will be made for this work.

3.12 PROTECTION OF STRUCTURES AND ADJUSTMENT OF APPURTENANCES

A. Where water valve boxes, manholes, catch basins, or other underground utility appurtenances are within the area to be surfaced, the CONTRACTOR shall adjust the tops of these facilities to conform with the proposed surface elevations. The CONTRACTOR shall notify the proper authority and either raise or lower the appurtenances or make arrangements with that authority for having the facilities altered at the CONTRACTOR's expense before proceeding with the resurfacing. The CONTRACTOR will be responsible for making certain that appurtenances are brought to proper grade to conform with finished surface elevations and any delays experienced from such obstructions will be considered as incidental to the paving operation. No additional payment will be made. Protect all covers. All adjustments shall be made in accordance with the requirements of the respective utility.

3.13 EXCESS MATERIALS

A. Dispose of all excess materials. Make arrangements for the disposal and bear all costs or retain any profit incidental to such disposal.

3.14 CONTRACTOR'S RESPONSIBILITY

A. Settlement of replaced pavement over trenches within the warranty period shall be considered the result of improper or inadequate compaction of the subbase or base materials. The CONTRACTOR shall promptly repair all pavement deficiencies noted during the warranty period at the CONTRACTOR's sole expense.

END OF SECTION

SECTION 02810 – IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials, equipment, and services to complete the irrigation work as required for a complete, operating system and as specified herein.

B. The completed and proper construction of the irrigation system including,
but not limited to:

1. All piping, including mains, laterals, fittings, sleeves, connections to existing laterals, tees, risers, and swing joints.

2. All control, gate, globe, pressure reducing, air relief, quick coupling and other valves; including valve boxes, markers, connections, operators and other accessories.

3. Complete automatic control system, including controllers, water conservation equipment, control wiring, and grounding.

4. Complete distribution system including sprinkler heads and bubbler heads; including proper nozzles as called for herein and all other appurtenances and accessories for proper operation.

5. Pump station, city water meter and irrigation flow meter back-up source, and backflow preventer.

6. All excavation, site work, relocation or replacement of utilities, backfill and restoration of all disturbed areas.

7. Providing a complete and operable system for the irrigation of all landscaping on the project site.

8. Adjusting head locations, and any other system components to comply with the requirements of landscaping as actually installed.

9. Supply, deliver, store and protect all equipment and materials including pipe and fittings, sprinkler heads, valves, controllers, wire, and other component parts necessary for the installation of a fully automatic irrigation system.

1.02 QUALITY ASSURANCE

A. Applicable ANSI, ASTM, FED. SPEC. Standards and Specifications, and applicable

building codes and other public agencies having jurisdiction upon the Work.

B. Construct the system in accordance with local codes, ordinances and laws, and manufacturer's instructions.

C. Disruption, destruction, or disturbance of existing plant, trees, shrubs, turf, underground utilities or any structure shall be completely restored at Contractor's expense.

D. Prevent foreign materials, such as, concrete, mortar mix, limerock, soil, grease, oils, etc. from mixing with native soil except as specified herein.

E. Obtain permits and pay required fees to governmental agencies having jurisdiction over the Work. Inspections required by local ordinances or codes shall be arranged as required.

F. Work shall be guaranteed for one year from date of acceptance against all defects in materials, equipment and workmanship. Repairs, if required, shall be done promptly.

G. Restore all disturbed areas resulted from construction activity. Restoration of disturbed areas shall match existing.

1.03 SUBMITTALS

A. Provide a full shop drawing submittal with zones for turf and beds incorporating sprinkler heads and bubbler heads. Include controls, sensors and other components for a fully operational system. Submittal shall be signed and sealed by a Florida registered engineer.

B. Provide catalog cut sheets of products specified or required. The cut sheets shall list manufacturer's name, catalog name, and catalog number as well as size, type, and illustration of product to be supplied. Do not begin construction and installation until products proposed for use are approved.

C. Provide manufacturer's warranties as applicable.

D. Prepare "As-Built" drawings on reproducible bases which show deviations from the contract drawings. The "As-built" drawings shall also indicate and show approved substitutions of size, material and manufacturer's name and catalog number. Two copies of the drawings and one electronic file shall be submitted before final acceptance of Work.

PART 2 - PRODUCTS

2.01 PVC PIPE

A. PVC pipe shall be virgin, high impact, polyvinyl chloride pipe which shall be continuously and permanently marked with the manufacturer's name, material, size, and schedule or type. Pipe shall conform to U.S. Department of Commerce Commercial Standard CS 207-60 or latest revision. Material shall conform to all requirements of Commercial Standard (CS,256-63) or latest revision.

B. Main line, sleeves, and supply and discharge headers shall be SCH 40 PVC conforming to ASTM D, 1785.

2.02 GALVANIZED PIPE

A. Pipe installed above grade for the pump station and backflow preventer and elsewhere, if applicable, shall be galvanized painted steel conforming to ASTM A.120 Schedule 40.

2.03 FITTINGS

A. PVC fittings shall be SCH 40, Type 1, and must be of domestic manufacturer. Fittings shall be identified according to pressure rating or schedule.

B. Galvanized fittings shall be malleable iron screwed fittings conformed to ANSI B 16.3.

2.04 SWING JOINTS AND RISERS

A. Bubblers shall be installed on flexible swing joints consisting of thickwalled poly pipe and insert
elbows.

2.05 SPRINKLER HEADS

A. All sprinkler heads shall be as manufactured by Toro, Hunter, Rainbird, or approved equal. The manufacturer shall guarantee all sprinklers and components for not less than one year from installation, warranty against all defects in normal material and workmanship.

B. Bubbler heads shall be adjustable flow type capable (flow rates from zero to 2 GPM).

2.06 ELECTRICAL VALVES

A. Series and Manufacturer

1. Rainbird Manufacturer

2. PEB Series Diaphragm Valves

Electrically activated remote control valve (size as required) shall be of plastic construction with stainless steel trim, normally closed with manual bled plug and manual control (cross handle on 1-1/2" and 2" models; screwdriver adjustment on 1" model). Solenoid shall be 3.5 watt, 24 volt A.C. with waterproof molded coil and removable from valve without running coil and twisting wire. Diaphragm shall be of rubber material. Tir-Act solenoid porting shall prevent a continuous flow of water through the ports during operation. Inlet port to solenoid shall be filtered with self-flushing stainless steel screen, removable from outside of valve body for maintenance. All parts shall be serviceable without removing valve from the line. Valve shall have no external plumbing or tubing and may be installed at any angle without affecting valve operation.

2.07 VALVE BOXES

A. Valve boxes for electric and manual valves shall be Brooks concrete type or approved equal, designed for installation with irrigation systems. Each valve box shall be large enough to provide at least two inches of clearance around all valve parts. The word "irrigation" shall be imprinted in the valve box cover. Covers for valve boxes shall have an anti-theft locking mechanism.

2.08 AUTOMATIC CONTROLLER

A. Series and manufacturer

1. Rainbird Manufacturer

2. ESP Series

B. The sprinkler controller shall provide for complete automatic operation of the sprinkler system and shall be wall mounted type. Controller shall have a station capacity as noted. Each station shall have an independent time control. Minor timing adjustments shall be made from the face of the controller with no disassembly necessary. Controller shall provide for rapid advance between stations. Stations may be programmed to be omitted. Controller shall provide for manual operation when particular stations require special irrigation. Controller shall provide variable day cycles for every day, every other day, every third day, etc.

C. All station wiring shall be color-coded with a section indicator key printed and visible at the connection point.

D. There shall be fused circuit protection to prevent damage due to excessive voltage surges. A pump start circuit which can also be used to control a master valve shall be included in each unit. Each controller shall have U.L. approval.

E. The casing of each controller shall be a metal locking, weatherproof cabinet. Operation instructions shall be printed on the inside door of each controller for easy access when programming. Section location chart shall also be placed inside cabinet door.

2.09 CONTROL WIRE

A. Electrical control and ground wire shall be irrigation control cable. Wiring to be used for connecting the automatic remote control valves to each automatic controller shall be Type "U.F.", 600 volt, solid copper, single conductor wire with PVC insulation and bear U.L. approval for direct underground burial feeder cable.

B. Insulation shall be 4/64" thick minimum covering of an approved thermoplastic compound for positive waterproof protection of sizes AWG size 118 through and including AWG size 10. AWG size 8 through AWG size 00 shall be insulated with 5/64" of the approved thermoplastic compound.

C. Verification of wire types and installation procedures shall be checked with and made to conform to local codes. Wires shall be color coded and have different color or stripes for each zone control wire between controller and valve.

2.10 PUMP STATION

A. Pump station shall be a pre-fabricated type with a capacity of 40 GPM @ 92 FT.HD. for a 10' lift. Station shall be manufactured by Hoover Pump or approved equal.

B. Basic components of the station shall include: (1) a self priming pump with the capacity noted; (2) a 2 HP motor selected to match on site electric; (3) isolation and check valves; (4) automatic controller; (5) rain sensor; (6) filter; (7) fiberglass enclosure, and (8) control panel including starter, high and low pressure shut-off, and low voltage and phase protection.

2.11 BACKFLOW PREVENTER

A. The backflow preventer shall be a pressure vacuum type manufactured by Febco or approved equal.

2.12 GATE VALVES

A. Gate valves shall be 150 lb. brass with non-rising stem, and shall be manufactured by Nibco or approved equal.

2.13 PAINT

A. Exterior alkyd enamel, flat black or approved equal shall be used on above ground PVC risers and other designated irrigation equipment. CONTRACTOR shall provide paint sample to CONSULTANT for approval prior to execution of painting.

2.14 RAIN SENSOR

A. Rain Sensor shall be Rain Bird RSD-BEx, or approved equal.

B. Install this shut off device per Florida Statutes 373.62 and field verify that the devise is operating correctly.

PART 3 - EXECUTION

3.01 PREPARATION

A. Layout mainline and headers and perform line adjustments and site modifications prior to excavation.

B. Locate valves to assure ease of access for maintenance and so there is no physical interference with other elements of the project. Align valves parallel to each other in

manifold system. Locate valves to be least susceptible to damage by vehicles.

C. Furnish temporary support, adequate protection and maintenance of underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the Work.

D. Where the grade or alignment of the pipe is obstructed by existing utility structures such as conduit, ducts, pipe branch connections to sewer mains, main drains, water services, etc., the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with the Owner of such utility. No deviation from the required line or grade shall be made without the written approval.

3.02 PIPE INSTALLATION

A. Excavation shall be unclassified and shall include materials encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein and cause minimum disturbance to existing conditions. Directional bore under existing pavement and sidewalks rather than cut and restore. No pavement shall be cut without written approval.

B. Pipe shall be delivered and stored on the job site with suitable protection against any damage to pipe and fittings.

C. Trenches shall be made wide enough to allow a minimum of six (6) inches between parallel pipe lines. Trenches for pipe lines shall be made of sufficient depths to provide the minimum cover from finish grade as follows:

1. 18" minimum cover over main lines.

2. 18" minimum cover over all sleeved lines routed under pavement.

3. 8" minimum cover over all headers routed in landscaped areas.

4. Allow for sufficient width of excavating and working in trenches made in soft soil.

D. Pipe and fittings shall be carefully inspected before installation in the trench. Rocks over 1" diameter and unsuitable bearing material shall be removed from trench.

1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. The fitting shall be "dry" tested for proper size before solvent is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer.

2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal contraction.

3. Pipe openings shall be plugged during construction to prevent entrance of foreign material.

E. Pipe to be installed under roadways, sidewalks, or other hardscape areas shall be placed in a SCH 40 PVC sleeve which has an inside diameter of not less than one inch larger than the outside diameter of the pipe or the combined outside diameter of pipes installed. Extend sleeve at least 36" beyond edge of pavement and stabilize for construction. Verify locations with other contractors and notify CONSULTANT or OWNER'S representative immediately of any conflicts.

F. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. Backfill shall be placed in six inch (6") lifts and shall be thoroughly compacted, except in areas to receive trees and shrubs. Backfill under pavement or sidewalks shall be compacted to 98% of maximum A.A.S.H.O. T-180 density. The surface of backfilled trenches shall be even with the surrounding ground surface.

3.03 SPRINKLER HEAD INSTALLATION

A. A bubbler shall be installed at each tree. Each bubbler shall be installed on a flexible swing joint consisting of thickwalled poly pipe and insert elbows.

3.04 CONTROLLER

A. Controller shall be installed following the recommendations of the manufacturer of the equipment. The location of controller shall be approved by the City before installation. Controller shall be a component of the pump station.

B. Controller shall be properly grounded for protection from lightning.

3.05 CONTROL WIRE

A. Control wires shall be installed at least fifteen inches below finish grade, and laid to the side of the main line. Provide looped slack at valves and snake wires in bundles at ten foot (10') intervals.

B. No underground splices shall be made except at electric valves in valve boxes. Solder splices and coat with elastometric waterproof cement. Wrap with electrical tape and coat again with elastometric waterproof cement.

C. All wire passing under existing or future paving or construction shall be encased in SCH 40 PVC conduit extending at least twenty-four inches (24") beyond edges of paving and stabilized for construction. Installation procedures shall conform to all local codes.

D. Wire shall be color coded to facilitate troubleshooting.

3.06 AUTOMATIC VALVES

A. Each automatic valve shall be installed in a valve box and shall be arranged for easy adjustment. Valve boxes shall be installed flush with grade and shall contain a minimum of one cubic foot of coarse gravel under the valve itself. CONTRACTOR shall insure percolation through the box. Valve boxes shall be located and installed to deter vandalism.

3.07 PUMP STATION (IF REQUIRED)

A. The pump station shall be installed in accordance with manufacturer's instructions.

B. Pump station shall be mounted on and anchored to a 6" thick reinforced concrete slab sized to accommodate the station and associated equipment.

C. The pump shall be activated by the automatic controller.

3.08 BACKFLOW PREVENTER

A. The backflow preventer shall be installed in accordance with local codes to meet requirements for cross connection control.

B. The backflow preventer shall be located to be concealed from view.

3.10 RAIN SENSOR

A. A Rain sensor shall be installed in the system to conserve water. Rain sensor shall be installed in accordance with local codes and manufacturer's instructions. The rain sensor shall be a component of the pump station.

3.11 GATE VALVES

A. Gate valves shall be installed in accordance with local codes and arranged in valve box for easy adjustment and removal. Gate valves shall be installed on the main line and upstream of each solenoid valve.

3.12 VALVE BOXES

A. Valve boxes shall be installed so the top of the box is at finished grade and parallel to adjacent boxes, curbs, walks. Each valve box cover shall be equipped with an anti-theft mechanism. Valve boxes shall be installed to deter vandalism and damage by vehicular traffic.

B. Proper drainage material shall be provided per box.

3.13 TESTING AND INSPECTION

A. Cleaning and Pressure Testing: Flush irrigation system with water to clear lines of foreign materials after system assembly is complete prior to installation of sprinkler heads. Cap and plug outlets and fill lines with water. Pressurize assembly to 100 P.S.I. System shall hold at 100 P.S.I. for one hour with no loss in pressure. Joints, tees, elbows, caps and connections shall be left uncovered during this test. Main line sections of solid unbroken pipe should be buried at intervals adequate to secure stabilization of pipe runs when pressurized. If necessary, repair leaks and retest assembly until satisfactory. Install sprinkler heads after approval of test results of complete assembly, less sprinkler heads.

B. Make repairs, replacements, adjustments, and reconstruction required to pass inspections and test.

C. Final inspection shall be made when the complete system is in place, operable and all repairs, additions, adjustments and other work is complete. Demonstrate the proper operation of the system, show the system's conformance with the plans and specifications, and demonstrate that the irrigation system gives proper and adequate coverage of landscaped areas.

D. Make further repairs, corrections and adjustments to eliminate any deficiencies which may be discovered after acceptance.

3.14 WARRANTY

A. Warranty the landscape irrigation system for a period of one and one half (1 1/2) years after the written final acceptance.

B. Enforce manufacturer's and supplier's warranties. Malfunctions, deficiencies, breaks, damages, disrepair or other disorder due to materials, workmanship, or installation shall be immediately and properly corrected.

C. Make full and immediate restoration of damages caused by system malfunction.

END OF SECTION 02810

SECTION 02900 - LANDSCAPING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: The work consists of furnishing, planting, watering, fertilizing, mulching, pruning and transplanting and initial maintenance of all plants of the species, size and quality in the locations indicated on Drawings and the installation of soil, soil amendments, fine grading, fertilizer, planting soil and top dressing in areas indicated on Drawings.

B. Related Sections:

1. Section 02300 – Earthwork
2. Section 02810 – Irrigation
3. Section 03300 – Cast-In-Place Concrete
4. Section 16500 – Lighting Systems

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 2487-85 Standard Testing Method for Classification of Soil for Engineering Purposes.

B. "Grades and Standards for Nursery Plants", by the Florida State Department of Agriculture, latest edition.

C. "Approved Planting Practices" by the American Association of Nurserymen.

D. "Hortus", by L.H. Bailey, Second Edition.

E. "Manual of Cultivated Plants" by L.H. Bailey.

F. "Standard Plant Names" by the American Joint Committee on Horticultural Nomenclature."

1.03 QUALITY ASSURANCE

A. Contract Landscape work to a single firm specializing in landscape contracting. Landscape Contractor must show proof of having successfully completed three (3) or more similar projects within the last five (5) years in Monroe County, Florida.

B. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
2. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Landscape Architect, together with proposal for use of equivalent material.

3. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable.
4. Planting Soil: Before delivery of planting soil, furnish Landscape Architect with written statement giving location of properties from which planting soil is to be obtained, names and addresses of owners, depth to be stripped and crops grown during past 2 years.
5. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quality, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 2004 "American Standard for Nursery Stock." Provide healthy, vigorous stock grown in a recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions or disfigurement.
6. Inspection: The Landscape Architect may inspect trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size and quality. Notify Landscape Architect prior to shipping so that nursery inspection can be scheduled. Landscape Architect retains right to further inspect trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from project site.
7. In the event that Landscape Architect suspects deficiencies in materials used on this project, such materials will be tested by Owner contacted testing laboratory.

    a. Cost of Testing:

        1) Initial Testing: By Owner.
        2) Retesting: By Contractor.

    b. Evidence of non-compliance will result in rejection of all work.

C. Qualifications of Workers: Provide at least one person who shall be present at all times during execution of this portion of work and who shall be thoroughly familiar with type of materials being installed and best methods for their installation and who shall direct the work performed under this section.

D. Quality Control

1. Notify the Landscape Architect at least 5 work days in advance of the following for field review:

    a. Field inspection of trees or shrubs at place of growth.
    b. Review of proposed tree pit locations as represented by staking.
    c. Review upon delivery of plant materials and sod at the site to verify species, vigor, size, condition, shape, quantity in compliance with specifications and drawings.
    d. Review of tree pit excavation and final subgrade.
    e. Review of all backfilling for palm and tree pits.
    f. Review of work and materials after completion of planting. This review shall be scheduled sufficiently in advance and in cooperation with the Landscape

Architect so that it may be conducted within 48 hours after completion of planting.

g. Review after a 30-day period of maintenance upon written request by the Contractor. Request shall be received at least five (5) days before anticipated date of review.

h. Review for final acceptance at the end of the warranty period.

1.04 DEFINITIONS

A. Satisfactory Fill Materials: Materials classified in ASTM D2487 as CW, GP, SW and SP properly worked by Contractor to obtain optimum moisture and compaction.

B. Unsatisfactory Materials: Materials of any classification that are determined by testing laboratory as too wet or too soft for providing a stable foundation for pavement and walks will be classified as "unsatisfactory."

C. The words "plant materials" or "plants" refer to and include trees, shrubs, hedge, ground cover, annuals, grass or herbaceous materials.

D. Specimen: An exceptional, heavy, symmetrical, tightly knit plant so trained or favored in its development that its appearance is unquestionable and outstandingly superior in form, number of branches, compactness and symmetry. Specimen shall conform to the standard for "Florida Fancy" as per the State of Florida, Department of Agriculture.

E. Ground Cover: Anything other than grass.

1.05 SUBMITTALS

A. Samples: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.

B. Soil and Soil Amendments

1. Planting Soil Mixture: Prior to Contractor purchasing planting soil mixture Contractor shall obtain a soil test of planting soil mixture in accordance with the most current edition of Methods of Soil Analysis by the Soil Science Society of America, Inc. for particle size and soil fertility. A sample of planting soil mixture and soil test results shall be submitted to Owner and Landscape Architect.
2. Existing Soil Test: Prior to Contractor purchasing planting soil mixture and fertilizer Contractor shall obtain a soil test of existing soil on site in accordance with the most current edition of Methods of Soil Analysis by the Soil Science Society of America, Inc. for existing particle size and existing soil fertility. A sample of the existing soil and soil test results shall be submitted to Owner and Landscape Architect. Soil tests shall indicate specific types of soil and nutrient requirements for all plant material specified. Contractor shall select the appropriate soil amendments and fertilizers needed for plant material specified based on results of planting soil test and existing soil test.

C. Plant and Material Certifications:

1. Certificates of inspection as required by governmental authorities.

2. Label data substantiating that plants, trees, shrubs and planting materials comply with specified requirements.
3. . Submit photographs of trees, palms and shrubs to Landscape Architect for approval.

D. Planting Schedule: Proposed planting schedule, indicating dates for each type of landscape work during normal season for such work in areas of site. Once accepted, revise dates only as approved in writing after documentation of reasons for delays.

E. Maintenance Schedule: Proposed maintenance schedule, indicating dates for maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing after documentation for reasons for delays.

F. Contract Closeout Submittals:

1. Record Drawings: Provide blueprint with red line markings indicating changes made to the planting system layout during installation.
2. Manual: Deliver one copy giving complete instructions regarding maintenance of materials, complete nomenclature of items used and a copy of the guarantee issued to Landscape Architect and Owner upon conditional acceptance of installation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Trees, Palms and Shrubs: Provide freshly dug palms and provide container grown trees, shrubs and small palms. Do not prune prior to delivery unless otherwise approved by Landscape Architect. Do not bend or bind-tie trees or shrubs in such manner as to damage bark break branches or destroy natural shape. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery.

C. Deliver trees, palms and shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

D. Do not remove container-grown stock from containers until planting time.

E. Immediately remove from the site materials which do not comply with the provisions of this Section of these Specifications.

F. Replacements: In the event of damage or rejection, immediately make repairs and replacements necessary to the acceptance of Landscape Architect at no additional cost to Owner.

G. Plants shall not be planted on job until they have been inspected at receiving site and accepted by the Landscape Architect.

H. Legible identification tags shall be attached to at least one plant of each species. Packages, boxes or bunches of plants shall also be identified with a similar tag. Plants which show improper handling, bruised trunks, broken branches or root balls or arrive on site in an unsatisfactory condition will be rejected.

I. Where formal arrangements or consecutive order of trees or shrubs are shown, select stock for uniform height and spread and label with number to assure symmetry in planting.

J. Shipment and Delivery: Acceptance of plant material will be given by the Landscape Architect and Owner only after the material is planted and after meeting all of the incidental requirements prescribed herein and on the plans.

1.07 JOB CONDTIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions or obstructions, notify Landscape Architect before planting.

1.08 SEQUENCING

A. Notify the Landscape Architect a minimum of 5 work days in advance of delivery of plant material.

B. Construction Review: In addition to other progress construction reviews, the Contractor shall schedule and facilitate the following related reviews giving notice to the Landscape Architect at least 5 work days in advance.

1. Field inspection of trees, palms and shrubs at place of growth.
2. Review of proposed tree pit locations as represented by staking.
3. Review upon delivery of plant materials at the site to verify species, vigor, size, condition, shape, quantity in compliance with specifications and drawings.
4. Review of tree pit excavation and final subgrade.
5. Review of all backfilling for palm and tree pits as well as the placement of the planting soil.
6. Review of work and materials after completion of planting for conditional acceptance. This review shall be scheduled sufficiently in advance and in cooperation with the Landscape Architect so that it may be conducted within 48 hours after completion of planting.
7. Review after a 30-day period of maintenance upon written requested by the Contractor. Request shall be received at least five days before anticipated date of review.
8. Review for final acceptance at the end of the warranty period.

1.09 WARRANTY

A. Irrigate the newly planted trees, palms, shrubs and ground cover until plant material is covered by fully operational electric irrigation. Irrigation shall occur in sufficient quantity to insure the orderly establishment of the plant material.

B. Warrant plants for one year after conditional acceptance by the Landscape Architect and Owner. Any planting that fails or dies within that period shall be replaced and replanted immediately without expense to Owner, provided that the Contractor shall not be held responsible for losses beyond his control arising from "Acts of Providence"; acts of vandalism; or loss arising from documented neglect on the part of Owner to properly care for planting after acceptance.

C. Make periodic reviews of the planting at no extra cost to Owner during the warranty period to determine what changes, if any, should be made in Owner maintenance program. Proposed changes shall be submitted, in writing, to Owner and, jointly by copy, to the Landscape Architect.

D. At conclusion of the one year warranty period, the Landscape Architect shall make a construction review to determine the condition of planting. Plants that have died or, in the opinion of the Landscape Architect, are in an unhealthy or badly impaired condition for reasons other than vandalism, "Acts of Providence", or documented neglect by Owner, shall be replaced by the Contractor as soon as possible, except that replacement will not be required in any season definitely unfavorable for the kinds of plants involved.

E. Before final acceptance, at the end of the warranty period, remove guying and saucers. Install mulch around trees formerly with saucers. Bracing of palms shall remain in place for one year unless the removal is directed by Landscape Architect.

1.10 MAINTENANCE

A. Maintain all planting, starting at the time of planting and continuing for 365 calendar days after planting is complete and conditional acceptance by the Landscape Architect and Owner.

B. Maintain and protect all plants including incidental materials until end of maintenance period.

C. Plant Maintenance:

1. Maintenance shall begin immediately after each plant is planted and shall continue until the completion of the 365 day maintenance period. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected for the period of time stated above.
2. Settled plants shall be reset to proper grade position, planting saucer rested and dead material removed. Guys shall be tightened and repaired.
3. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit. Upon completion of planting, the Contractor shall remove from the site excess soil and debris, and repair all damage to structures resulting from planting operations.

D. General Maintenance:

1. Maintenance shall include all watering, weeding, fertilizing, cultivating, spraying, adjustment of guying, staking and pruning necessary to keep plant material in a healthy vigorous growing condition and to keep planted area neat and attractive.
2. Provide all equipment and means for proper application of water to those planted areas not provided with an irrigation system.
3. Planting areas shall be kept weed free with manual removal or an herbicide program until final acceptance is incurred.

E. Replacements:

1. At the end of the maintenance period, plant material shall be in a healthy growing condition.
2. During maintenance period immediately replace any plants showing weakness and probability of failure with a new healthy plant of the same type and size, without additional cost to Owner.

F. Extension of Maintenance Period: Continue maintenance period, at no additional cost to Owner, for additional thirty days after previously noted deficiencies have been corrected. Warranty period shall commence upon acceptance of replaced plant material.

G. The Contractor shall conclude maintenance (exclusive of replacement within warranty period) upon written acceptance of the Landscape Architect at the end of the maintenance period or, as provided for above, at the end of the extended maintenance period.

H. Protection:

1. Irrigate the newly planted trees, palms, shrubs and groundcover until final acceptance is issued.
2. Irrigation will occur in sufficient quantity to insure the orderly establishment of the trees, palms, shrubs and groundcover.
3. Planting area shall be kept weed free by manual removal or by an herbicide program until final acceptance is issued.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Planting Soil: An evenly blended mixture of 50% fresh water sand and 50% inland glades muck shall be used for trees and shrubs and 70% fresh water sand and 30% inland glades muck shall be used for palms. Fresh water sand and inland glades muck shall be thoroughly mixed with amendments based on soil analysis provided by Contractor.

1. Material shall be proportioned by volume rather than weight.
2. Site mixing will not be acceptable.
3. Sand shall be free of silt and sludge.
4. Mixture shall be free of rocks greater than 2 inches in size, limbs, roots and other deleterious matter.

5. Landscape Architect reserves the right to reject planting soil utilized at any time during the execution of work that does not meet specification.

B. Commercial Fertilizers: Commercial grade fertilizer shall be uniform in composition, dry, free flowing and delivered to site in fully labeled, unopened containers, bearing name, trade name or trademark and warranty of producer. Contractor is responsible for specifying fertilizers needed based on plant material, existing soil analysis and planting soil analysis. Contractor is responsible for providing soil analysis. All fertilizers shall conform to applicable State and Federal laws and shall be installed according to manufacturer's recommendations.

C. Trees, Palms & Shrubs:

1. Trees and shrubs shall be as noted on plans and as approved by Landscape Architect and Owner.
2. Caliper measurement, height measurement, height relation to caliper, spread, root ball dimensions, and ground covers, etc. shall conform to the applicable standards above and the requirements for this project.
3. Substitutions in plant species or sizes shall be made only after written authorization by the Landscape Architect and Owner.
4. Materials or work may be rejected if, in the opinion of the Landscape Architect, such work does not meet the requirements of the Specifications. Rejected materials shall be promptly removed from the site by the Contractor at no expense to Owner or Landscape Architect.

D. Pruning:

1. Plants shall not be pruned prior to delivery except as authorized by the Landscape Architect.
2. Plants shall have been transplanted or root pruned at least once in the three years prior to the contract date.
3. Immediately upon selection by the Contractor and acceptance by the Landscape Architect, all major field grown trees shall be completely root pruned at the nursery site and held in that condition for a period of 45 to 60 days. Plants shall not be further dug or transported without field acceptance of Landscape Architect and Owner.
4. All tree pruning shall be in accordance with ANSI A-300 Guidelines for Tree Pruning.

E. Tree and Palm Guys: Provide Arrow Anchor, tree guy anchoring system (TG-2) trees less than 2-1/2" caliper and TG-1 for trees greater than 2-1/2" caliper by U.S. Rigging Supply or equal approved by Landscape Architect.

F. Large Palm Guys: Install and brace palms in a vertical position. Place a minimum of five layers of burlap around the trunk and, in turn, have a minimum of five wood battens placed vertically over it. The battens shall be retained in place by two ¾ inch high carbon steel bands. Three wood braces, placed at a 60 degree angle equidistant around the plant shall be nailed to the battens. No nails shall be placed into the palm trunk. Three bracing pads shall be placed below grade at the bottom of each brace.

G. Peat: Spaghnum peat moss for horticultural use.

H. Mulch: Natural color shredded eucalyptus bark or Enviromulch free of weed. No cypress mulch shall be used and no red or other artificially colored mulch shall be used.

I. Water: Potable water shall be provided by the Contractor. In the event of emergency or other loss of water supply, the Contractor shall be responsible for water supply.

J. Plant Material:

1. Plant species shall conform to those indicated on Drawings.
2. Plant Quality:

a. Plants shall be freshly dug, balled and burlapped nursery grown stock or container grown nursery stock. All plants shall be free of broken, damaged root balls or root bound conditions. Plants shall be sound, healthy, vigorous, free from plant diseases, insect pests, or their eggs and shall have healthy normal root systems.
b. Collected plants shall not be used unless authorized in writing by the Landscape Architect.
c. Plant material, not otherwise specified as being Florida Fancy or "Specimen" shall be Florida No. 1 or better quality, graded in accordance with Grades and Standards for Nursery Plants, published by the State of Florida, Department of Agriculture. Plants judged to be not in accordance with said standards will be rejected.
d. Ground Cover

1) Provide plants established and well rooted in removable containers or integral peat pots and with not less than minimum number and length of runners required by ANSI Z60.1 for the pot size shown or listed.

PART 3 – EXECUTION

3.01 INSPECTION

A. Inspect work of all other trades and verify that all such work is complete to the point at which this landscape work may properly commence. Verify that planting may be completed in accordance with Contract Documents.

B. Discrepancies:

1. In the event of discrepancy, immediately notify Landscape Architect.
2. Do not proceed with installation of materials or plants in areas of discrepancy until all such discrepancies have been fully resolved to the satisfaction of the Landscape Architect.
3. Plans supercede tabulations, Contractor responsible for verifying all takeoffs.

C. It shall be the Contractor's responsibility to thoroughly test the irrigation system and report any malfunctions to Owner. It shall be the Contractor's responsibility to hand water prior to completion of installation of irrigation system.

3.02 PREPARTION – GENERAL

A. Stake the proposed location of trees, palms and large shrubs to be planted.

B. Excavate planting pits and beds, prepare subgrade.

C. Provide plants, fertilizer and planting soil and incidental materials as specified.

D. Place plants, backfill and guy or brace plants as required.

E. Fine grade planting areas and complete incidental work as specified.

3.03 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, weeds, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.

B. Mix planting soil at rates specified and as shown in plans.

C. Remove all existing soil from all plantbeds and pits.

D. All plant beds and pits shall be filled with planting soil.

3.04 PREPARTION OF PLANTING BEDS

A. Loosen subgrade of planting bed areas to a minimum depth of 18" for shrubs, 6" for groundcover using a culti-mulcher or similar equipment. Remove stones measuring over 6 inches in any dimension. Remove sticks, stones, rubbish and other extraneous matter.

B. Remove existing soil and spread planting soil mixture to minimum depth of 18" for shrubs and 6" for groundcover to meet lines, grades, and elevations shown, after light rolling and natural settlement. Work planting soil into top of loosened subgrade to create a transition layer then place remainder of the planting soil.

3.05 EXCAVATION FOR TREES, PALMS AND LARGE SHRUBS

A. Excavate pits, beds, and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.

1. For balled and burlap (B&B), make excavations at least again as wide as the ball diameter and 36" depth, plus following allowance for setting of ball on a layer of compacted backfill:

a. Allow for 6 inch thick setting layer of planting soil mixture.

2. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

B. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.

C. Fill excavations for trees and shrubs with water and allow water to percolate out prior to planting.

3.06 PLANTING TREES, PALMS, SHRUBS AND GROUNDCOVER

A. Set trees and shrubs on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball 10% above elevation of adjacent finished landscape grades. Set palms in same manner as tree except with top of ball at the same elevation as adjacent finished grade. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. After placing final layer of backfill watering shall occur again.

B. Set container grown stock, as specified for balled burlapped stock, except cut containers on 2 sides with an approved can cutter. Remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.

C. Saucer top of backfill to allow for water retention.

D. Mulch planted areas and provide not less than 3 inches thickness of mulch.

E. Unless otherwise directed by Landscape Architect, do not cut tree leaders, or prune trees or palms. Any pruning directed by Landscape Architect must be in compliance with ANSI A-300 Guidelines for Pruning, latest version.

F. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

G. Guy and stake trees immediately after planting, as indicated.

3.07 ADJUSTMENT AND CLEANING

A. Cleaning up the Site: Upon completion of any landscape project, the Contractor must thoroughly clean up the project site. In addition to removing all equipment, unused materials, deleterious materials and surplus excavated material, the Contractor shall fine grade all disturbed areas and the areas adjacent to the new plantings to provide a neat and uniform site. All damaged or altered existing structures as a result of the landscape work shall be corrected.

3.08 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain trees, palms, shrubs, and other plants until final acceptance, but in no case, less than following period:

1. 365 days after substantial completion of planting and conditional acceptance by Landscape Architect and Owner.

C. Maintain trees, palms, shrubs, and other plants by pruning, cultivating, and weeding as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore

or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

3.09 CLEANUP AND PROTECTION

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.10 INSPECTION AND ACCEPTANCE

A. When landscape work is completed, including maintenance, Landscape Architect will, upon request, make an inspection to determine final acceptance.

1. Landscape work may be inspected for final acceptance in portions as agreeable to Landscape Architect, provided each portion of work offered for inspection is complete, including maintenance.

B. When inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected by Landscape Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

END OF SECTION 02900

SECTION 02721 -CATCH BASINS AND INLETS

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the work necessary for the catch basins and inlets complete.

PART 2 PRODUCTS

2.1 CONCRETE

A. Concrete shall be ready-mixed, Class I concrete as specified in Section 345 of FDOT Standard Specifications for Road and Bridge Construction.

2.2 FORMS

A. Forms shall be conformance with Section 425 of FDOT Standard Specifications for Road and Bridge Construction.

2.3 EPOXY-COATED REINFORCING BARS

A. Deformed bars as specified herein before and in addition, conforming to ASTM A775, except as otherwise specified herein, for all reinforcing steel regardless of whether the steel is used in pre-cast units or cast in place units. Provide a written certification to the ENGINEER in accordance with Section 4.12, 4.2.1 of ASTM A775 and a statement that the coating and coated bars have been tested as outlined in Annex A1 and meets the requirements of Annex A1 of ASTM A775. The bond strength of the coated bars shall not be less than 80 percent of the uncoated bars. Repair damaged epoxy coating per Article 3.5 of this Section.

2.4 UNITS

A. Inlet dimensions and details of construction shall conform to FDOT Roadway and Traffic Specifications and Design Standards.

2.5 PRECAST UNITS

A. At the opinion of the Contractor, approved pre-cast units may be substituted for cast-in-place units. Pre-cast units shall conform to ASTM C478. All pre-cast units shall have epoxy-coated reinforcing bars. Submit details of proposed units to the ENGINEER for review. Concrete risers for extensions shall be a maximum of 6 inches high and of the same quality as the sections. ENGINEER shall review risers before installation.

2.6 MORTAR

A. Standard premixed mortar conforming to ASTM C387, Type S, or proportion 1 part Portland cement to 2 parts clean, well-graded sand that will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement:

Hydrated lime, 10 percent diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the concrete.

2.7 FRAMES AND GRATINGS

A. Cast iron frames and gratings for catch basins and storm drain inlets shall be as indicated. Bearing surfaces shall be clean and shall provide uniform contact. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and all defects, and shall conform to ASTM A48, Class 30.

2.8 BASE ROCK

A. Base rock shall be crushed gravel or crushed rock, free from dirt, clay balls, and organic material, and conforming to size No. 89 graduation as specified in the Standard Specifications or similar accepted material and shall be imported, if necessary, at the Contractor's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock that has been crushed and graded to size as specified, will not be accepted for base rock.

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Excavation as required to accomplish the construction. Backfill shall be as specified for the adjoining pipe trench.

3.2 CONSTRUCTION OF CATCH BASINS AND INLETS

A. Construct inlets and catch basins at the locations shown and in accordance with the Drawings. Construct forms to the dimensions and elevations required. Forms shall be tight and well braced Chamfer corners of forms.

B. Prior to placing the concrete, remove all water and debris from the forms. Moisten forms just prior to placing the concrete. Handle concrete from the transporting vehicle to the forms in a continuous manner as rapidly as practical without segregation or loss of ingredients. Immediately after placing, compact concrete with a mechanical vibrator. Limit the duration of vibration to the time necessary to produce satisfactory consolidation without causing segregation.

C. Screed the top surface of exposed slabs and walls. When the initial water has been absorbed, float the surfaces with a wood float and lightly trowel with a steel trowel to a smooth finish free from marks or irregularities. Finish exposed edges with a steel-edging tool. Remove forms and patch any defects in the concrete with mortar mixed in the same proportions as the original concrete mix.

D. Cure concrete by preventing the loss of moisture for a period of 7 days. Accomplish with a membrane-forming curing compound. Apply the curing compound immediately after removal of forms or finishing of the slabs. Protect concrete from damage during the 7-day curing period.

3.3 PLACING PRECAST UNITS

A. Remove water from the excavation. Place a minimum of 6 inches of rock base and thoroughly compact with a mechanical vibrating or power tamper.

3.4 EXTENSIONS

A. Install extensions to height determined by ENGINEER. Lay risers in mortar with sides plumb and tops to grade. Joints shall be sealed with mortar, with interior and exterior troweled smooth. Prevent mortar from drying out and cure by applying a curing compound. Extensions shall be watertight.

3.5 REPAIR OF DAMAGED EPOXY COATING ON REINFORCING BARS

A. Damaged epoxy coating shall be repaired with patching material conforming to ASTM A775. Repair shall be done in accordance with the patching material manufacturer's recommendations.

3.6 INSTALLATION OF FRAMES AND GRATES

A. Set frames and grates at elevations indicated or as determined in the field and in conformance with the Drawings.

B. Frames may be cast in, or shall be set in mortar.

3.7 CLEANING

A. Upon completion, clean each structure of all silt, debris, and foreign matter.

PART 4 PAYMENT

4.1 INLETS

A. Payment for inlets will be made at the unit price per inlet stated in the CONTRACTOR'S Proposal. This price shall constitute full compensation for all work required for the construction of the inlets, complete, including the bottom, top, frame and grate, and for over excavating and placing the compacted 6-inch layer of base rock under the inlet bottom.

4.2 REMOVAL OF INLETS AND STORM MANHOLES

A. Payment for the removal of existing inlets and storm manholes, regardless of depth, will be based on the unit price stated in the CONTRACTOR'S Proposal. Payment shall constitute full compensation for all work required to remove each existing inlet or storm manhole, complete, as specified.

END OF SECTION

SECTION 02724 - STORM SEWERS

PART 1.0 GENERAL

1.1. WORK INCLUDED

This section covers the work necessary for the storm sewers and appurtenances, complete.

PART 2.0 PRODUCTS

2.1. GENERAL

All storm sewer pipe in the project shall be Polyethylene, as specified herein.

A. PIPE

Polyethylene (PE) Pipe and Fittings: This specification applies to high density polyethylene corrugated pipe with an integrally formed smooth waterway. Nominal sizes for which this specification is acceptable are 4 - 60 inch diameters. Sizes 4 - 60 inch shall be either AASHTO Type 'S' or Type 'D' as follows. Sizes 4 - 60 inch designated as AASHTO Type 'S' (N-12) shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations for Type 'S' sizes 4 - 60 inch shall be annular (N-12). Sizes 42 thru 60 inch designated as AASHTO Type 'D' (N-12HC) shall consist of an essentially smooth waterway braced circumferentially with circular ribs which are formed simultaneously with an essentially smooth outer wall. The 42 thru 60 inch (N-12HC) sizes shall conform to AASHTO Type 'D' (which describes dual wall pipe with a smooth waterway). Pipe manufactured for this specification shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, M294 and MP7. Pipe and fittings shall be made from virgin PE compounds which conform to the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D3350.
The fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes and end caps. These fittings may be installed by various methods such as snap-on, bell and spigot, bell – bell and wrap around couplers. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the manufacturer shall be used. Where designated on the plans or project specifications, an elastomeric gasket meeting the requirements of ASTM F477 shall be supplied.

B. MORTAR

Mortar shall be standard premix mortar conforming to ASTM C387, Type N, or proportioned 1 part portland cement to 2 parts of clean, well-graded sand which will pass a 1/8-inch screen by volume with water added only as necessary to produce a stiff workable mortar. Admixtures may be used not exceeding the following percentages by weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will adhere readily to the pipe. Mortar mixed for longer than 30 minutes shall not be used.

C. PIPE BEDDING AND PIPE ZONE MATERIAL

Pipe bedding and pipe zone material are identical and shall be crushed gravel or crushed rock, free from dirt, clay balls, and organic material and conforming to size No. 57 (per FDOT Standard Specifications) gradation as specified in the Standard

Specifications or similar accepted material and shall be imported, if necessary, at the CONTRACTOR's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock which has been crushed and graded to size as specified, will not be accepted for pipe bedding materials.

PART 3.0 EXECUTION

3.1. LINE AND GRADE

A. Installation of the pipe shall be in accordance with the manufacturer and either AASHTO Section 30 or ASTM Recommended Practice D2321.

B. Do not deviate from line or grade, as established by the ENGINEER, more than 1/2 inch for line and 1/4 inch for grade, provided that such variation does not result in a level or reverse sloping invert. Measure for grade at the pipe invert -- not at the top of the pipe -- because of permissible variation in pipe wall thickness.

C. All storm sewers shall be laid using a laser accepted by the ENGINEER. The beam shall be directed through the pipe. Batter boards or instrument laying will not be permitted. The laser shall be constantly shielded from the direct sun.

D. The CONTRACTOR shall set offset stakes or other accepted method of controlling alignment and grade for excavation of trenches and for pipe laying. The CONTRACTOR shall submit in writing his proposed method of establishing line and grade to the ENGINEER for acceptance.

3.2. LAYING AND JOINTING PIPE AND FITTINGS

A. Do not permit mud and foreign material to get into the pipe. During laying operations, do not permit debris, tools, clothing, or similar items to be placed in pipes.

B. Pipe laying shall proceed upgrade with ends pointing in the direction of flow. After a section of pipe has been lowered into the trench, clean the ends of the pipe. Be careful in handling pipe to prevent breakage. Remove any pipe damaged and replace at the CONTRACTOR's sole expense.

C. Make assembly of the joint in accordance with the recommendations of the manufacturer of the type of joint used. Provide all special tools and appliances required for the jointing assembly.

D. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between joints. Apply sufficient pressure in making the joint to assure that the joint is "home," as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed. Pipe 21 inches and smaller shall be laid so the inside joint space does not exceed 3/8 inch in width.

E. Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

F. Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

3.3. FINAL STORM SEWERS CLEANING

A. Prior to final acceptance and final structure-to-structure inspection by the ENGINEER of the storm sewers system, completely flush or clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, and other foreign material from the storm sewers system at or near the closest downstream manhole. If necessary, use mechanical rodding equipment to remove accumulated mud, silt, and all other deposits from the storm sewer system at no additional cost to the OWNER.

B. Upon the ENGINEER's final structure-to-structure inspection of the storm sewers system, if foreign matter and other construction debris are still prevalent in the system, reflush and clean the sections and portions of the lines as required.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   a. Auger Foundations and Pile Caps
   b. Grade Beams

B. Related Sections include the following:
   a. Division 2 Section "Earthwork" .
   b. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, and grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

a. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction**,** qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   a. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   a. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
   b. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2. FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   a. Plywood, metal, or other approved panel materials.

b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

- High-density overlay, Class 1 or better.
- Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
- Structural 1, B-B or better; mill oiled and edge sealed.
- B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
   a. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.3. STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, galvanized.

C. Deformed-Steel Wire: ASTM A 496.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4. REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5. CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   a. Portland Cement: ASTM C 150, Type I or Type II

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded.

a. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Water: ASTM C 94 and potable.

2.6. VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

a. Products:

- Fortifiber Corporation; Moistop Ultra A.
- Raven Industries Inc.; Vapor Block 15
- Reef Industries, Inc.; Griffolyn Type-65G

2.7. FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

a. Products:

- ChemMasters; Chemisil Plus.
- Curecrete Distribution Inc.; Ashford Formula.
- Sonneborne Sonnosil

2.8. CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

a. Products:

- ChemMasters; Spray-Film.
- Dayton Superior Corporation; Sure Film.
- Sika Corporation, Inc.; SikaFilm.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Water: Potable.

D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

a. Products:

- ChemMasters; Spray-Cure & Seal Plus.
- Sonneborn, Div. of ChemRex; Kure-N-Seal 5.
- Tamms Industries, Inc.; LusterSeal 300.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

a. Products:

- ChemMasters; Polyseal WB.
- L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
- Tamms Industries, Inc.; LusterSeal WB 300.

2.9. RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

a. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10. CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

a. Silica Fume: 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

2.11. CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Grade Beams, Augers and Pile Caps: Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: Per Plans.
b. Maximum Water-Cementitious Materials Ratio: 0.40
c. Slump Limit: 5 inches, plus or minus 1 inch.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: Per Plans.
b. Minimum Cementitious Materials Content: 520 lb/cu. yd.
c. Slump Limit: 5 inches, plus or minus 1 inch.

2.12. CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

a. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1. FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

a. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

a. Install keyways, reglets, recesses, and the like, for easy removal.
b. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Do not chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2. EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3. REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for **24** hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

   a. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
   b. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect or Engineer.

3.4. SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

   a. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5. VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

   a. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6. STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

   a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7. JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, and only at locations indicated or as approved by Architect or Engineer.

a. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
b. Form keyed joints as indicated or approved. Embed keys at least 1-1/2 inches into concrete.
c. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
d. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of floor slabs.
e. Locate joints beside columns integral with walls, near corners, and in concealed locations where possible.
f. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
g. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

a. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.8. CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect or Engineer.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints only as approved. Deposit concrete to avoid segregation.

a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
b. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

a. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
b. Maintain reinforcement in position on chairs during concrete placement.
c. Screed slab surfaces with a straightedge and strike off to correct elevations.
d. Slope surfaces uniformly to drains where required and as indicated on the drawings.
e. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Hot-Weather Placement: Comply with ACI 301 and as follows:

a. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9. FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

a. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10. FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

a. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

a. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

3.11. MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs (where applicable) by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12. CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

- Water.
- Continuous water-fog spray.
- Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

b. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13. JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

a. Defer joint filling until concrete has aged at least **six** months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14. CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect or Engineer. Remove and replace concrete that cannot be repaired and patched to Architect's or Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
b. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect or Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

a. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
b. After concrete has cured at least 14 days, correct high areas by grinding.
c. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
d. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
e. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's or Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's or Engineer's approval.

3.15. FIELD QUALITY CONTROL

A. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

a. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
b. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.

- When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

c. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
d. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 50 deg F and below and when 80 deg F and above, and one test for each composite sample.
e. Compression Test Specimens: ASTM C 31.

- Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
- Cast and field cure two sets of two standard cylinder specimens for each composite sample.

f. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

- Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
- A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

g. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

h. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

i. Test results shall be reported in writing to Architect and Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

j. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect or Engineer but will not be used as sole basis for approval or rejection of concrete.

k. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect or Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42or by other methods as directed by Architect or Engineer.

l. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

m. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 03300

PROJECT ELECTRICAL NOTES :

1. All work shall be in accordance with the National Electrical Code and other applicable codes and standards. Contractor shall coordinate with local utility for any special requirements.
2. Approval shall be obtained from the Structural Engineer prior to cutting or drilling any structural support members.
3. All device boxes shall be installed flush and conduits run concealed in finished areas except as specifically indicated otherwise.
4. All outdoor receptacle outlets shall be G.F.I.
5. All outlets, wall switches and cover plates shall have "white" finish or color selected by Architect.
6. All exterior fixtures, outlets, switches, etc. to be weatherproof and manufactured foe exterior installation.

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART I - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   a. Electrical equipment coordination and installation.
   b. Sleeves for raceways and cables.
   c. Sleeve seals.
   d. Common electrical installation requirement.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

a. To provide for ease of disconnecting the equipment with minimum interference to other installations.
b. To allow right of way for piping and conduit installed at required slope.
c. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2- PRODUCTS (Not Applicable)

PART 3- EXECUTION

3.1. COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

3.3. SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4. FIELD QUALITY CONTROL

A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.

END OF SECTION 16050

SECTION 16060 - GROUNDING AND BONDING

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.
   a. Underground distribution grounding.
   b. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

   a. Ground rods.
   b. Ground rings.
   c. Grounding for sensitive electronic equipment.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

   a. Instructions for periodic testing and inspection of grounding features and ground rings based on NETA MTS and or NFPA 70B.

      - Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
      - Include recommended testing intervals.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

   a. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2- PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

a. Solid Conductors: ASTM B 3.
b. Stranded Conductors: ASTM B 8.
c. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
d. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
e. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Bare Grounding Conductor :

a. No. 4 AWG minimum, soft-drawn copper.
b. Conductor Protector: Half-round PVC.

D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

a. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by10 feet in diameter.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
a. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
b. Backfill Material: Electrode manufacturer's recommended material.

PART 3- EXECUTION

3.1. APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.

a. Bury at least 24 inches below grade.

C. Conductor Terminations and Connections:

a. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
b. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
c. Connections to Structural Steel: Welded connectors.

3.2. GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.3. EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

a. Feeders and branch circuits.
b. Lighting circuits.
c. Receptacle circuits.
d. Single-phase motor and appliance branch circuits.
e. Three-phase motor and appliance branch circuits.
f. Flexible raceway runs.
g. Armored and metal-clad cable runs.

h. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
i. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

j. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
k. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.4. INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

a. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
b. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
c. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

a. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
b. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
c. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 3/0 AWG.

a. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
b. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

a. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
b. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

- Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
- Perform tests by fall-of-potential method according to IEEE 81.

C. Report measured ground resistances that exceed the following values:

a. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
b. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
d. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16072 - ELECTRICAL SUPPORTS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Hangers and supports for electrical equipment and systems.
b. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. OSHPD: Office of Statewide Health Planning and Development.

D. RMC: Rigid metal conduit.

E. SBC: Standard Building Code.

F. UBC: Uniform Building Code.

1.4 SUBMITTALS

A. Product Data: Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of electrical support component used.

a. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings: Indicate materials and dimensions and identify hardware, including attachment and anchorage devices, signed and sealed by a qualified professional engineer. Professional engineer qualification requirements are specified in Division 1 Section "Quality Requirements." Include the following:

a. Fabricated Supports: Representations of field-fabricated supports.

C. Welding certificates.

D. Qualification Data: For professional engineer and testing agency.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection: Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five times the applied force.

B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly.

a. Manufacturers:

- Cooper B-Line; a division of Cooper Industries.
- ERICO International Corporation.
- Allied Support Systems; Power-Strut Unit.
- GS Metals Corp.
- Michigan Hanger Co., Inc.; O-Strut Div.
- National Pipe Hanger Corp.
- Thomas & Betts Corporation.
- Unistrut; Tyco International, Ltd.
- Wesanco, Inc.

b. Finishes:

- Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3.
- Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-3.
- Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-3.

C. Raceway and Cable Supports: As described in NECA 1.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser

conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

H. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers:

- Hilti, Inc.
- ITW Construction Products.
- MKT Fastening, LLC.
- Simpson Strong-Tie Co. Inc.

I. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers:

- Cooper B-Line; a division of Cooper Industries.
- Empire Tool and Manufacturing Co., Inc
- Hilti, Inc.
- ITW Construction Products.
- MKT Fastening, LLC.
- Powers Fasteners.

J. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.

K. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

L. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.

M. Toggle Bolts: All-steel springhead type.

N. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3- EXECUTION

3.1. APPLICATION

A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2. SUPPORT INSTALLATION

A. Comply with NECA 1 for installation requirements, except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

a. To Wood: Fasten with lag screws or through bolts.
b. To New Concrete: Bolt to concrete inserts.
c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
d. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
e. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
f. To Light Steel: Sheet metal screws.
g. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3. INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4. CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and seismic criteria at Project.

B. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.

C. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of the base.
D. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
F. Install anchor bolts to elevations required for proper attachment to supported equipment.
G. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
H. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."

END OF SECTION 16072

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1- GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Identification for raceway.
b. Identification for conductors and communication and control cable.
c. Underground-line warning tape.
d. Warning labels and signs.
e. Instruction signs.
f. Equipment identification labels.
g. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2- PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

a. Power Circuits: Black letters on an orange field.
b. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

a. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

a. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
b. Compounded for permanent direct-burial service.
c. Embedded continuous metallic strip or core.
d. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

a. Engraved legend with black letters on white face.
b. Punched or drilled for mechanical fasteners.
c. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

a. Minimum Width: 3/16 inch (5 mm).
b. Tensile Strength: 50 lb (22.6 kg), minimum.
c. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
d. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3- EXECUTION

3.1. APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange snap-around label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:

a. Mechanical and Electrical Supervisory System: Green and blue.
b. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

a. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
b. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
c. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for cables in raceway.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

a. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

- Power transfer switches.
- Controls with external control power connections.

b. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

I. Instruction Signs:

a. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
b. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer load shedding.

J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

a. Labeling Instructions:

- Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
- Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches (100 mm) high.
- Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

b. Equipment to Be Labeled:

- Panelboards, electrical cabinets, and enclosures.
- Access doors and panels for concealed electrical items.
- Electrical switchgear and switchboards.
- Emergency system boxes and enclosures.
- Motor-control centers.
- Disconnect switches.
- Enclosed circuit breakers.
- Motor starters.

- Push-button stations.
- Power transfer equipment.
- Contactors.
- Remote-controlled switches, dimmer modules, and control devices.
- Power-generating units.
- Voice and data cable terminal equipment.
- Intercommunication and call system master and staff stations.
- Television/audio components, racks, and controls.
- Fire-alarm control panel and annunciators.
- Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
- Monitoring and control equipment.
- Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.2. INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Colors for 208/120-V Circuits:

- Phase A: Black.
- Phase B: Red.
- Phase C: Blue.

b. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use

multiple tapes where width of multiple lines installed in a common trenchexceeds 16 inches (400 mm) overall.

J. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION 16075

SECTION 16120 - CONDUCTORS AND CABLES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Building wires and cables rated 600 V and less.
b. Connectors, splices, and terminations rated 600 V and less.
c. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

a. Division 16 Section "Voice and Data Communication Cabling" for cabling used for voice and data circuits.
b. Division 16 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

a. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2- PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Alcan Products Corporation; Alcan Cable Division.
b. American Insulated Wire Corp.; a Leviton Company.
c. General Cable Corporation.
d. Senator Wire & Cable Company.
e. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THW and THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFC Cable Systems, Inc.
b. Hubbell Power Systems, Inc.
c. O-Z/Gedney; EGS Electrical Group LLC.
d. 3M; Electrical Products Division.
e. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

a. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
b. Pressure Plates: Plastic, Carbon steel, Stainless steel. Include two for each sealing element.
c. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3- EXECUTION

3.1. CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Aluminum conductors will not be allowed.

3.2. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3. INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Electrical Supports and Seismic Restraints."

F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.4. CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

a. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

a. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."

L. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6. SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7. FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

3.8. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

a. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding critical equipment and services for compliance with requirements.
b. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
c. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

- Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
- Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:

a. Test procedures used.
b. Test results that comply with requirements.
c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

a. Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.
b. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
c. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

C. Shop Drawings: Signed and sealed by a qualified professional engineer.

a. Design Calculations: Calculate requirements for selecting seismic restraints.
b. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
b. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

a. AFC Cable Systems, Inc.
b. Alflex Inc.
c. Anamet Electrical, Inc.; Anaconda Metal Hose.
d. Electri-Flex Co.
e. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
f. LTV Steel Tubular Products Company.
g. Manhattan/CDT/Cole-Flex.
h. O-Z Gedney; Unit of General Signal.
i. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

F. Plastic-Coated IMC and Fittings: NEMA RN 1.

G. EMT and Fittings: ANSI C80.3.

a. Fittings: Set-screw or compressiontype.

H. FMC: Aluminum or Zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

a. American International.
b. Anamet Electrical, Inc.; Anaconda Metal Hose.
c. Arnco Corp.
d. Cantex Inc.
e. Certainteed Corp.; Pipe & Plastics Group.
f. Condux International.
g. ElecSYS, Inc.
h. Electri-Flex Co.
i. Lamson & Sessions; Carlon Electrical Products.
j. Manhattan/CDT/Cole-Flex.
k. RACO; Division of Hubbell, Inc.
l. Spiralduct, Inc./AFC Cable Systems, Inc.
m. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

2.4 METAL WIREWAYS

A. Manufacturers:

a. Hoffman.
b. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA [**1**] [**3R**].

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type Screw-cover type Flanged-and-gasketed type As indicated.

F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Manufacturers:

a. Hoffman.
b. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

a. Manufacturers:

- Airey-Thompson Sentinel Lighting; Wiremold Company (The).
- Thomas & Betts Corporation.
- Walker Systems, Inc.; Wiremold Company (The).
- Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

a. Manufacturers:

- Butler Manufacturing Co.; Walker Division.
- Enduro Composite Systems.
- Hubbell, Inc.; Wiring Device Division.
- Lamson & Sessions; Carlon Electrical Products.
- Panduit Corp.
- Walker Systems, Inc.; Wiremold Company (The).
- Wiremold Company (The); Electrical Sales Division.

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

a. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
b. Emerson/General Signal; Appleton Electric Company.
c. Erickson Electrical Equipment Co.
d. Hoffman.
e. Hubbell, Inc.; Killark Electric Manufacturing Co.
f. O-Z/Gedney; Unit of General Signal.
g. RACO; Division of Hubbell, Inc.
h. Robroy Industries, Inc.; Enclosure Division.
i. Scott Fetzer Co.; Adalet-PLM Division.
j. Spring City Electrical Manufacturing Co.
k. Thomas & Betts Corporation.
l. Walker Systems, Inc.; Wiremold Company (The).
m. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Floor Boxes: Cast metal, fully adjustable, rectangular.

F. Floor Boxes: Nonmetallic, nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

a. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
b. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

B. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3- EXECUTION

3.1. RACEWAY APPLICATION

A. Outdoors:

a. Exposed: Rigid steel or IMC.
b. Concealed: Rigid steel or IMC.
c. Underground, Single Run: RNC.
d. Underground, Grouped: RNC.
e. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
f. Boxes and Enclosures: NEMA 250, Type [**3R**] [**4**].

B. Indoors:

a. Exposed: EMT.
b. Concealed: EMT.
c. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
d. Damp or Wet Locations: Rigid steel conduit.
e. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

- Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 1/2-inch trade size (DN 16).

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

a. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
b. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits embedded in or in contact with concrete.

3.2. INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

   a. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.

   a. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
   b. Space raceways laterally to prevent voids in concrete.
   c. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   d. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

   a. Run parallel or banked raceways together on common supports.
   b. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

   a. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

   a. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
   b. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

   a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   b. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Set floor boxes level. Trim after installation to fit flush with finished floor surface.

U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3. PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

a. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
b. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4. CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
b. Single- and double-pole snap switches and dimmer switches.
c. Device wall plates.
d. Pin and sleeve connectors and receptacles.
e. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

a. Cord and Plug Sets: Match equipment requirements.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Wiring Devices:

- Bryant Electric, Inc./Hubbell Subsidiary.
- Eagle Electric Manufacturing Co., Inc.
- Hubbell Incorporated; Wiring Device-Kellems.
- Leviton Mfg. Company Inc.
- Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

D. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.

a. Devices: Listed and labeled as isolated-ground receptacles.
b. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

E. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.

a. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
b. Active TVSS Indication: Visual and audible with light visible in face of device to indicate device is "active" or "no longer in service."
c. Receptacle Type: Heavy-Duty grade, with isolated-ground terminal.
d. Identification: Distinctive marking on face of device to denote TVSS-type unit.

F. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

2.3 PENDANT CORD/CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.

a. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
b. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

a. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
b. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

a. Switch: 20 A, 120/277-V ac.
b. Receptacle: NEMA WD 6, Configuration 5-15R.

2.6 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

a. Plate-Securing Screws: Metal with head color to match plate finish.
b. Material for Wet Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."

PART 3- EXECUTION

3.1. INSTALLATION

A. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

C. Remove wall plates and protect devices and assemblies during painting.

3.2. IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

a. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3. CONNECTIONS

A. Ground equipment according to Division 16 Section "Grounding and Bonding."

B. Connect wiring according to Division 16 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

a. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
b. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 16140

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

a. Fusible switches.
b. Nonfusible switches.
c. Bolted-pressure contact switches.
d. High-pressure, butt-type contact switches.
e. Molded-case circuit breakers.
f. Molded-case switches.
g. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Current and voltage ratings.
c. Short-circuit current rating.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

a. Test procedures used.
b. Test results that comply with requirements.
c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
b. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

a. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
b. Altitude: Not exceeding 6600 feet.

1.7 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
b. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Siemens Energy & Automation, Inc.
d. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type GD HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Nonfusible Switch, 1200 A and Smaller: NEMA KS 1, Type [**GD**] [**HD**], lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
b. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
c. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 FUSED POWER CIRCUIT DEVICES

A. Bolted-Pressure Contact Switch: UL 977; operating mechanism shall use a rotary-mechanical-bolting action to produce and maintain high-clamping pressure on the switch blade after it engages the stationary contacts.

a. Manufacturers:

- Boltswitch, Inc.
- Eaton Corporation; Cutler-Hammer Products.

- Pringle Electrical Mfg. Co.
- Siemens Energy & Automation, Inc.
- Square D/Group Schneider.

B. High-Pressure, Butt-Type Contact Switch: UL 977; operating mechanism shall use butt-type contacts and a spring-charged mechanism to produce and maintain high-contact pressure when switch is closed.

a. Manufacturers:

- General Electric Co.; Electrical Distribution & Control Division.

b. Main Contact Interrupting Capability: Twelve times the switch current rating, minimum.
c. Operating Mechanism: Manual handle operation to close switch stores energy in mechanism for closing and opening.

- Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
- Mechanical Trip: Operation of mechanical lever or push button or another device causes switch to open.

d. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
e. Service-Rated Switches: Labeled for use as service equipment.
f. Ground-Fault Relay: Comply with UL 1053. Self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.

- Configuration: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground fault indicator.
- Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
- No-Trip Relay Test: Operation of "no-trip" test control permits ground-fault simulation test without tripping switch.
- Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).

g. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.

2.4 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Moeller Electric Corporation.
d. Siemens Energy & Automation, Inc.
e. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

a. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
b. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
c. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

- Instantaneous trip.
- Long- and short-time pickup levels.
- Long- and short-time time adjustments.
- Ground-fault pickup level, time delay, and I^2t response.

d. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
e. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
f. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
c. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 16 Section "Electrical Power Monitoring and Control."
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
h. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
j. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

a. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and material of conductors.
b. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
c. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.
d. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Provide "dummy" trip unit where required for proper operation.

e. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
f. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.5 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

a. Outdoor Locations: NEMA 250, Type 3R.
b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
d. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3- EXECUTION

3.1. EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.

B. Concrete base is specified in Division 16 Section "Electrical Supports and Seismic Restraints," and concrete materials and installation requirements are specified in Division 3.

3.3. INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4. IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.5. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Prepare for acceptance testing as follows:

a. Inspect mechanical and electrical connections.
b. Verify switch and relay type and labeling verification.
c. Verify rating of installed fuses.
d. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.

C. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

D. Perform the following field tests and inspections and prepare test reports:

a. Test mounting and anchorage devices according to requirements in Division 16 Section "Electrical Supports and Seismic Restraints."
b. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
c. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
d. Infrared Scanning:

- Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
- Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
- Instruments, Equipment and Reports:

✓Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
✓Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6. ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7. CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 16410

SECTION 16491 - FUSES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Cartridge fuses rated 600 V and less for use in switches panelboards controllers and motor-control centers.
b. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

a. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
b. Let-through current curves for fuses with current-limiting characteristics.
c. Time-current curves, coordination charts and tables, and related data.
d. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

a. In addition to items specified in Division 1 Section " Operation and Maintenance Data," include the following:

- Let-through current curves for fuses with current-limiting characteristics.
- Time-current curves, coordination charts and tables, and related data.
- Ambient temperature adjustment information.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Bussman, Inc.
b. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
c. Ferraz Shawmut, Inc.
d. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

a. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
b. Finish: Gray, baked enamel.
c. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
d. Fuse Pullers: For each size of fuse.

PART 3- EXECUTION

3.1. EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. FUSE APPLICATIONS

A. Service Entrance: Class L, time delay J, time delay.

B. Feeders: Class L, time delay J, time delay.

C. Motor Branch Circuits: Class [**RK1**] [**RK5**], time delay.

D. Other Branch Circuits: Class [**RK1, time delay**] [**RK5, time delay**] [**J, fast acting**] [**J, time delay**].

3.3. INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4. IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 16491

SECTION 16521 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

a. Exterior luminaires with lamps and ballasts.
b. Luminaire-mounted photoelectric relays.
c. Poles and accessories.
d. Luminaire lowering devices.
e. Concrete foundation.

1.3 DEFINITIONS

A. CRI: Color-rendering index.

B. HID: High-intensity discharge.

C. Luminaire: Complete lighting fixture, including ballast housing if provided.

D. Pole: Luminaire support structure, including tower used for large area illumination.

E. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in Florida Building Code.

B. Live Load: Single load of 500 lbf, distributed as stated in Florida Building Code.

C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in Florida Building Code.

1.5 SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

a. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
b. Details of attaching luminaires and accessories.
c. Details of installation and construction.
d. Luminaire materials.

e. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

B. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

a. Photoelectric relays.
b. Ballasts, including energy-efficiency data.
c. Lamps, including life, output, and energy-efficiency data.
d. Materials, dimensions, and finishes of poles.
e. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
f. Anchor bolts for poles.
g. Manufactured pole foundations.

C. Shop Drawings:

a. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
b. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
c. Wiring Diagrams: Power and control wiring.

D. Samples for Verification: For products designated for sample submission in Exterior Lighting Device Schedule. Each sample shall include lamps and ballasts.

E. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

F. Qualification Data: For agencies providing photometric data for lighting fixtures.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

I. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

B. Warranty Period for Luminaires: Five years from date of Substantial Completion.
C. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
D. Warranty Period for Color Retention: Five years from date of Substantial Completion.
E. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.
F. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
C. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
D. Ballasts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
E. Globes and Guards: 10 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (SEE ELECTRIC DRAWING FOR MANUFACTURE INFORMATION)

2.2 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

a. White Surfaces: 85 percent.
b. Specular Surfaces: 83 percent.
c. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

N. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.

a. Color: As selected from manufacturer's standard catalog of colors.
b. Color: Match Architect's sample of manufacturer's standard color.
c. Color: As selected by Architect from manufacturer's full range.

O. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

P. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   a. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
   b. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
   c. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

      - Color: As selected by Architect

2.3 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

C. Relay with locking-type receptacle shall comply with NEMA C136.10.
Adjustable window slide for adjusting on-off set points.

2.4 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

B. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.

Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

C. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

E. Materials: Shall not cause galvanic action at contact points.
Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
Anchor-Bolt Template: Plywood or steel.

F. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

G. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M;

and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

H. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4.

2.5 FIBERGLASS POLES

A. Poles: Comply with ANSI C136.20, with access handhole in pole wall.

a. Mounting: Embedded.
b. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Resin Color: Dark bronze; provide uniform coloration throughout entire wall thickness.

C. Surface Finish: Pigmented polyurethane, with a minimum dry film thickness of 1.5 mils.

PART 3 - EXECUTION

3.1. LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

C. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

D. Adjust luminaires that require field adjustment or aiming.

3.2. POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:

C. Fire Hydrants and Storm Drainage Piping: 60 inches.
Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.

D. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 3 Section "Cast-in-Place Concrete."

E. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

F. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.

Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
Install base covers, unless otherwise indicated.
Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

3.3. INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Division 3 Section "Cast-in-Place Concrete."

3.4. CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Division 16 Section "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5. GROUNDING

A. Ground metal poles and support structures according to Division 16 Section "Grounding and Bonding."

a. Install grounding electrode for each pole, unless otherwise indicated.
b. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Division 16 Section "Grounding and Bonding."

a. Install grounding electrode for each pole.
b. Install grounding conductor and conductor protector.
c. Ground metallic components of pole accessories and foundations.

3.6. FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

C. Verify operation of photoelectric controls.

D. Illumination Tests:

a. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

- IESNA LM-5, "Photometric Measurements of Area and Sports Lighting."
- IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
- IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."

- IESNA LM-64, "Photometric Measurements of Parking Areas."
- IESNA LM-72, "Directional Positioning of Photometric Data."

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.7. DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaire lowering devices. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 16521