



CITY OF TAMPA

Bob Buckhorn, Mayor

CONTRACT ADMINISTRATION DEPARTMENT

David L. Vaughn, AIA, Director

ADDENDUM NO. 1

DATE: November 14, 2013

Contract 14-C-00006; Lake Eckles Pump Station and Force Main Replacement

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

- Item 1: Insert, after Workmanship and Materials Section 15, the attached Workmanship and Materials Sections 16, 17, 18, 24, 32, 36, 92, 105 108, 112, 327, 425, 16010, 16050, 16095, 16110, 16120, 16195, 16400, 16450, 16475 and 16940.
- Item 2: Insert, after Workmanship and Materials Section 16940, the attached Contract Items.
- Item 3: Attached for reference is the pre-bid meeting sign-in sheet.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to ContractAdministration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Management Supervisor

SECTION 16 - RESTORATION OF STREET PAVEMENTS

W-16.01 General

The various street surfaces disturbed, damaged, or destroyed during the performance of the work under this Contract shall be restored and maintained as shown, specified, and directed. Included in this classification are permanent pavement surfaces of all types, pavement bases, curb, curb and gutter, alleys, driveways, and sidewalks.

The quality of workmanship and materials used in the restoration shall produce a street surface equal to or better than the condition before the work began.

Service boxes, manhole frames and covers, and similar structures not conforming to the new work shall be set to established grade at the Contractor's expense, and no separate payment will be made therefor.

All portland cement and asphaltic concrete pavements shall be removed in rectangular sections with sawed vertical cuts, or to existing joints, as directed by the Engineer. Concrete pavements shall be cut with a concrete saw. Asphaltic concrete pavements one-inch thick or greater shall be cut with a tool having a square neat edge. The edges of adjacent pavement shall be trimmed to straight lines which a roller can follow. Where reinforced concrete pavement is removed, one foot of existing reinforcement on each side of the excavation shall be left exposed and tied to the replaced reinforcing steel.

The equipment necessary for the proper performance of pavement replacement shall be on the site in satisfactory working condition and shall be subject to approval of the Engineer before the work is started.

All replaced concrete pavements shall have a minimum bearing on undisturbed earth outside the line of excavations of at least nine (9) inches.

W-16.02 Standards

The restoration of street pavement shall be performed in strict conformance with the standards relating to equipment, materials, and methods of construction of the authority having jurisdiction over the pavements, unless otherwise specified herein. Pavements to be restored are under the jurisdiction of the several agencies as follows:

1. State Highways are under the jurisdiction of the State of Florida Department of Transportation. Work on such pavements shall conform to the Department of Transportation Standard Specifications for Road and Bridge Construction.
2. City Streets are under the jurisdiction of the City of Tampa Department of Public Works. Work on such pavements shall conform to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, except that densities (including for subgrade) and other testing requirements shall follow current Department of Public Works specifications, and except that Sections 330 and 331 shall be modified as shown in this Section. The type and thickness of pavement, base and stabilization shall be as shown, specified, and

directed by the Engineer.

3. County Roads are under the jurisdiction of the Hillsborough County Engineering Department. Work on such pavements shall conform to County specifications.

All specifications of the several agencies having jurisdiction over pavement restoration work shall be the current issue of such specifications as of the date of the "Notice to Bidders," except as specified otherwise herein.

W-16.03 Temporary Restoration

Upon completion of backfilling, the street or sidewalk surface damaged or destroyed shall be promptly placed in condition for safe temporary use. Temporary work shall be maintained in a suitable and safe condition for traffic until the permanent pavement is laid, or until final acceptance of the work.

Where the area over which existing pavement has been disturbed is to be repaved as part of an overall project by the agency having jurisdiction, any special temporary pavement replacement shall be as specified in the "Specific Provisions."

Pavement surfaces shall be temporarily restored by placing thereon, to proper line, grade and transverse profile, a layer or layers of compacted limerock conforming to all requirements regarding configuration, thickness, and density as detailed in the Plans, specified, and directed by the Engineer. When the compacted thickness of the limerock layer is greater than 6 inches, the base shall be constructed in multiple courses. Each course shall not exceed 6 inches in compacted thickness. Where the existing pavement has a permanent wearing surface, the temporary pavement shall be finished with a suitable grade of asphalt and sand to provide a temporary wearing course and to eliminate dust nuisance.

Curbs, where possible, shall be temporarily reset in place, as part of the work of temporary restoration of pavement.

Damaged or destroyed sidewalks shall be temporarily restored, immediately upon placing of the backfill, by placing a compacted layer of fine crushed limestone, choked with limestone screenings, which shall have a minimum thickness of three inches below the existing finished sidewalk grade.

The temporary pavement shall be maintained by the Contractor and all holes and depressions filled until the permanent pavement is placed.

Limerock or shell placed in areas where the existing pavement is shell, limerock, crushed stone, or other similar material and is classed as nonpermanent pavement, will not be measured for separate payment. Placement of limerock or shell as nonpermanent pavement replacement will be included for payment under the various classified Unit Price Contract Items for pipelines.

Temporary sand and asphalt wearing courses placed on limerock base on which a permanent pavement surface will be constructed shall be incidental to the permanent pavement base work, and no separate payment will be made therefor.

Limestone screenings for temporary sidewalk surface shall be incidental to sidewalk replacement, and no separate payment will be made therefor.

Limerock base placed in areas to receive a permanent pavement surface will be measured for payment under the appropriate Contract Item for permanent pavement base.

W-16.04 Preparation of Temporary Pavement for Permanent Pavement Replacement

After due notice and within the time specified, the temporary limerock pavement shall be prepared as the base to receive the new permanent pavement surface.

Prior to construction of the pavement base, the City will furnish the Contractor with the preconstruction survey notes for the streets disturbed by construction. The Contractor shall use these notes in bringing the base installed to grade allowing for the permanent pavement surface to be constructed.

The preparation of the base shall consist of bringing the area to be replaced to a grade conforming to the required grade and cross section, of uniform density, ready to receive the permanent pavement. This is to be accomplished by excavating or backfilling as needed, shaping, watering as required, or permitting to dry to proper consistency, and rolling the entire area with an approved self-propelled roller weighing not less than eight tons. Shaping and rolling shall be continued until the base has been properly prepared and shows that no further compaction of any practical benefit would result from continued rolling. The base shall be tested as to cross section, crown, and elevation. After being properly prepared, it shall be so maintained until the permanent pavement is constructed. Any part of the base area not accessible to the roller shall be thoroughly compacted by hand or by mechanical compaction in a manner acceptable to the Engineer. Preparation shall include sawing, cutting and trimming edges of existing pavements to provide a neat, uniform edge to abut the new pavement.

After completion of the base, the Contractor shall furnish the Engineer with survey notes verifying the base has been constructed to grade. Upon approval, payment will be made for permanent pavement base.

W-16.05 Certification for Limerock for Pavement Base

The Contractor shall furnish notarized certifications from all suppliers of limerock stating that all limerock supplied for use as pavement base conforms to the requirements of the applicable sections of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

W-16.06 Permanent Pavement Base Densities

Permanent base material shall be installed and compacted to the required densities (98% modified proctor) in layers not exceeding six inches.

W-16.07 Permanent Pavement Surface Restoration

Permanent restoration of pavement shall be pavement of the type and thickness detailed in the Plans, Specific Provisions, or as directed by the Engineer.

If the existing type of pavement is classified as nonpermanent pavement, the temporary restoration shall be reworked and completed and left in a condition at least equivalent to the existing nonpermanent pavement.

W-16.08 Replacement of Curb, Curb and Gutter, Sidewalk and Driveways

All permanent restoration of street curb or curb and gutter shall be of the same type and thickness as the curb or curb gutter which abuts. The grade of the restored curb and curb and gutter shall conform with the grade of the existing adjacent curb or curb and gutter.

Except as otherwise specified herein or detailed in the Plans, all permanent restoration of driveways and sidewalks shall conform to the manner of construction as originally placed and to the lines and grades as given by the Engineer. No patching of concrete driveway areas will be allowed between joints or dummy joints.

Where sidewalks are replaced, the replacement shall be the full width of the walk and minimum lengths shall be 60 inches. Restoration of adjacent lawn is incidental to sidewalk replacement, and no separate payment will be made therefor.

W-16.09 Replacement of Traffic Markings and Signalization Loops

The Contractor shall furnish all labor, equipment and materials to replace, test and maintain all traffic markings (temporary and permanent) and signalization loops removed or damaged by pipeline construction and appurtenance work as shown on the Plans, specified and directed by the Engineer.

The replacement of traffic markings (temporary and permanent), signalization loops and all appurtenant work shall be replaced by the Contractor in kind.

It shall be the Contractor's responsibility to field verify before construction begins all markings and signalization loops to be replaced.

All traffic markings and signalization loops shall conform to the Workmanship and Materials standards set forth in the latest edition of the Florida Department of Transportation Standard and Supplemental Specifications.

Payment for the replacement of temporary and permanent traffic markings, signalization loops and all appurtenant work shall be included in the unit bid price for Permanent Pavement Surface Replacement, Asphaltic Concrete, and no separate payment shall be made therefor.

W-16.10 Hot Bituminous Mixtures (Section 330) Type S Asphaltic Concrete (Section 331)

This Subsection shall Replace and/or Modify Portions of F.D.O.T. Standard Specifications for Road and Bridge Construction (2007) Sections 330, 331 and 334.

SECTION 330 HOT BITUMINOUS MIXTURES

All references to the CITY OF TAMPA shall mean the local agency. All references to the Engineer shall mean the designated Engineer of the local agency. Any incorrect references to FDOT specifications, test methods, or standards should be brought to the attention of the Engineer for clarification.

330-1 Description. Construct plant-mixed hot bituminous pavements and bases. Establish and maintain a quality control system that provides assurance that all materials, products and completed construction submitted for acceptance meet Contract requirements.

330-1.1 General: Meet the requirements of Section 320 for plant and equipment, and meet the general construction requirements of Section 330. The Engineer will accept the work based on one of the following methods as described in 334-5 and 334-6:

- 1) Asphalt Work Category 1,
- 2) Asphalt Work Category 2,
- 3) Asphalt Work Category 3

330-1.2 Quality Control/Acceptance Testing: The contractor's submittal of documentation for quality control testing may be waived by the Engineer; however, the contractor shall not be exempt from implementing quality control procedures regarding material and workmanship. The local agency shall perform the quality acceptance testing, or utilize a licensed private testing laboratory of the Engineer's choice.

SECTION 331 TYPE S ASPHALTIC CONCRETE

331-1 Description.

331-1.1 General: Construct a Type S Hot Mix Asphalt (HMA) pavement course as specified by the Contract. The general composition and physical test properties for all mixes shall be met per F.D.O.T Standard Specifications for Road and Bridge Construction. Meet the applicable requirements for plants, equipment, and construction requirements.

Where Type S Asphalt Concrete is specified in the Contract, if approved by the Engineer, the equivalent fine Type SP Asphalt Concrete mixture (Traffic Level C) meeting the requirements of Section 334 may be selected as an alternate at no additional cost to the Department. The equivalent mixes are as follows:

Type S-I.....	Type SP-12.5
Type S-II.....	Type SP-19.0
Type S-III.....	Type SP-9.5

Meet the requirements for plant and equipment specified in Section 320. Meet the general construction requirements specified in Section 330.

331-1.2 Layer Thicknesses:

331-1.2.1 Structural Layers: The allowable layer thicknesses for Type S Asphalt Concrete mixtures used in structural and overbuild applications is as follows:

Type S-III.....	3/4 – 1 1/4 inches [20 – 30 mm]
Type S-I.....	1 1/4 – 2 1/2 inches [30 – 60 mm]
Type S-II.....	2 – 2 3/4 inches [50 – 70 mm]

In addition to the minimum and maximum thickness requirements, the following

restrictions are placed on Type S mixtures when used as a structural course:

Type S-III – Limited to the final (top) structural layer, one layer only.

Type S-I – May not be used in the first layer of courses over 3 1/2 inches [90 mm] thick, nor in the first layer of courses over 2 3/4 inches [70 mm] thick on limited access facilities.

Type S-II – May not be used in the final (top) structural layer.

331-1.2.2 Additional Requirements: The following requirements also apply to Type S Asphalt Concrete mixtures:

1. A minimum 1 1/2 inch [40 mm] initial lift is required over an Asphalt Rubber Membrane Interlayer (ARMI).

2. When construction includes the paving of adjacent shoulders (#5 feet [#1.5 m] wide), the layer thickness for the upper pavement layer and shoulder shall be the same and paved in a single pass, unless shown differently in the plans.

3. All overbuild layers shall be Type S asphalt concrete. Use the minimum and maximum layer thicknesses as specified in 331-1.2.1 unless shown differently in the plans. On variable thickness overbuild layers, the minimum allowable thickness may be **reduced by 1/2 inch (13 mm), and the maximum allowable thickness may be increased 1/2 inch (13 mm)**, unless shown differently in the plans. Other variations from these thicknesses must be approved by the Engineer.

331-4 General Composition of Mixture.

331-4.3 Mix Design: Prior to the production of any asphalt mixture, obtain the Engineer's conditional approval of the mix design. If required by the Engineer, send representative samples of all component materials, including asphalt binder to a laboratory designated by the Engineer for verification. The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and at his discretion, the Engineer may no longer allow the use of the mix design. Furnish the following information:

1. The specific project on which the mixture will be used.

2. The source and description of the materials to be used.

3. The gradation and approximate proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use.

4. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly No. 200 [75 µm]) should be accounted for and identified for the applicable sieves.

5. A single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%. For structural mixes (S-I, S-II and S-III) establish the optimum asphalt content at a level corresponding to a minimum of 4.5% air voids. For FC-3 mixes, establish optimum asphalt content at a level corresponding to a minimum of 5.0% air voids.

6. A single temperature at which the mixture is intended to be discharged from the plant.

7. The laboratory density of the asphalt mixture for all mixes except Open-Graded Friction Courses.

8. Evidence that the completed mixture will meet all specified physical requirements.

9. The name signature dated of the individual responsible for the Quality Control of the

mixture during production.

331-4.4 Contractor Quality Control: Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for quality control purposes.

331-5 Acceptance Procedures:

331-5.1 General Construction Requirements: shall meet same requirements as 334-5 General Construction Requirements (with exception to requirements regarding SP spread rates, unless specified by the Engineer).

331-6 Acceptance of the Mixture: shall meet same requirements as 334-6 Acceptance of the Mixture (with exception to Table 334-3 to be replaced with Table 331-6).

Table 331-6	
Tolerances for Acceptance Tests	
Characteristic	Tolerance
Asphalt Binder Content	±0.55%
Passing No. 4 [4.75 mm] sieve	±7.00%
Passing No. 10 [2.00 mm] sieve	±5.50%
Passing No. 40 [425 µm] sieve*	±4.50%
Passing No. 200 [75 µm] sieve	±2.00%
*Applies only to Types S-I, S-II, S-III, and FC-3.	

331-7 Acceptance of the Mixture at the Roadway: shall meet same requirements as 334-6 Acceptance of the Mixture (with exception to Table 334-3 shall be replaced with Table 331-6).

Table 334-7	
Roadway Density Acceptance Values	
Characteristic	Tolerance
Roadway Density (average of three cores)	92.0% G_{mm} (proposed mix design)
Roadway Density (avg. of 5 tests nuclear method)	95.0% G_{sb} (proposed mix design)
Roadway Density (avg. of 5 tests nuclear method)	96.0 % G_{sb} (lab density)

SECTION 334 SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Type SP Hot Mix Asphalt (HMA) pavement based on the type of work specified in the Contract and the Asphalt Work Categories as defined below. Meet the applicable requirements for plants, equipment, and construction requirements as defined below. Use a HMA mix that meets the requirements of this specification.

334-1.2 Asphalt Work Mix Categories: Construction of Hot Mix Asphalt Pavement will fall into one of the following work categories:

334-1.2.1 Asphalt Work Category 1: Includes the construction of bike paths.

334-1.2.2 Asphalt Work Category 2: Includes the construction of new HMA turn

lanes, paved shoulders and other non-mainline pavement locations.

334-1.2.3 Asphalt Work Category 3: Includes the construction of new mainline HMA pavement lanes, milling and resurfacing.

334-1.3 Mix Types: Use the appropriate HMA mix as shown in Table 334-1.

Table 334-1 HMA Mix Types		
Asphalt Work Category	Mix Types	Traffic Level
1	Type SP-9.5 , or equivalent as determined by the Engineer	A
2	Type SP-9.5, SP-12.5, or equivalent as determined by the Engineer	B or C
3	Type SP-9.5, SP-12.5	C

A Type SP mix one traffic level higher than the traffic level specified in the Contract may be substituted, at no additional cost (i.e. Traffic Level B may be substituted for Traffic Level A, etc.).

334-1.4 Gradation Classification: HMA mixes are classified as either coarse or fine, depending on the overall gradation of the mixture. Coarse and fine mixes are defined in 334 3.2.2. Use only fine mixes.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

Type SP-9.5..... 9.5 mm
Type SP-12.5..... 12.5 mm

334-1.5 Thickness: The total pavement thickness of the HMA Pavement will be based on a specified spread rate or plan thickness as shown in the Contract Documents. Before paving, propose a spread rate or thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan spread rate or thickness. When the total pavement thickness is specified as plan thickness, the plan thickness and individual layer thickness will be converted to spread rate using the following equation:

$$\text{Spread rate (lbs/yd}^2\text{)} = t \times G_{mm} \times 43.3$$

where: t = Thickness (in.) (Plan thickness or individual layer thickness)
 G_{mm} = Maximum specific gravity from the mix design

For target purposes only, spread rate calculations shall be rounded to the nearest whole number.

334-1.5.1 Layer Thicknesses: Unless otherwise called for in the Contract Documents, the allowable layer thicknesses for HMA mixtures are as follows:

Type SP-9.5..... 3/4 - 1 1/2 inches
Type SP-12.5..... 1 1/2 - 2 1/2 inches

334-1.5.2 Additional Requirements: The following requirements also apply to HMA

mixtures:

1. When construction includes the paving of adjacent shoulders (≤ 5 feet wide), the layer thickness for the upper pavement layer and shoulder shall be the same and paved in a single pass, unless otherwise called for in the Contract Documents.

2. For overbuild layers, use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract Documents. On variable thickness overbuild layers, the minimum allowable thickness may be reduced by 1/2 inch, and the maximum allowable thickness may be increased by 1/2 inch, unless called for differently in the Contract Documents.

334-1.6 Weight of Mixture: The weight of the mixture shall be determined as provided in 320 2.2 of the Florida Department of Transportation (FDOT) specifications.

334-2 Materials.

334-2.1 Superpave Asphalt Binder: Unless specified elsewhere in the Contract or in 334-2.3.3, use a PG 67 22 asphalt binder from the FDOT Qualified Products List (QPL).

334-2.2 Aggregate: Use aggregate capable of producing a quality pavement. For Category 2 and 3 projects, require the aggregate supplier to certify that the material meets FDOT requirements.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture if approved by the Engineer. Usage of RAP is subject to the following requirements:

1. Limit the amount of RAP material used in the mix to a maximum of 50 percent by weight of total aggregate.
2. Do not use RAP material in any friction course mixes.
3. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.
4. Provide RAP material having a minimum average asphalt content of 4.0 percent by weight of total mix. The Engineer may sample the stockpile to verify that this requirement is met.
5. Use a grizzly or grid over the RAP cold bin, in-line roller crusher, screen, or other suitable means to prevent oversized RAP material from showing up in the completed recycle mixture. If oversized RAP material appears in the completed recycle mix, take the appropriate corrective action immediately. If the appropriate corrective actions are not immediately taken, stop plant operations.

334-2.3.2 Material Characterization: Assume responsibility for establishing the asphalt binder content, gradation, viscosity and bulk specific gravity (Gsb) of the RAP material based on a representative sampling of the material.

334-2.3.3 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334 2. Maintain the viscosity of the recycled mixture within the range of 4,000 to 12,000 poises.

Table 334-2

Asphalt Binder Grade for Mixes Containing RAP	
Percent RAP	Asphalt Binder Grade
<20	PG 67-22
20 – 29	PG 64-22
≥ 30	Recycling Agent

334-3 Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregates, mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R35 04, except as noted herein. Submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. Prior to the production of any asphalt mixture, obtain the Engineer's conditional approval of the mix design. If required by the Engineer, send representative samples of all component materials, including asphalt binder to a laboratory designated by the Engineer for verification. The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and at his discretion, the Engineer may no longer allow the use of the mix design.

334-3.2.2 Mixture Gradation Requirements: Combine the aggregates in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M323 04, Table 3. Aggregates from various sources may be combined.

334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M323 04, Table 3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M323 04, Table 4. Fine mixes are defined as having a gradation that passes above or through the primary control sieve control point. Use only fine mixes

334-3.2.3 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T312 04. Use the number of gyrations as defined in AASHTO R35 04, Table 1.

334-3.2.4 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M323 04, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M323 04, Table 6.

334-3.2.5 Moisture Susceptibility: Test 4 inch specimens in accordance with FM 1 T 283. Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi. If necessary, add a liquid anti-stripping agent from the FDOT's Qualified Products List, or hydrated lime in order to meet these criteria.

In lieu of moisture susceptibility testing, add a liquid anti-stripping agent from the FDOT Qualified Products List. Add 0.5% liquid anti-stripping agent by weight of binder.

334-3.2.6 Additional Information: In addition to the requirements listed above, provide the following information on each mix design:

1. The design traffic level and the design number of gyrations (N_{design}).

2. The source and description of the materials to be used.
3. The FDOT source number and the FDOT product code of the aggregate components furnished from an FDOT approved source (if required).
4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.
5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.
6. The bulk specific gravity (G_{sb}) value for each individual aggregate and .
7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1 percent.
8. A target temperature at which the mixture is to be discharged from the plant and a target roadway temperature. Do not exceed a target temperature of 330°F for modified asphalts and 315°F for unmodified asphalts.
9. Provide the physical properties achieved at four different asphalt binder contents. One shall be at the optimum asphalt content, and must conform to all specified physical requirements.
10. The name of the Mix Designer.
11. The ignition oven calibration factor.

334-4 Contractor Quality Control.

Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for quality control purposes.

334-5 General Construction Requirements.

334-5.1 Weather Limitations: Do not transport asphalt mix from the plant to the roadway unless all weather conditions are suitable for the laying operations.

334-5.2 Limitations of Laying Operations:

334-5.2.1 General: Spread the mixture only when the surface upon which it is to be placed has been previously prepared, is intact, firm, and properly cured, and is dry.

334-5.2.2 Air Temperature: Spread the mixture only when the air temperature in the shade and away from artificial heat is at least 40°F for layers greater than 1 inch (100 lb/yd²) in thickness and at least 45°F for layers 1 inch (100 lb/yd²) or less in thickness (this includes leveling courses). The minimum temperature requirement for leveling courses with a spread rate of 50 lb/yd² or less is 50°F.

334-5.3 Mix Temperature: Heat and combine the ingredients of the mix in such a manner as to produce a mixture with a temperature at the plant and at the roadway, within a range of $\pm 30^\circ\text{F}$ from the target temperature as shown on the mix design. Reject all loads outside of this range.

334-5.4 Transportation of the Mixture: Transport the mixture in vehicles previously cleaned of all foreign material. After cleaning, thinly coat the inside surface of the truck bodies with soapy water or an asphalt release agent as needed to prevent the mixture from adhering to the beds. Do not allow excess liquid to pond in the truck body. Do not use diesel fuel or any other hazardous or environmentally detrimental material as a coating for the inside surface of the truck body. Cover each load at all times.

334-5.5 Preparation of Surfaces Prior to Paving:

334-5.5.1 Cleaning: Clean the surface of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

334-5.5.2 Patching and Leveling Courses: Where the HMA is to be placed on an existing pavement which is irregular, wherever the plans indicate, or if directed by the Engineer, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses.

334-5.5.3 Application over Surface Treatment: Where an asphalt mix is to be placed over a surface treatment, sweep and dispose of all loose material from the paving area.

334-5.5.4 Tack Coat: Apply a tack coat on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes, unless directed otherwise by the Engineer. Use a tack coat product meeting FDOT specifications. Use an emulsified tack coat spread rate of 0.02 to 0.08 gal/sy or as specified by the Engineer.

334-5.6 Paving:

334-5.6.1 Alignment of Edges: With the exception of pavements placed adjacent to curb and gutter or other true edges, place all pavements by the stringline method to obtain an accurate, uniform alignment of the pavement edge. Control the unsupported pavement edge to ensure that it will not deviate more than ± 1.5 inches from the stringline.

334-5.6.2 Rain and Surface Conditions: Immediately cease transportation of asphalt mixtures from the plant when rain begins at the roadway. Do not place asphalt mixtures while rain is falling, or when there is water on the surface to be covered. Once the rain has stopped and water has been removed from the tacked surface to the satisfaction of the Engineer and the temperature of the mixture caught in transit still meets the requirements as specified in 334-5.3, the Contractor may then place the mixture caught in transit.

334-5.6.3 Checking Depth of Layer: Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32 feet to stabilize before the second check is made to determine the effects of the adjustment.

334-5.6.4 Hand Spreading: In limited areas where the use of the spreader is impossible or impracticable, spread and finish the mixture by hand.

334-5.6.5 Spreading and Finishing: Upon arrival, dump the mixture in the approved paver, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the work is completed, the required weight of mixture per square yard, or the specified thickness, is secured. Carry a uniform amount of mixture ahead of the screed at all times.

334-5.6.6 Thickness of Layers: Construct each course of Type SP mixtures in layers of the thickness shown in 334-1.5.1.

334-5.7 Leveling Courses:

334-5.7.1 Patching Depressions: Before spreading any leveling course, fill all mixture, and compact thoroughly.

334-5.7.2 Spreading Leveling Courses: Place all courses of leveling with an asphalt paver or by the use of two motor graders, one being equipped with a spreader box. Other types of leveling devices may be used upon approval by the Engineer.

334-5.7.3 Rate of Application: When using Type SP-9.5 (fine graded) for leveling, do not allow the average spread of a layer to be less than 50 lb/yd² or more than 75 lb/yd². The quantity of mix for leveling shown in the plans represents the average for the entire

project; however, the Contractor may vary the rate of application throughout the project as directed by the Engineer. When leveling in connection with base widening, the Engineer may require placing all the leveling mix prior to the widening operation.

334-5.8 Compaction: For each paving or leveling train in operation, furnish a separate set of rollers, with their operators.

When density testing for acceptance is required (Asphalt Work Category 3) to meet the specified density requirement, select equipment, sequence, and coverage of rolling. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops to the extent that effective compaction may not be achieved or the rollers begin to damage the pavement.

When density testing for acceptance is not required (Asphalt Work Categories 1 and 2), use a rolling pattern approved by the Engineer.

Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.

334-5.9 Joints.

334-5.9.1 Transverse Joints: Construct smooth transverse joints, which are within 3/16 inch of a true longitudinal profile when measured with a 15 foot manual straightedge.

334-5.9.2 Longitudinal Joints: For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6 to 12 inches laterally between successive layers. Do not construct longitudinal joints in the wheelpaths. The Engineer may waive these requirement where offsetting is not feasible due to the sequence of construction.

334-5.10 Surface Requirements: Construct a smooth pavement with good surface texture and the proper cross-slope.

334-5.10.1 Texture of the Finished Surface of Paving Layers: Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 334-5.10.4.

334-5.10.2 Cross Slope: Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents.

334-5.10.3 Pavement Smoothness: Construct a smooth pavement meeting the requirements of this Specification. Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Make them available at the job site at all times during paving operations for Asphalt Work Category 3 and make them available upon request of the Engineer for Asphalt Work Categories 1 and 2.

334-5.10.3.1 Asphalt Work Category 3:

334-5.10.3.1.1 Acceptance Testing: Straightedge the final Type SP structural layer and friction course layer with a rolling straightedge. Test all pavement lanes where the width is constant using a rolling straightedge and document all deficiencies on a form approved by the Engineer. Notify the Engineer of the location and time of all straightedge testing a minimum of 48 hours before beginning testing.

334-5.10.3.1.2 Rolling Straightedge Exceptions: Testing with the rolling straightedge will not be required in the following areas: intersections, tapers, crossovers, parking lots and similar areas. In addition, testing with the rolling

straightedge will not be performed on the following areas when they are less than 50 feet in length: turn lanes, acceleration/deceleration lanes and side streets. However, correct any individual surface irregularity in these areas that deviates from the plan grade in excess of 3/8 inch as determined by a 15 foot manual straightedge, and that the Engineer deems to be objectionable, in accordance with 334-5.10.4. The Engineer may waive or modify straightedging requirements if no milling, leveling, overbuild or underlying structural layer was placed on the project and the underlying layer was determined to be exceptionally irregular.

334-5.10.3.1.3 Final Type SP Structural Layer: Straightedge the final Type SP structural layer with a rolling straightedge behind the final roller of the paving train. Correct all deficiencies in excess of 3/16 inch in accordance with 334-5.10.4.2, and retest the corrected areas.

334-5.10.3.1.4 Friction Course Layer: At the completion of all paving operations, straightedge the friction course. Correct all deficiencies in excess of 3/16 inch in accordance with 334-5.10.4.3. Retest all corrected areas.

334-5.10.3.2 Asphalt Work Categories 1 and 2: If required by the Engineer, straightedge the final structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. Correct all deficiencies in excess of 5/16 inch in accordance with 334-5.10.4.2. Retest all corrected areas. If the Engineer determines that the deficiencies on a bicycle path are due to field geometrical conditions, the Engineer will waive corrections with no deduction to the pay item quantity.

334-5.10.4 Correcting Unacceptable Pavement:

334-5.10.4.1 General: Correct all areas of unacceptable pavement at no additional cost.

334-5.10.4.2 Structural Layers: Correct deficiencies in the Type SP structural layer by one of the following methods:

a. Remove and replace the full depth of the layer, extending a minimum of 50 feet on either side of the defective area for the full width of the paving lane.

b. Mill the pavement surface to a depth and width that is adequate to remove the deficiency. (This option only applies if the structural layer is not the final surface layer.)

334-5.10.4.3 Friction Course: Correct deficiencies in the friction course layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on either side of the defective area for the full width of the paving lane. Corrections may be waived if approved by the Engineer.

334-6 Acceptance of the Mixture.

334-6.1 General: The asphalt mixture will be accepted based on the Asphalt Work Category as defined below:

- 1) Asphalt Work Category 1 – Certification by the Contractor as defined in 334-6.2.
- 2) Asphalt Work Category 2 – Certification and quality control testing by the Contractor as defined in 334-6.3
- 3) Asphalt Work Category 3 – Quality control testing by the Contractor and acceptance testing by the Engineer as defined in 334-6.4.

334-6.2 Certification by the Contractor: On Asphalt Work Category 1 construction, the Engineer will accept the mix on the basis of visual inspection. Submit a Notarized Certification of

Specification Compliance letter on company letterhead to the Engineer stating that all material produced and placed on the project was in substantial compliance with the Specifications. The Engineer may run independent tests to determine the acceptability of the material.

334-6.3 Certification and Quality Control Testing by the Contractor: On Asphalt Work Category 2 construction, submit a Notarized Certification of Specification Compliance letter on company letterhead to the Engineer stating that all material produced and placed on the project was in substantial compliance with the Specifications, along with supporting test data documenting all quality control testing as described in 334-6.3.1. If so required by the Contract, utilize an Independent Laboratory as approved by the Engineer for the quality control testing. The mix will also require visual acceptance by the Engineer. In addition, the Engineer may run independent tests to determine the acceptability of the material.

334-6.3.1 Quality Control Sampling and Testing Requirements: Perform quality control testing at a frequency of once per day. Obtain the samples in accordance with FDOT Method FM 1 T 168. Test the mixture at the plant for gradation (P-8 and P-200) and asphalt binder content (P_b). Test the mixture on the roadway for density using six-inch diameter roadway cores obtained at a frequency of three cores per day or by Nuclear Density Method if approved by Engineer.

Determine the asphalt content of the mixture in accordance with FM 5 563. Determine the gradation of the recovered aggregate in accordance with FM 1 T 030. Determine the roadway density in accordance with FM 1 T 166 or with FM 1-T 238. The minimum roadway density will be based on the percent of the maximum specific gravity (G_{mm}) from the approved mix design. If the Contractor or Engineer suspects that the mix design G_{mm} is no longer representative of the asphalt mixture being produced, then a new G_{mm} value will be determined from plant-produced mix with the approval of the Engineer. Roadway density testing will not be required in certain situations as described in 334-6.4.1. Assure that the asphalt content, gradation and density test results meet the criteria in Table 334-3.

Table 334-3 Quality Control and Acceptance Values	
Characteristic	Tolerance
Asphalt Binder Content (percent)	Target \pm 0.55
Passing No. 8 Sieve (percent)	Target \pm 6.00
Passing No. 200 Sieve (percent)	Target \pm 2.00
Roadway Density (average of three cores)	91.5% G_{mm}
Roadway Density (any single core)	90.0 % G_{mm}
Roadway Density (any single core)	90.0 % G_{mm}
Roadway Density (avg. of 5 tests nuclear method if approved by Engineer)	91.5% G_{mm}

334-6.4 Quality Control Testing by the Contractor and Acceptance Testing by the Engineer: On Asphalt Work Category 3, perform quality control testing as described in 334-6.3.1. In addition, the Engineer will accept the mixture at the plant or at the site with respect to gradation (P-8 and P-200) and asphalt binder content (P_b). The mixture will be accepted on the roadway with respect to density. The Engineer will sample and test the material as described in 334-6.3.1. The

Engineer will randomly obtain at least one set of samples per day. Assure that the asphalt content, gradation and density test results meet the criteria in Table 334-3. Material failing to meet these acceptance criteria will be addressed as directed by the Engineer.

334-6.4.1 Acceptance Testing Exceptions: When the total quantity of any mix type in the Project is less than 200 tons, or on Asphalt Work Category 1 construction, the Engineer will accept the mix on the basis of visual inspection. The Engineer may run independent tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, variable thickness overbuild courses, leveling courses, first lift of asphalt base course placed on subgrade, miscellaneous asphalt pavement, or any course with a specified thickness less than 1 inch or a specified spread rate less than 100 lbs/sy. In addition, density testing for acceptance may not be performed on the following areas when they are less than 100 feet in length: crossovers, intersections, turning lanes, acceleration lanes, deceleration lanes, or ramps. Compact these courses in accordance with a standard rolling procedure approved by the Engineer. In the event that the rolling procedure deviates from the approved procedure, placement of the mix will be stopped.

334-7 Method of Measurement.

For the work specified under this Section, the quantity to be paid for will be the weight of the mixture, in tons.

The bid price for the asphalt mix will include the cost of the liquid asphalt or the asphalt recycling agent and the tack coat application as specified in 334-5.5.4. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix.

334-8 Basis of Payment.

334-8.1 General: Price and payment will be full compensation for all the work specified under this Section.

SECTION 17 - LAWN REPLACEMENT

W-17.01 General

The Contractor shall replace all lawn areas which have been removed or damaged due to construction. Lawn replacement includes fine grading the areas to be restored and furnishing and placing topsoil, fertilizer, sod, sprigs, seeding, and maintaining all areas. Grassing and mulching or sodding lawn areas will be required as directed. Grassing shall be accomplished by seeding.

Sod shall be Argentine Bahia, St. Augustine, or other approved native grass sod, and shall be well matted with grass roots. It shall be sufficiently thick to secure a dense stand of live grass, with a minimum thickness of 2 inches. The sod shall be live, fresh and uninjured, and shall contain sufficient moisture at the time of planting to induce growth. The type and quality of sod shall be approved by the Engineer before placing.

Grass seed shall be Argentine Bahia, 60 #/acre from March 1 to November 1; 50 #/acre with 20 #/acre of rye grass seed from November 1 to March 1. Argentine Bahia seed shall be a scarified seed having a minimum active germination of 40% and total of 85%.

Mulch material shall be free of weeds and shall be oat straw or rye, Pangola, peanut, Coastal Bermuda or Bahia grass hay.

W-17.02 Topsoil

Where areas are to be restored by sodding, topsoil shall be placed to a minimum compacted depth of 2 inches over the subgrade. Where areas are to be restored by grassing, topsoil shall be placed to a minimum compacted depth of 4 inches over the subgrade. All topsoil shall be suitable excavated topsoil which has been segregated or other topsoil material approved by the Engineer. Topsoil shall be free from stones, roots, sticks, or other foreign substances.

W-17.03 Water

The Contractor shall furnish at his own expense all water required for lawn replacement and maintenance of the work until final acceptance.

W-17.04 Construction Methods

Prior to sodding or grassing, the Contractor shall fine grade the subgrade to 4 inches below finished grade. Topsoil shall be spread over the subgrade to a uniform depth and density. Topsoil shall be uniformly compacted by a light hand roller weighing between 250 and 750 pounds to the specified depths for sodding or grassing.

After the surface has been properly prepared, the sod shall be placed and firmly embedded by light tamping. Additionally, dolomite (lime) shall be applied at a rate of 2 tons per acre if required for pH control.

Immediately after the sod has been planted, if the soil does not contain sufficient moisture to ensure growth, water shall be applied twice daily for the first week, once in the morning or late evening and once at approximately 2:00 P.M. Water shall then be applied once a day over the next 2 weeks and alternating days for an additional 2 weeks. If rooting has not taken place by the end of the third week, 1 daily watering shall continue until sod is firmly rooted.

One month after the sod has been planted, a complete fertilizer with a 14-14-14 or 15-0-15 fertilizer with minor elements shall be applied at the rate of 16 pounds per 1,000 square foot. The ground shall not be wet when the fertilizer is applied but will be immediately watered after application of the fertilizer to remove it from the leaf area.

Prior to grassing, 14-4-14 or 15-0-15 fertilizer shall be applied to the soil at the rate of approximately 300 pounds per acre. Grass seed at the specified rate per acre shall then be raked into the soil and covered with mulching material. The area shall then be thoroughly rolled with approved equipment.

After the grass has been planted, if the soil does not contain sufficient moisture to ensure growth, water shall be applied as directed by the Engineer. After the grass has started growing, fertilizer shall be applied uniformly over the area weekly, at a rate of 0.5 pounds nitrogen and potash per 1,000 square feet, until turf cover the area. The fertilizer shall not be applied unless the surface of the ground or sod is sufficiently moist to quickly dissolve the fertilizer.

W-17.05 Caretaking

The Contractor shall keep all replaced lawn areas in good, healthy, insect free, moist condition by watering, replanting or resodding, weeding, fertilizing, and cutting as specified, and directed by the Engineer.

* * *

SECTION 18 - LEAKAGE TESTS

W-18.01 General

All pipelines will be tested and inspected for infiltration or leakage by the Engineer with the assistance of the Contractor prior to final acceptance of the work. All tests and inspections will be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

The Contractor shall notify the Engineer when the work is ready for testing and inspecting, and tests and inspections shall be made as soon thereafter as practicable under the direction of the Engineer. Personnel for reading meters, gauges, or other measuring devices will be furnished by the Engineer. The Contractor shall furnish all other labor, materials, services, and equipment, including power, fuel, meters and gauges, pumps, bulkheads, backflow preventers, water, and other items and apparatus necessary for making leakage tests, preparing pipelines for testing, assembling, placing, and removing testing equipment, and placing pipelines in service, all to the satisfaction of the Engineer. Only City water shall be used for testing unless otherwise approved by the Engineer. The water shall be obtained and metered from sources approved by the Engineer. After testing, the water shall be disposed of by the Contractor into storm sewers or drainage courses approved by the Engineer.

W-18.02 Tests of Sewer - General

All sewers shall be tested for infiltration or leakage after completion of backfilling. All wyes, house connections, and stubs shall be suitably plugged or bulkheaded to the satisfaction of the Engineer prior to testing. All sewers shall be cleaned and pumped out as necessary prior to testing.

Sewers shall be tested for infiltration, unless otherwise ordered by the Engineer. If the Engineer determines that groundwater conditions are not suitable for infiltration testing, sewers shall be tested for leakage. Sewers may be tested for leakage by measuring leakage out of the sewer or by air testing. The length of sewer to be tested shall be subject to prior approval by the Engineer.

The length of house connections, if any, will be included in the total length of sewer under test when computing infiltration or leakage.

All testing equipment and the arrangement of such equipment shall be subject to the prior approval of the Engineer. Sections of sewers under test shall be arranged to prevent the internal pressure on any joint from exceeding 10 psi.

Refer to Section 11 - PVC Pipe Gravity for specific requirements for infiltration and leakage testing for PVC gravity pipe.

W-18.03 Infiltration Test of Sewers

Infiltration tests shall be performed when the groundwater level is a minimum of 2 feet above the crown of the sewer at the highest point in the test section. No such tests shall be started until the infiltration conditions are established in the work to be tested. The Contractor shall

provide suitable

observation wells along the line of the work or other approved means to determine the groundwater level.

Infiltration tests will be made by measuring the infiltrated flow of water over a measuring weir set up in the invert of the sewer a distance, as approved by the Engineer, from a temporary bulkhead or other limiting point of infiltration. Testing shall be for a minimum period of 4 hours. The quantity of infiltration for any section of the sewer shall not exceed 50 gallons/mile/day/inch of pipe diameter.

W-18.04 Leakage Test of Sewers

Leakage tests shall be performed by bulkheading the section of sewer under test at the manhole, at the lower end, and filling the sewer with clear water until the water level is up a minimum of 2 feet above the crown of the sewer or a minimum of 2 feet above the groundwater level, whichever is greater, in the manhole at the highest point in the section. Leakage will be the measured amount of water added to maintain the level in the higher end manhole. Tests shall be carried on a minimum of 4 hours with readings at 30-minute intervals. The quantity of leakage for any section of the sewer shall not exceed the limits specified for infiltration in the subsection headed "Infiltration Test of Sewers."

W-18.05 Air Leakage Test of Sewers

Air pressure leakage tests shall be limited to sewers 30 inches in diameter and smaller. The maximum allowable air leakage is based on pretwetted pipe walls. The contractor may, therefore, fill the pipe with clear water and then empty the pipe prior to air testing. When pipe walls are pretwetted, air leakage tests shall be completed within 24 hours after filling the sewer section to be tested.

Air pressure tests shall be made by placing the sewer under 3.0 psig air pressure and measuring the volume of air required to maintain this pressure. The rate of air leakage shall be determined when the system reaches an equilibrium state and air flow shall be read by means of an approved rotameter.

The maximum rate of air loss shall be 0.003 cfm per square foot of interior pipe surface, and the maximum air flow shall not exceed 2.0 cfm when the total pressure on the sewer is maintained at 3.0 psig. When the groundwater level is above the invert of the sewer, but below a level adequate for infiltration testing, the maximum air loss shall be reduced 6 percent for each foot of groundwater above the sewer invert.

Air testing equipment shall be arranged so that compressors, valving, gauges, and other test devices are located at the ground surface. Air testing equipment shall have an approved air relief arrangement to prevent the sewer from being pressurized to greater than 10.0 psig.

W-18.06 Leakage Tests of Force Mains

Force mains shall be tested as a whole or in sections valved or bulkheaded at the ends. The mains shall be tested under an average hydrostatic pressure of not less than 100 pounds per square

inch, unless otherwise indicated in the Specific Provisions. The pressure shall be applied to the pipeline through a tap in the pipe by means of a hand pump or other method and shall be maintained for a minimum of 4 hours or as referenced in AWWA Standard C605. Air shall not be used for testing force mains. The leakage for all force mains, as determined by the above test, shall not exceed the allowable leakage for PVC water mains and shall comply with requirements of AWWA Standard C605 “Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water” Section 7 (less references to disinfection).

All harnessed sections of the buried force main shall be completely backfilled before such sections are tested.

W-18.07 Repairing Leaks

When infiltration or leakage occurs in excess of the specified amount, defective manholes, pipe, pipe joints, or other appurtenances shall be located and repaired at the expense of the Contractor. If the defective portions cannot be located, the Contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a sewer or force main within the allowable infiltration or leakage limits upon such retesting as necessary and directed by the Engineer.

* * *

SECTION 24 - PVC PIPE - FORCE MAIN

W-24.01 General

All pipe and fittings, 4"-48" nominal diameter, shall be solid wall polyvinyl chloride (PVC) pipe manufactured to standards as outlined in the following sections.

W-24.02 Pipe standards

For PVC force mains, 4" through 12", the pipe shall be AWWA C900, DR-18 (class 150). For PVC force mains 14" through 48", the pipe shall conform to AWWA C905, DR-25. The outside diameter dimensions shall be identical to ductile iron pipe dimensions. The pipe shall have integral bell push on type joints conforming to ASTM D3139. Bell ends shall be equipped with elastomeric gaskets meeting the requirements of ASTM F477. The color shall be **white** and the nominal laying length per pipe section shall be 20 ft.

W-24.03 Pre-Installation Tests, Reports, Markings and Submittals

All pipe and fittings shall be marked per Section 2.6 "Marking Requirements" of AWWA C900.

PRIOR TO SHIPMENT of the pipe and fittings to the project site, the Contractor shall submit to the Engineer test reports and certifications as described below, duly certified by the manufacturer's testing facility or an independent certified testing laboratory demonstrating full compliance with AWWA C900 or C905. Certification from the supplier is not acceptable.

An original, plus four (4) copies of the following, shall be submitted to the Engineer.

1. The name, address, and phone number of the pipe and fittings manufacturer and the location of the plant at which they will be manufactured.
2. **CERTIFICATION AND CERTIFIED TEST REPORTS** that each **LOT** of pipe and fittings has been manufactured, sampled, and tested per AWWA C900 or C-905. The City shall be provided in writing with the means to cross-reference the markings with the certification and test reports (i.e. date of manufacturer, lot number and shift number etc.). If this information is marked on the pipe in a code, the markings shall be decoded in writing.

W-24.04 Bedding Requirements

Unless otherwise indicated on the Plans, the PVCP force main shall be installed with Class "C" bedding as shown on the plans. If suitable fill material is not excavated at the project site, it shall be imported. Compaction requirements are described in subsection W-24.12 "Bedding Placement for Pipelines". In no cases shall a concrete cradle be used. In the event the Contractor opts to install crushed stone, it shall be **NO GREATER THAN A #57 STONE**.

W-24.05 Fittings

Ductile iron fittings are acceptable unless the plans specifically call for PVC fittings. Ductile iron fittings shall comply with WM 10 Ductile Iron Pipe and Fittings

W-24.06 Harnessing

Joint restraint devices for all pipes and fittings shall meet requirements as specified under the W-10 Ductile Iron Pipe and Fittings, Section 10.10 Harnessing. Thrust blocks shall not be allowed.

The coating system shall be Mega-Bond as manufactured by EBAA Iron, Inc., Eastland, Texas, or approved equal.

W-24.07 Marking and Locating

Two strands of #12 gauge green insulated copper tracing wires shall be attached to the pipe with duct tape at regular intervals in the 10 and 2 o' clock position. The wires shall be looped around each bell. See Section W-13 "Directional Drilling HDPE Pipe" requirements for directional drilled pipe. Wire insulation must be suitable for buried service such as HDPE or HMWPE. Nylon insulation is not acceptable. Wires must be spliced together with wire connectors suitable for buried service such as DBR Kit by 3M, Snakebite by Copperhead Industries or equal. Twisting wires together and sealing with electrical tape is not acceptable. No payment will be made for pipe that does not pass a continuity test through the wires after installation. See standard details for additional requirements.

The locating wire shall terminate at the top of each valve box, air release valve box and manhole and must be capable of extending 24" above the top of the box (or manhole) in such a manner so as not to interfere with the valve operation.

W-24.08 Installation

Installation of PVC force mains shall comply with the requirements of AWWA Standard C605 "Underground Installation Of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings For Water".

Pipe bending shall not be allowed.

Joint deflections up to a maximum of 1 degree will be permitted at integral bell and spigot joints. Joint deflections up to a maximum of 3 degrees will be permitted by utilizing twin-gasketed couplings instead of integral bell and spigot joints. Deflections larger than 3 degrees shall be accomplished with ductile iron fittings.

Air release valves shall use service saddles to attach the corporation stop connection to the PVC pipe. The service saddle body shall be sized exactly to the outside diameter of the pipe, with double straps anchored with a minimum of a four bolt pattern. The service saddle body shall be ductile iron, the sealing gasket shall be BUNA-N rubber and the straps shall be corrosion resistant alloy steel.

W-24.09 Testing

Testing of PVC force mains shall comply with the requirements of AWWA Standard C605 "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe And Fittings For Water" Section 7 (less references to disinfecting). The hydrostatic and leakage testing may be performed simultaneously. The average hydrostatic test pressure shall be 100 psi.

Air pressure testing of installed pressure pipe is expressly prohibited due to the catastrophic nature of failure should failure occur.

W-24.10 Storage of PVC Pipe

Pipe shall be stored at the job site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage, or deformation to bell ends of the pipe. When unit packages of PVC pipe are stacked, the Contractor ensure that the weight of upper units does not cause deformation to pipe in lower units.

PVC pipe unit packages shall be supported by racks or dunnage to prevent damage to the bottom during storage. Supports shall be spaced to prevent pipe bending.

PVC pipe shall not be stored close to heat sources or hot objects such as heaters, boilers, steam line, engine exhaust, etc.

When unit packages of PVC pipe are stacked, ensure that the height of the stack does not result in instability which could cause stack collapse, pipe damage, bodily injury, and property damage.

The interior as well as all sealing surfaces of pipe, fittings, and other accessories shall be kept free from dirt and foreign matter.

Gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease.

W-24.11 Handling of PVC Pipe - Standard Procedures

When using fork lifts or other handling equipment, prevent damage to PVC pipe.

When handling PVC pipe, avoid severe impact blows, abrasion damage and gouging or cutting by metal surfaces or rocks. Avoid stressing bell joints and damage of bevel ends.

Pipe shall be lowered, not dropped, from trucks and into trenches.

In preparation for pipe installation, placement (stringing) of pipe shall be as close to the trench as practical and on the opposite side from excavated earth. Bell ends shall point in the direction of work progress.

The Engineer may reject any pipe that shows visible signs of damage resulting from poor storage and handling practices.

W-24.12 Bedding Placement for Pipelines

Select fill material, used as pipe bedding, shall be placed by hand, in uniform layers not greater than 6 inches in loose thickness and thoroughly compacted in place. Select fill material pipe bedding shall extend to one foot over the top of the pipe.

Each layer of select fill shall be thoroughly tamped and compacted in place by hand or with suitable mechanical or pneumatic tools to a dry density not less than 95 percent of the maximum dry density as determined by AASHTO Des: T-180. No stone larger than 4 inches in diameter shall be placed closer than two feet to any point on any pipe.

W-24.13 Trench Backfill

Trench backfilling work shall be done in a manner to prevent dropping of material directly on top of any conduit or pipe from a vertical distance greater than 5 feet. In no case shall backfilling material from a bucket be allowed to fall directly on a structure or pipe and in all cases, the bucket shall be lowered so that the shock of falling earth will not cause damage.

Lumps shall be broken up and if there are any stones, pieces of crushed rock or lumps which cannot be readily broken up, they shall be distributed throughout the mass so that all interstices are solidly filled with fine material.

W-24.14 Backfill for Short Tunnel

Where pipelines are placed in short tunnels, the annular space between the outside of the pipe wall and the tunnel wall shall be completely filled with select fill material or suitable excavated material. Pipelines in short tunnels shall be suitably supported, to permit placing backfill which shall be suitably tamped in place.

W-24.15 Inspection and Testing of Backfilling

All backfill shall be subject to test by the Engineer.

* * *

SECTION 36 - PAINTING

W-36.01 General

Painting includes furnishing all labor, materials, and services to paint all structures and equipment specified and required to complete the work, including, but not limited to, the following: preparation of surfaces; field painting of existing and proposed structures, piping, conduit, ductwork and equipment as specified, and the marking of existing piping and electrical conduit. The work shall include furnishing samples of paints and color charts.

Paint and other materials shall be of the type and quality of the manufacturer on which the coating schedule is based. All coats of paint for any particular surface and thinners used shall be from the same manufacturer. The treatment of the surface to be painted and the application of paint shall be in accordance with the instructions of the manufacturer and as approved by the Engineer. The colors of paints shall be as approved by the Engineer. Specimens, approximately 8 by 10 inches in size, shall be prepared and submitted to the Engineer. The minimum number of specimen custom mixed colors submitted shall be 6 not including color coding colors. Only paint of approved manufacturers shall be delivered and stored at the site.

All painting shall be in accordance with the schedules included in this specification. A supplementary schedule of paint products shall be submitted, with mil thickness, to cover all paint applied. The schedule shall be in accordance with the recommendations of the manufacturer of the paint. The total mil thickness of all coatings shall be not less than the schedule included in this section.

W-36.02 Delivery and Storage

Paints, stains, varnish, or ingredients of paints to be mixed on the job shall be prepared, packed and labeled, and guaranteed by an approved manufacturer. All material shall be delivered to the site in original, unbroken containers.

The manner of and place for storing the painting materials at the site shall be as approved by the Engineer. The storage space shall be kept clean at all times. Every precaution shall be taken to eliminate fire hazards.

W-36.03 Surface Preparation

Prior to painting, all surfaces shall be prepared and cleaned in strict accordance with the paint manufacturer's recommendations and as directed by the Engineer. Surfaces shall be dry before any paint is applied. Special surface preparation work shall be as directed by the manufacturer of the paint specified to be applied to the surface.

Metal Surfaces:

This includes all exterior and interior steel surfaces and all nonferrous metals. This applies to structural and miscellaneous steel, motors, designated housings and protective guards, piping, valves, stairs, and in general, all surfaces to be painted as designated in these specifications.

All surfaces shall be cleaned in accordance with Steel Structures Painting Council standards SSPC - SP1 Solvent Cleaning for removal of grease and oil. This standard allows for pressure washing, detergent cleaning, etc. Additional rust, loose paint, loose mill scale, etc., shall be removed in accordance with SSPC - SP2 Hand Tool Cleaning or SSPC - SP3 Power Tool Cleaning. All welds, beads, blisters or protuberances, other than identification markings shall be ground smooth. Pits and dents shall be filled with a suitable product as approved by the Engineer, and other imperfections shall be removed. Painted edges shall be sanded smooth with adjacent bare metal surfaces.

Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, these areas shall be given two coats of asphalt varnish conforming to Fed. Spec. TT-V-51F.

Concrete and Wood Surfaces:

Surface preparation of all exterior concrete and wood surfaces shall be pressure washed to remove cobwebs, dirt, dust, and other surface contaminations. Mildew shall be treated with a 22% chlorine solution or otherwise by mixing equal parts solution bleach and water to the affected area. Loose paint and other defects shall be removed by hand; brushing, sanding, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

All interior concrete and wood surfaces including ceilings, walls, and floors shall be cleaned similar to SSPC - SP1 Solvent Cleaning standards. Loose paint and other defects shall be removed by hand; brushing, sanding, scraping, chipping or other hand tools or by power; brushes, impact tools, grinders, sanders or other power tools or by any combination thereof. Painted edges shall be sanded smooth to match adjacent bare surfaces.

Priming shall be performed with Porter Acri-Pro 100, 100% Acrylic, or equal. First and second coats shall be performed with Porter Acri-Shield, 100% Acrylic, or equal. Concrete, concrete masonry, and wood shall be thoroughly dry prior to painting.”

W-36.04 Coatings

All paints and similar materials shall be mixed in galvanized iron pans or pails or other approved containers of adequate capacity. All paint shall be stirred thoroughly before being taken from the containers, shall be kept stirred while using, and all ready-mixed paint shall be applied exactly as received from the manufacturer without addition of any kind of drier or thinner, except as specified or as permitted or directed by the Engineer. Successive coats of paint shall be tinted to make various coats easily distinguishable. Undercoats of paint shall be tinted to the approximate shade of the final coat of paint. The paint shall be a minimum temperature of 60 degrees F before application.

Only skilled painters shall be used on the work, and specialists shall be employed where required. Paint shall be applied by brush, roller, or sprayer in accordance with the manufacturer's recommendation. Finished surfaces shall not show brush marks or other irregularities. Top and bottom edges of doors shall be painted. Undercoats on hollow metal work shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal abrasive to remove all surface defects and provide a smooth, even surface.

Painting shall be a continuous and orderly operation to facilitate adequate inspection. All paint application methods shall be in accordance with the instructions of the paint manufacturer and as approved by the Engineer. Access panels, pipes, pipe covering, ducts, and other building appurtenances built into or adjoining walls to be painted shall be painted the same color as adjacent walls, unless otherwise directed by the Engineer. Hardware and accessories, fixtures, and similar items placed prior to painting shall be removed or protected during painting and replaced on completion of painting. All wall surfaces to be concealed by equipment shall be painted before installation of the equipment.

Areas under and adjacent to painted work shall be fully protected at all times and dripped or splattered paint shall be promptly removed. Painting shall not be done when the temperature is below 60 degrees F, or in dust-laden air, or until moisture on the surface has completely disappeared. If necessary, sufficient heating and ventilation shall be provided to keep the atmosphere and all surfaces to be painted dry and warm until each coat of paint has hardened. Any painting found defective shall be removed and repainted or touched up as directed by the Engineer.

Coatings must be allowed to cure before being recoated or placed into service. Drying time requirements recommended by the manufacturer should be followed exactly.

The final colors shall be as noted on the color schedule.

Coverage shall be complete. When color on undercoats shows through the final coat of paint, the work shall be covered by additional coats until the paint is of uniform color and appearance and coverage is complete, at no additional cost.

Rooms or areas being painted shall be supplied with sufficient temporary ventilation during painting operations to keep the atmosphere safe from harmful or dangerous fumes and harmful dust levels for personnel.

All application tools and equipment shall be in good working order and suitable for proper applications. It shall be the Contractor's responsibility to ensure that no paint mist or spatter falls or blows to other objects, vehicles, equipment, buildings, etc.

Coating Schedule:

All painting shall be in accordance with the following schedule. The number of coats shall not be less than the number shown on the schedule.

COATING SCHEDULE					
Surfaces	SHOP COAT	Primer	Coats		
			1ST	2ND	3RD
Aluminum	A		B	C	
Electrical Conduit	A		B	C	
Steel Pipe, Valves, and Fittings	A		B	C	
Galvanized Steel	A		B	C	
Ductile Iron Pipe, Valves, and Fittings	A		B	C	
Miscellaneous Steel and Ironwork	A		B	C	
Machinery, Interior, and Nonsubmerged		A	B	C	
Exterior Concrete or Masonry		D	E	E	

The designations in the following list are given solely for the purpose of indicating the type and quality of materials desired. Approved equivalent material of other manufacturers may be substituted. All coats of paint for any particular surface shall be from the same manufacturer.

ALPHABETICAL DESIGNATIONS OF PRODUCTS		
Symbol	Product Name and Number	Minimum Dry Film Thickness Mils per Coat
A	Tnemec N-140 Pota Pox Epoxy	4.0 – 6.0
B	Tnemec Series 446 Perma-Shield	5.0 - 7.0
C	(Above Grade) Tnemec 1074U Endurashield (Below Grade) Tnemec Series 446 Perma-Shield	4.0 - 6.0 5.0 – 7.0
D	Porter Acri-Pro 100, 100% Acrylic	1.2
E	Porter Acri-Shield, 100% Acrylic	1.4

W-36.05 Safety

The Contractor shall be responsible for exercising all necessary precautions to ensure that no accidents or damage to personnel, equipment, or buildings shall occur. The Contractor shall further determine any special operations which could influence the safe workmanship of his personnel with respect to electrical, mechanical, or chemical fumes or fire hazard situations.

When painting in confined areas or otherwise in areas where explosive fumes or gases need to be ventilated, the Contractor shall use suction type fans designated specifically for the safe removal of explosive fumes or gases, and all equipment involved shall meet all OSHA (Occupational Safety Hazard Act) requirements and MSHA (Mine Safety and Health Administration) approved. The Contractor shall be responsible in all respects for the safe conduct of his personnel when using any of the rigging or equipment involved in the accomplishment of the work specified herein.

W-36.06 Cleaning

The Contractor shall touch up and restore any damaged finish. Paint or other finishes spilled, splashed, or splattered shall be removed from all surfaces. Care shall be taken not to mar any surface finish or item being cleaned.

* * *

SECTION 92 - SLUICE GATES

W-92.01 General

Sluice gates include the furnishing and installation of all sluice gates. They shall be designed for seating or unseating pressures as specified, measured to the center of the gate. All sluice gates shall be the product of one manufacturer.

W-92.02 Design

Sluice gates shall meet the requirements of AWWA C501, except as otherwise specified. The Contractor shall provide an affidavit of compliance with all applicable provisions of AWWA C501 and additions herein. Working drawings and materials specifications shall be provided in accordance with the General Provisions.

W-92.03 Frames

Frames shall be of the standard flange type with the rear face machined and drilled to attach to the flange of a wall thimble or pipe. Square frames shall have bolting equivalent to round frames based on the total opening area. In no case shall the bolt spacing exceed 12 inches.

W-92.04 Seat Facings

Seat facings shall be driven into dovetail grooves machined in the face of the disc and frame.

W-92.05 Wedges

Gates shall be provided with adjustable wedging devices as required to prevent excessive leakage. The wedge adjustment shall be mounted on the slide.

W-92.06 Wall Thimbles

Wall thimbles shall be furnished by the gate manufacturer except when the gates are to be attached to wall castings which are a part of a pipeline.

Wall thimbles, in cross section, shall have the shape of a letter F unless shown or specified otherwise and shall be of cast iron.

The body of each thimble shall extend into the concrete or masonry as shown or specified, and in no case less than 6 inches. Ribs shall be provided where necessary on the periphery of the casting joining the flange, body, and collar and extending into the concrete to provide additional strength. A rubber gasket or mastic shall be provided between the gate frame and the thimble.

W-92.07 Stems

All sluice gates shall have rising stems except as otherwise specified. Where nonrising stems are permitted, the bottom of the stem shall be above the waterway.

The threads of the stem shall be machine cut or rolled and of the square or Acme type. The number of threads per inch shall be such as to work most effectively with the lift mechanism used. On rising-stem gates with manual hoists, the top of the stem shall be provided with a stop collar.

Where stems are furnished in more than one piece, the different sections shall be joined together by solid couplings. The couplings shall be threaded and keyed or threaded and bolted, and shall be of greater strength than the stem.

W-92.08 Sluice Gate Discs

Discs shall be of cast iron with vertical and horizontal ribs. The ribs and plate shall be of ample section to withstand, without distortion, the full working pressure with a safety factor of six. Each disc shall have tongues extending the full length of the disc. The tongues on each disc shall be fully machined on all sides.

Gates specified or required for continuous duty service shall have bronze tongue covers.

Each disc shall have a pocket cast in the center near the top, heavily reinforced by ribs, into which shall be fitted a solid bronze nut, threaded and keyed to the stem. This nut shall be of ample size to take the thrust of the stem, both ways.

W-92.09 Sluice Gate Guides

Guides shall be of cast iron of sufficient length so that not less than one-half of the disc is within the guides when the gate is open. Grooves shall be machined the full length of the guides of such dimensions so that there is not over 1/16-inch clearance with the tongues on the sides of the disc. Guides shall be of z-section and shall be machined to fit the frame and shall be bolted to the frame to prevent lateral movements. Holes for studs shall be spot faced.

Guide grooves on gates specified or required for continuous duty service shall be bronze lined.

Guides shall be reinforced with heavy ribs capable of taking the entire thrust due to water pressure and wedging action, at points of contact with the side wedges of the disc. Heavy bronze wedge facings shall be attached to the guides at points of contact with the side wedges, and these facings shall be machined on all bearing surfaces and shall make accurate contact with the side wedges. The portion of the guides extending above the frame shall be arranged for anchorage to the concrete.

W-92.10 Self-Contained Sluice Gates

Operating nuts for self-contained gates shall be at the gate yoke. Self-contained gates shall meet the requirements of the Specifications for rising stem gates and, in addition, shall have pads at the top to which the thrust yoke is to be bolted. These pads shall be accurately machined and drilled and shall be stiffened by substantial ribs. The thrust yoke shall be of cast iron, having pads at the bottom to bolt to the pads on top of the guides, and shall have heavy ribs capable of taking the thrust due to operating the gates. The top of the yoke shall be machined to provide a smooth bearing for the collar of the stem and shall be provided with a bolted cap to fit around the stem

collar of ample size to take the upward thrust of the stem. The thrust collar shall be of the same material as the stem and machined all over.

W-92.11 Flush Bottom Closure

Gates with a flush bottom closure as shown or specified shall be provided with compressible resilient seal at the bottom of the flush bottom closure gate opening. This seal shall be securely fastened either to the bottom of the disc or to the invert of the opening. In either case, the invert of the opening shall be flush with the floor of the channel as shown, and no protection shall be permitted. When the gate is fully closed, a leakproof seal shall be made by firm contact between the resilient seal and gate. All parts which come into contact with the resilient seal shall be fully machined and rounded sufficiently to prevent any cutting of the seal.

W-92.12 Materials

Materials used for the various parts of the gates shall meet the requirements of the following standard specifications:

Iron Castings	ASTM A 126 Class B
Seat Facings:	
Bronze	ASTM B 21 Alloys 464 or 482
Stainless Steel	ASTM A 276, Types 302, 303, 304
Thrust Nut and Wedges	ASTM B 584 Alloy 865
Assembly Bolts, Studs, Nuts and Anchor Bolts:	
Bronze	ASTM B 98
Stainless Steel	ASTM A 276, Types 302, 304 ASTM A 582, Type 303
Stems:	
Bronze	ASTM B 124 ASTM B 98
Stainless Steel	ASTM A 276, Types 302, 304 ASTM A 582, Type 303

W-92.13 Assembly and Erection

All parts entering into the sluice gates shall be carefully machined to jigs and templates and all like parts shall be interchangeable so that repair parts can be attached in the field without any fitting, chipping, or remachining. After the parts have been machined, the gates shall be completely assembled in the shop and there shall be no fitting or any departure from the dimensions on the shop drawings to make the parts fit together. Anchor bolt holes shall be drilled accurately to the layout called for on the drawings.

Sluice gates and appurtenances shall be accurately erected, free from distortion or undue strains.

Wall thimbles and anchor bolts to be embedded in concrete shall be placed before the concrete is placed and shall be supported and braced so that they will remain in perfect alignment during placing of concrete and thereafter. If the wall thimble is improperly placed, it shall be removed and replaced as directed at the Contractor's expense. When the frame is installed, the disc shall not be removed from the frame, but the complete assembly shall be installed together, to prevent springing the seats out of line. In bolting the frame to the wall thimble, no springing of the frame will be permitted. Wedges shall be properly adjusted. Stem guides shall be set so that the stems shall run smoothly, in perfect alignment. Care shall be taken to protect the equipment from mortar, concrete drippings, and other adhering substances.

W-92.14 Painting

Painting shall meet the requirements of the Workmanship and Materials section headed "Painting." Bright or rubbing surfaces shall not be painted, but shall be protected and left bright.

W-92.15 Testing

After being installed, sluice gates shall be tested in the presence of the Engineer for leakage, strength, opening and closing against the maximum heads practicable to obtain under operating conditions. All work of making the tests and all adjustments necessary to put the gates in satisfactory condition shall be performed by the Contractor at his own expense. Any leaks around the thimbles, frames, or gates shall be stopped. Leakage around discs shall not exceed the amounts allowed by AWWA C 501.

W-92.16 Operators

Operators for sluice gates shall be hand operated and be pedestal mounted with stem cover located on top slab above the sluice gate valve. Operator shall be the existing pedestal operator, if compatible with new sluice gate and stem. Pedestal shall be cleaned and painted as directed by Engineer

* * *

SECTION 105 - ROOT PRUNING

W-105.01 General

The Contractor shall make provisions for tree protection to the satisfaction of the Engineer prior to any excavation. All applicable site inspections and permits, shall be obtained from the City of Tampa Planning and Development Department, Natural Resources prior to commencing work.

The Contractor shall provide root pruning services as directed by the Engineer and Natural Resources.

W-105.02 Performance of Work

All root pruning shall be performed by a qualified, licensed tree professional under the direction of a certified arborist as approved by the Engineer.

All roots designated to be removed shall be severed leaving a smooth, uniform section at the remaining root end to prevent root damage.

Root pruning shall be performed with a chain saw, Dosko root pruner, or equal, as approved by Natural Resources.

Root pruning shall not occur within 6 feet of the base of the tree without guidance from Natural Resources staff, and no excavation shall occur inside the circumference of the root-pruned area.

* * *

SECTION 108

DEWATERING

108.1 General.

108.1.1 Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified, Florida-licensed professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

108.1.2 Submittals:

108.1.2.1 Shop Drawings (for dewatering system): Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

108.1.2.2 Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

108.1.2.3 Qualification Data: For qualified installer and professional engineer.

108.1.2.4 Field Quality-Control Reports

108.1.2.5 Videotape: Show existing conditions (prior to, during, and after construction) of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.

108.1.3 Quality Assurance:

108.1.3.1 Installer Qualifications: An experienced installer that has specialized in dewatering work.

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

108.1.3.3 Preinstallation Conference: Conduct conference at the project site. Review methods and procedures related to dewatering including, but not limited to, the following:

1. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
2. Geotechnical report.
3. Proposed site clearing and excavations.
4. Existing utilities and subsurface conditions.
5. Coordination for interruption, shutoff, capping, and continuation of utility services.
6. Construction schedule. Verify availability of installer's personnel, equipment, and facilities needed to make progress and avoid delays.
7. Testing and monitoring of dewatering system.

108.1.4 Project Conditions:

108.1.4.1 Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by the City or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify the City and the utility owner no fewer than two (2) days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without City's and utility owner's written permission.

108.1.4.2 Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. The City will not be responsible for interpretations or conclusions drawn from this data. Make additional test borings and conduct other exploratory operations necessary for dewatering.

108.1.4.3 Survey Work: Engage a qualified, Florida-licensed land surveyor to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify City if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

108.2 Execution.

108.2.1 Preparation:

108.2.1.1 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

108.2.1.2 Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the City and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

108.2.1.3 Provide temporary grading to facilitate dewatering and control of surface water.

108.2.1.4 Monitor dewatering system continuously.

108.2.1.5 Promptly repair damages to adjacent facilities caused by dewatering.

108.2.1.6 Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

108.2.2 Installation:

108.2.2.1 Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal and surface water controls. Space well points or wells at intervals required to provide sufficient dewatering. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

108.2.2.2 Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

108.2.2.3 Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom off foundations, drains, sewers, and other excavations. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

108.2.2.4 Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

108.2.2.5 Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction of completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

108.2.2.6 Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to the City. Remove dewatering system from project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

108.2.2.7 Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

108.2.3 Field Quality Control

108.2.3.1 Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated in the dewatering plan; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevations of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

108.2.3.2 Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 108

SECTION 112 - TREES, PLANTS, AND GROUNDCOVERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

Furnish all materials, equipment and labor as necessary for preparation of planting areas, soil treatment, planting of trees, shrubs, groundcovers and grass, relocation of designated plants, protection of plants, maintenance, guarantee and replacement of plants, and related items as required to complete the work as indicated on the drawings and specified herein.

1.2 DEFINITIONS:

- A. The following words and terms or pronouns used instead shall wherever they appear in these specifications, be construed as follows, unless a different meaning is clear from the context:

"Final Acceptance" shall mean that point in time when all requirements of project drawings and specifications are completed, including any punch list items, to the satisfaction of the Engineer. The contractor shall be notified in writing of final acceptance by the Engineer.

"Warranty Period" shall be a one year period beginning at Final Acceptance.

"Maintenance Period" shall begin when plant material is installed and continue for thirty (30) days after notification of Final Acceptance.

"Final Maintenance Inspection" shall occur at the end of the thirty (30) day maintenance period.

1.3 QUALITY ASSURANCE:

- A. The landscape installation shall be by a single firm specializing in landscape work.
- B. Plant names indicated shall comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed shall conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.
- C. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock" (ANSI Z60 1) and, sizing and grading standards of the latest edition of "Grades and Standards for Nursery Plants: Part I and II" by the Florida Department of Agriculture and Consumer Services. All plant material shall be "Florida No. 1" or better.
1. Caliper measurement shall be taken six (6) inches above ground level if four (4) inches or less. If greater than 4 (four) inches, caliper measurement will be taken at twelve (12) inches above ground level.

- D. Do not make substitutions. If specified landscape material is not obtainable submit to the Engineer in writing, proof of non-availability and proposal for use of equivalent material.
- E. All plants shall be nursery grown and 100% acclimatized to local planting conditions.
- F. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, and providing that the larger plants will not be cut back to size indicated. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated. Height and spread specified will prevail over container size specified, for groundcover and shrub material only.
- G. All trees will be inspected and approved by the Engineer at the place of growth, for compliance with specification requirements for quality, size, and variety. When trees cannot be obtained locally, provide sufficient photographs of the proposed plants for approval.
 - 1. Approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.
 - 2. Tag trees at the source of supply prior to inspection by the Engineer.

1.4 SUBMITTALS:

- A. Submit planting schedule showing scheduled dates for each type of planting in each area of site two weeks prior to beginning work.
- B. Submit certificates of inspection, as required by governmental authorities; and manufacturers or vendors certified analysis for soil amendments, herbicides, insecticides and fertilizer materials; submit other data substantiating that materials comply with specified requirements.
- C. Submit the following material samples:
 - 1. Mulch
 - 2. Topsoil with verification of sterilization and source.
 - 3. One typical sample of each shrub and groundcover material as specified, prior to planting for approval.
 - a. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.
- D. Upon final acceptance of plant material, submit two (2) written maintenance instructions recommending procedures for maintenance of plant materials for a one year period.
- E. Provide landscape planting as-built drawings:
 - 1. Legibly mark drawings to record actual installation.

2. Identify field changes of dimension and detail and changes made as directed by the Engineer.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.
- B. Trees must be held and fully acclimatized over a period not less than eight (8) weeks prior to delivery to site.
- C. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately prior to digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order. Upon arrival, the certificate shall be submitted to the Engineer. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Engineer. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
- D. Plant material that is stored improperly shall receive a special review established on a case by case basis.
- E. Cover plants transported on open vehicles with a protective covering to prevent wind burn.
- F. Topsoil shall be kept dry and loose for planting bed mixes.
- G. Label at least one (1) tree and one (1) shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common names.

1.6 JOB CONDITIONS:

- A. Work notification: Notify the Engineer at least seven (7) working days prior to installation of plant material. All plant samples shall be reviewed for approval prior to notification.
- B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations. Notify any affected utilities 48 hours prior to beginning work, if applicable.
- C. A complete list of plants, including a schedule of sizes, quantities, and other requirements are shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.
- D. Examine the subgrade, verify the elevations, observe the conditions under which work is to be performed, and examine unsatisfactory conditions before proceeding with the work.

1. When conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions or obstructions, notify the Engineer before planting to determine alternative action.
 2. Contractor shall be responsible for the removal of existing vegetation deemed necessary by the Engineer to carry out the scope of the project.
- E. The irrigation system shall be installed prior to planting, if applicable. Locate, protect and maintain the irrigation system during planting operations. Repair irrigation system components, new and existing, damaged during planting operations. Test system prior to installation of plant material.
- F. Any work taking place along a city, county or state road or median must comply with appropriate regulating authorities guidelines for "Traffic Controls for Construction and Maintenance Operations". Contractor shall be responsible to file and obtain any and all required agency permits.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Plants: Provide plants typical of their species or variety; with normal, densely-developed branches and vigorous, fibrous root systems. Provide only sound, healthy vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasion of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces.
1. All plant material shall be "Florida No. 1", or better.
 2. Dig balled and burlapped plants with firm, natural balls of earth of diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Cracked or mushroomed balls are not acceptable.
 3. Container-grown stock: Grown in container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
 - a. No plants shall be loose in container.
 - b. Container stock shall not be pot bound.
 4. Trees that have the main trunk forming a "Y" shape are not acceptable. Trees shall have a minimum of five (5) feet of trunk free from branching, unless otherwise specified.
 5. Sanding of palm tree trunks will not be accepted. Palm tree fronds shall be tied up to protect the bud from stress and damage. Fronds shall be tied with a material that will decompose naturally.
 6. Plants planted in rows shall be matched in form.

7. Plants larger than those specified in the plant list may be used when approved by the Engineer.
 - a. If the use of larger plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.
8. The height of the tree, measured from the crown of the roots to the average height of the top of the tree, shall not be less than the minimum size designated in the plant list. Container size designated, if any, shall be the minimum size required.
9. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.
10. Height and spread requirements, of shrub and groundcover material, indicated in the plant list shall prevail over container size indicated, unless otherwise specified.
11. Shrubs and small plants shall conform to the following standards:
 - a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
 - b. Single stemmed or thin plants will not be accepted.
 - c. Side branches shall be generous, well-twiggged, and the plant as a whole well-bushed to the ground, unless otherwise specified.
 - d. Plants shall be in a vigorous condition, free from dead wood, bruises, or other root or branch injuries.
12. Any plant material showing signs of shock will be judged on a case by case basis for acceptance or rejection.

2.2 ACCESSORIES:

- A. Refer to drawings and other portions of specifications for accessories specifically used on this project.
- B. Topsoil for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range between pH 5.5 and 6.5. Mixture 50% coarse native sand and 50% peat as specified.
 1. Expressly identify source location of topsoil proposed for use on the project.
 2. Provide topsoil free of substances harmful to the plant material. Topsoil shall be sterilized.

- C. Peat: Brown to black in color, sterile, weed and seed free, granulated raw peat, containing not more than 9% mineral on a dry basis.
- D. Fertilizer shall be complete with the following analysis and source compounds:
- 10% nitrogen derived from ammonium nitrate.
 - 2% phosphorous derived from super phosphate.
 - 10% potassium derived from potassium sulfate.
 - 4% magnesium derived from magnesium sulfate.
- The fertilizer shall be neutral and contain the essential micro-nutrients (Chelated Fe, Mn, Zn, Mo, Bo, Cu) in sulfates unless otherwise indicated in ppm.
- E. Anti-Desiccant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.
- F. Mulch shall be recycled mulch material (unless specified otherwise on drawings) clean, bright and free from weeds, moss, sticks and other debris. Mulch shall be spread at a minimum of two (2) inches deep and a maximum of four (4) inches deep or as otherwise noted.
- G. Water: Free of substances harmful to plant growth. Water shall contain less than 300 ppm soluble salts and less than 10 ppm chlorine, fluoride and sodium. Hoses or other methods of transportation shall be furnished by Contractor. Contractor shall furnish water supply from an acceptable source: deep wells, municipal potable supply and treated waste water.
- H. Anchors: Provide "Duckbill" Earth Anchor Systems or approved equal, with white vinyl coated cable of size appropriate for tree size.
- I. Guys: Provide guys of 12 gauge galvanized iron wire annealed. Provide 6" x 1-1/2" galvanized turnbuckles. Provide 1/2" reinforced rubber hose, cut to lengths necessary to protect tree branches from wire damage. Guys to be flagged with florescent flagging.
- Bracing: Provide braces of 2 x 4 P.T. pine. Wrap trunk with burlap. Wrap cleat band around 2x4x12 P.T. pine.
- J. Twine: Two-ply jute material.
- K. Filter Fabric: Rot resistant polypropylene fabric and water permeable.
- L. Drainage Tile: ASTM F405 corrugated polyethylene drainage tubing, perforated.
- M. Drainage Fill: AASHTO M43 #6 (3/8" to 3/4") clean uniformly graded stone or gravel.
- N. Pre-emergent weed killer: Apply 2: granular "Chipco" Ronstar or equal.

PART 3 - EXECUTION

3.1 INSPECTION:

Contractor shall examine proposed planting areas and conditions for installation. Do not start planting work until unsatisfactory conditions are corrected.

3.2 PREPARATION:

A. Time of planting.

1. Deciduous material: If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.

B. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.

C. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas, then secure the Engineer's acceptance before start of planting work. Give 24 hour notice for inspection. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected. Verify locations of existing utilities.

D. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 3 times greater than diameter of rootball for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4". Remove excavated materials from the site, as specified and directed by the Engineer.

E. Provide pre-mixed planting mixture for use around the balls and roots of the plants consisting of topsoil and 1/2 lb. plant fertilizer as specified, for each cu. yd. of mixture.

F. Provide pre-mixed ground cover bed planting mixture consisting of topsoil and 1/2 lb. plant fertilizer as specified, per cu. yd. Provide beds a minimum of 8" deep. Excavate groundcover beds 4" deep, add planting mixture and fill to a depth of 8". If slopes are greater than 4 to 1 increase depth to 12".

G. Palm trees with clear trunk greater than six (6) feet in height shall be backfilled with soil indigenous to the site.

3.2 INSTALLATION:

A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Set plant material 2-3" above the finished grade. No filling will be permitted around trunks or stems. Backfill the pit with half indigenous soil to the site and half planting mixture until approximately 2/3 full, then water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Do not use muddy

mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water.

After balled and burlapped plants are set, place soil mixture around bases of balls and fill all voids.

1. Remove all burlap, ropes, and wires from the tops of balls.
- B. Space groundcover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 4" of the trunks of trees and shrubs within planting bed and to within 6" edge of bed.
- C. Apply anti-desiccant using power spray to provide adequate film over trunks, branches, stems, twigs and foliage.
- D. Mulch:
1. Apply pre-emergent weed killer over grade prior to mulching, as directed by the Engineer. Use rates recommended for specified product.
 2. Mulch tree, shrub planting pits and shrub beds with required mulching material 2" deep or as otherwise noted immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.
- E. Staking/Guying:
1. Stake and guy all trees immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may effect tree survival or appearance occur, the Engineer may require immediate staking and guying.
 2. Stake trees under 3" caliper.
 3. Guy trees 3" caliper and over.
 4. Brace all palm trees. Wrap with 5 layers burlap approximately 1/3 of the way up trunk. Attach lumber with cleats and hammer braces to lumber. Secure to ground with stake.
- F. Pruning:
1. Prune branches of B&B stock, prior to transplanting, to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds, proportion shall in all cases be as approved by Engineer. Remove or cut back broken, damaged, and unsymmetrical growth of new wood. Prune trees to retain required height and spread. Do not cut structural branches. Required sizes are the size after pruning.

2. Multiple leader plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches at branch collars.

G. Care of Existing Trees:

1. All existing trees, if any, shall be protected through the duration of this project as outlined in the Tree Protection Standards of the City of Tampa Site Clearing Ordinance. These requirements and those attached at the end of this section are available in the City Hall Annex Building, 3rd floor east, Duplication Office for a fee.

H. Tree Relocation:

1. Tree relocation shall be performed under the supervision of the City Arborist.

3.3 MAINTENANCE:

- A. Begin maintenance immediately after planting. Maintain all plant material until final acceptance and for an establishment period of thirty (30) days after final acceptance.

- B. Maintenance shall include but is not limited to pruning, cultivating, mowing, weeding, fertilizing, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.

1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.
2. Tighten and repair guy wires and stakes as required.
3. Correct defective work immediately after deficiencies become apparent and weather permits.
4. In addition to irrigation system, water trees every other day saturating the soil to a depth of three (3) feet for the first two (2) weeks. If no irrigation system exists, water plant material per the following schedule:

1-30 days - water every other day, saturating the soil to a depth of three (3) feet.

30-90 days - water twice a week, saturating the soil to a depth of three (3) feet.

90-365 days - water once a week, saturating the soil to a depth of three (3) feet.

Quantity of water applied should be adjusted in accordance to rainfall.

3.4 ACCEPTANCE:

- A. Inspection to determine acceptance of planted areas will be made by the Engineer upon Contractor's request. Provide notification at least five (5) working days before requested inspection date.

1. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition.
- B. The Engineer will prepare a "punch list" of those items which must be corrected before reinspection for final acceptance. The Engineer will determine an appropriate time period in which punch list items must be corrected. Provide 48 hour notification of need for reinspection.
- C. The City will assume plant maintenance 30 days after final acceptance, at which time, the contractor shall request a final maintenance inspection for acceptance, where requirements as stated in 3.5 apply.

3.5 WARRANTY:

- A. Warrant plant material to remain alive and be in a healthy, vigorous condition for a period of one (1) year after completion and final acceptance of entire project.
- B. Replace, in accordance with the drawings and specifications, all plants that are dead or as determined by the Engineer to be in an unhealthy or unsightly condition, and have lost their natural shape due to Contractor's negligence. The cost of such replacement(s) shall be at Contractor's expense. Warrant all replacement plants for one (1) year after final acceptance.
- C. Warranty shall not include damage or loss of trees, plants, or groundcovers caused by fires, floods, freezing, rains, lightning storms or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area; and acts of vandalism.
- D. Remove and replace immediately all plants found to be dead or in unhealthy condition as determined by the Engineer at any time during warranty period. Make replacements within four (4) weeks of notification.
 1. An inspection will be conducted at the end of the warranty period. Contractor will replace any plants found to be dead or in poor condition at this time within four (4) weeks of inspection. Contractor will also remove any tree bracing or guying determined by the Engineer to be unnecessary at this point in the tree's development.

3.6 CLEANING

Perform cleaning during installation of the work and upon completion of work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

* * *

SECTION 327 - MILLING OF EXISTING ASPHALT PAVEMENT

W-327.01 General

The work specified in this section consists of removing existing asphaltic concrete pavement by milling to improve the rideability of the finished pavement, to lower the finished grade adjacent to existing curb prior to resurfacing, or to completely remove existing pavement.

When milling to improve rideability, an average depth of cut will be specified in the plans.

Unless otherwise specified, the milled material becomes the property of the Contractor.

W-327.02 Equipment

The milling machine shall be capable of maintaining a depth of cut and cross slope that will achieve the results specified in the plans and specifications. The overall length of the machine (out to out measurement excluding the conveyor) shall be a minimum of 18 feet. The minimum cutting width shall be six feet.

The milling machine shall be equipped with a built-in automatic grade control system that can control the transverse slope and the longitudinal profile to produce the specified results.

Any commercially manufactured milling machine meeting the above requirements will be approved to start the project. If it becomes evident after milling has started that the milling machine cannot consistently produce the specified results, the milling machine will be rejected for further use.

When milling to lower the grade adjacent to existing curb or other areas where it is impractical to use the above described equipment, the use of a smaller milling machine will be permitted.

The milling machine shall be equipped with means to effectively limit the amount of dust escaping the removal operation.

For complete pavement removal, the use of alternate removal and crushing equipment, in lieu of the equipment specified above, may be approved by the Engineer.

W-327.03 Construction

When milling to improve rideability, the existing pavement shall be removed to the average depth specified in the plans, in a manner that will restore the pavement surface to a uniform cross section and longitudinal profile. The Project Engineer may require the use of a stringline to ensure maintaining the proper alignment.

The longitudinal profile of the milled surface shall be established on the side of the cut nearest the centerline of the road. The cross slope of the milled surface shall be established by a second sensing device near the outside edge of the cut or by an automatic cross slope control mechanism. The plans may waive the requirement for automatic grade or cross slope controls

where the situation warrants such action.

The Contractor may elect to make multiple cuts to achieve the required pavement configuration or depth of cut.

The milling machine shall be operated to effectively minimize the amount of dust being emitted from the machine. Prewetting of the pavement may be required.

If traffic is to be maintained on the milled surface prior to the placement of the new asphaltic concrete, the pattern of striations shall be such as to produce an acceptable riding surface. The Project Engineer will control the traveling speed of the milling machine to produce a texture that will provide an acceptable riding surface.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a power broom or other approved equipment to remove to the greatest extent practicable, fine material which will duct under traffic. This operation shall be conducted in a manner so as to minimize the potential for creation of a traffic hazard and to minimize air pollution.

Sweeping of the milled surface with a power broom will be required prior to placing asphaltic concrete.

In urban and other sensitive areas where dust would cause a serious problem, the Contractor shall use a street sweeper (using water) or other equipment capable of removing and controlling dust. Approval of the use of such equipment is contingent upon its demonstrated ability to do the work.

To prevent, to the greatest extent practicable, the infiltration of milled material into the storm sewer system when the milling operation is within the limits of, and adjacent to a municipal curb and gutter or a closed drainage system, the sweeping operation shall be performed immediately after the milling operations or as directed by the Engineer.

This operation shall also include the thorough removal of all milled material from the gutter in such a manner as to protect the curb from damage and to prevent the material being swept into the inlet openings or inlet grates. The equipment and methods utilized to sweep the gutter shall be approved prior to beginning and may be changed or revised to achieve the desired results as directed by the Engineer.

W-327.04 Milled Surface

The milled surface shall have a reasonably uniform texture and shall be within 1/4 inch of a true profile grade and shall have no deviation in excess of 1/4 inch from a straight edge applied to the pavement perpendicular to the centerline. The variation of the longitudinal joint between multiple cut areas shall not exceed 1/4 inch. Areas varying from a true surface in excess of the above stated tolerance may be accepted without correction if the Engineer determines that they were caused by a pre-existing condition which could not have reasonably been corrected by the milling operations. Any unsuitable texture or profile, as determined by the Engineer, shall be corrected by the Contractor at no additional compensation.

The Engineer may required remilling of any area where a surface lamination causes a non-

uniform texture to occur.

* * *

SECTION 425 - STORMWATER INLETS, MANHOLES AND JUNCTION BOXES

W-425.01 General

The work specified in this section consists of the construction of inlets, manholes, junction boxes, shoulder gutter inlets, and yard drains. These structures shall be of reinforced concrete, or may be of brick masonry if circular and constructed in place, and shall include the necessary metal frames and gratings. The work under this section shall also include the adjustment of those structures shown in the plans to be adjusted or which are required to be adjusted for the satisfactory completion of the work. The new structures shall be constructed in conformity with the plans and in accordance with these specifications and the latest City of Tampa Stormwater Standard Details.

W-425.02 Composition and Proportioning

Concrete: Unless otherwise shown in the plans, all concrete for these structures shall be Class II as specified in the latest FDOT Standard Specifications Section 346, except Section 346.6.1.

Mortar: The mortar for brick masonry shall be of portland cement and sand, mixed in the proportions of one part cement to two parts of sand. Miami Oolitic rock screenings may be substituted for the sand upon prior approval of the Engineer. All the materials shall pass the No. 8 Sieve, and be uniformly graded from coarse to fine. At the option of the Contractor, hydrated lime, in an amount not to exceed ten percent of the amount of cement used, may be added to the mortar.

As an alternate to the above, masonry cement may be used in lieu of the above-specified mortar provided that it is delivered in packages properly identified by brand name of manufacturer, net weight of package, and whether it is Type 1 or Type 2, and further provided that it has not been in storage for a period greater than six months. Hydrated lime shall not be used with masonry cement.

The sand and cement shall be thoroughly mixed dry in proper boxes or mortar mixers and such quantity of clean fresh water added as will provide a stiff mortar of the proper consistency. The whole mass shall be thoroughly mixed until used. Any mortar that has set shall not be retempered in any way, and no mortar shall be used more than one and one-half (1-1/2) hours after mixing.

W-425.03 Gratings

Gratings and frames fabricated from structural steel shall be Zinc (hot-dip galvanized) Coatings on Iron and Steel Products, in accordance with the requirements of ASTM A123. These requirements do not apply when A-588 steel is used.

When Alternate "G" grates are specified, the chain, bolt, nuts, and cold shuts shall be galvanized after fabrication in accordance with the requirements of ASTM A153.

W-425.04 Forms

Forms shall be of wood or metal, so designed and constructed that they may be removed without injury to the concrete. They shall be built true to line and grade and braced in a substantial and unyielding manner, and shall be approved by the Engineer before being filled with concrete.

W-425.05 Precast Inlets, Manholes, and Junction Boxes

Careful attention shall be given to the proper construction or reconstruction of the pavement adjacent to the gutters and at street intersections to obtain satisfactory drainage to the inlets from the intersecting streets.

The Contractor may request to substitute precast inlets, manholes, and junction boxes in lieu of cast-in-place units unless otherwise shown in the plans or directed by the Engineer. At locations not so restricted, the Contractor shall carefully examine the plan details at each structure to determine if use of a precast unit is feasible. The design and fabrication of precast units shall be in accordance with the standard index drawings, which may allow use of designs other than those detailed in the standard index drawings.

Smooth welded wire fabric may be substituted for deformed re-bar or welded deformed wire reinforcement in non-circular precast drainage structures provided the following requirements are met:

1. The smooth welded wire fabric shall comply with ASTM A-185.
2. Substitution of equal areas of smooth wire fabric for the reinforcing steel and provided the width and length of the unit is four times the width of the spacing of the cross wires.
3. Wire shall be continuous around the box and spliced at a quarter point of one side with an overlap of not less than the spacing of the cross wires plus two inches.

W-425.06 Construction Methods

Excavation: Excavation shall comply with the requirements specified in Section 1.

Placing and Curing Concrete: The concrete shall be placed in the forms, to the depth shown in the plans and thoroughly vibrated. After the concrete has hardened sufficiently, it shall be covered with suitable material approved by the Engineer, and kept moist for a period of three days.

Setting Manhole Castings: After the concrete has been cured as specified above, the frame of the casting shall be set in a full mortar bed composed of one part portland cement to two parts of fine aggregate.

Reinforcing Steel: The construction methods for the steel reinforcement shall be as specified in Section 6.

Laying Brick: All brick shall be saturated with water before being laid. The brick shall be laid by the shovejoint method so as to bond them thoroughly into the mortar. Headers and stretchers shall be so arranged as to bond the mass thoroughly. Joints shall be finished properly as the work progresses and shall be not less than 1/4 inch or more than 3/4 inch in thickness. No spalls or bats shall be used except for shaping around irregular openings or when unavoidable at

corners.

The inside of the brick masonry walls shall be plastered uniformly with cement mortar one-half (1/2) inch in thickness mixed in proportions of one part of cement and two parts of clean, sharp sand.

Placing Pipe: Inlet and outlet pipes shall be of the same size and kind as the connecting pipe shown in the plans. They shall extend through the walls for a distance beyond the outside surface sufficient for the intended connections, and the concrete shall be constructed around them neatly so as to prevent leakage along their outer surface. The inlet and outlet pipes shall be flush with the inside of the wall.

Backfilling: Backfilling shall conform with the requirements specified in Section 2.

Adjusting Existing Structures: Existing manholes, catch basins, inlets, valve boxes, monument boxes, etc., within the limits of the proposed work, that do not conform to the finished grade of the proposed pavement, or to the finished grade designated on the plans for such structures, shall be cut down or extended, and made to conform to the grade of the new pavement, or to the designated grade of the structure if outside of the proposed pavement area. The materials and construction methods for this work shall conform to the requirements specified above.

Where manholes are to be raised, the adjustment may, at the Contractor's option, be made by the use of adjustable extension rings of the type which do not require the removal of the existing manhole frame. The extension device shall provide positive locking action and shall permit adjustment in height as well as diameter. The particular type of device used shall meet the approval of the Engineer.

Adjusting Structures: When an item of payment for adjusting manholes, valve boxes, inlets, or monument boxes is provided in the proposal, the number of such structures designated to be paid for under separate items, and which are satisfactorily adjusted, shall be paid for at the contract units prices each for Adjusting Inlets, Adjusting Manholes, Adjusting Valve Boxes, and Adjusting Monument Boxes.

For any of such types of these structures required to be adjusted but for which no separate item of payment is shown in the proposal for the specific type, payment shall be made under the item of Adjusting Miscellaneous Structures.

W-425.07 Drainage Structures

1. All inlets, manholes, and junction boxes shall, unless otherwise directed by the Engineer, be constructed as per design plans and applicable design standards. All manholes shall be Traffic Bearing type. It shall be the responsibility of the Contractor to assure that the designated sizes of the drainage structures meet the following criteria:
 - a. The minimum distance from the top of the opening for the highest pipe to the bottom of the top slab shall be ten inches (10"); 12 inches from top of pipe to bottom of top slab, before "stack" is used.
 - b. The minimum diameter for stack heights shall be thirty-six (36) inches.

- c. The minimum distance between pipe openings shall be nine (9) inches.
 - d. For four-sided structures having openings in more than one corner, individual shop drawings must be submitted for prior approval.
2. If warranted by field conditions and directed by the Engineer, the Contractor shall, at such locations, construct brick drainage structures (in place of concrete drainage structures), according to the standards specified below:
- Brick construction shall be as follows:
- a. Wall thickness minimum eight inches (8") up to eight feet (8') height, unless specified otherwise.
 - b. Wall thickness minimum twelve inches (12") up to twelve feet (12') height, unless specified otherwise.
 - c. Brick shall be laid in 1:2 (Portland cement-sand) mortar.
 - d. Before laying the bricks in mortar, the bricks shall be thoroughly sprinkled with clean water (not to saturation extent).
 - e. Brick for manhole and inlet structures shall be laid in stretcher courses, with every sixth course a header course.
 - f. All brick structures shall be plastered smooth inside also with 1/2-inch thick, 1:2 (Portland cement-sand) mortar.
 - g. No "unsound" brick shall be used. As a test, if a light hammer blow, with the brick held lightly in hand, does not produce a uniform crisp ringing sound, the brick shall be construed to have crack(s), or otherwise unsound and shall be rejected.
 - h. All bricks shall be solid.
3. No additional compensation shall be paid for brick structures. Brick and concrete shall not be used simultaneously in drainage structure walls. Walls of round structures shall be constructed of concrete only.
4. For all types of manholes, the top and bottom slab shall be as per applicable D.O.T. standards, even if brick is allowed to be used in the manhole walls. The following criteria shall apply to slab thicknesses and steel reinforcements:
- a. Top and bottom slabs shall have same thicknesses and reinforcements in any manhole structure.
 - b. The minimum slab thickness and reinforcement shall be 8 inches thick and #6 bars at 6-inch centers both ways.

- c. 4-foot by 6-foot (4' x 6') or larger manholes, including circular manholes with inside diameter of 5-feet (5.0') or larger, shall have 10-inch thick slabs with #7 bars at 6-inch centers both ways.
 - d. Unless specified on the Plans, four-sided structures with both inside dimensions in excess of eight feet (8.0') and circular structures with inside diameter in excess of eight feet (8.0') shall not be covered by D.O.T. and the above criteria.
- 5. All grate inlets shall conform to the City of Tampa design standards.
 - 6. Grates on inlets, as well as all other structures, shall be Traffic Bearing Type, unless specified otherwise, and subject to approval of the Engineer. All grate inlets shall be fitted with an approved metal frame at the top to seat the grates.
 - 7. All Type-P manholes shall be bid at one average unit price regardless of size and shape. Similarly, all Type-J manholes will be bid at one average unit price regardless of size and shape unless indicated otherwise in the proposal.
 - 8. The reinforcements and shapes for all drainage structures, unless directed by the Engineer otherwise, shall conform to the Plans and applicable design standards.
 - 9. Vertical support columns (one in case of Type 5 inlet) shall be constructed by the Contractor, as a part of the D.O.T. Type 5 and 6 curb inlets, where and as directed by the Engineer.
 - 10. The Contractor, if so directed by the Engineer in order to better meet site requirements, shall construct B-S-1, B-R-2, B-V-1, or B-R-1 type curb inlets in lieu D.O.T. Type 5 and 6 inlets and vice-versa without additional cost to the City. P-5 and P-6 inlets shall have 3-1/2-foot by 3-1/2-foot substructures unless oversize pipe is to be accommodated or otherwise directed by the Engineer. Legible, detailed plans of each inlet type shall be provided to the Contractor.

Side openings in curb and grate type inlets may be specified in the Plans or by the Construction Engineer to meet site conditions. The Contractor shall provide such openings without any additional cost.

- 11. When precast drainage structures are requested as substitutions for poured in place concrete structures, the Contractor shall meet the following additional requirements:
 - a. Minimum height of the base structure (manhole or inlet barrel), unless restricted by design, shall be 5 feet 0 inches before extending the structure height by another precast "barrel." The minimum height of the top (extension) precast "barrel" shall be 1 foot 6 inches. "Barrel" extensions of less than 1-foot 6-inch height shall be cast in place with continuous reinforcement.
 - b. Four-sided structures may be considered as an alternate to circular structures, but not the reverse.
 - c. For substructures for the City-type curb inlets, unless specified otherwise, directed

by the Engineer, or to accommodate larger pipes, the Contractor may use a 3-foot by 4-foot (inside dimensions) structure. This structure shall have same slab and wall thicknesses and steel reinforcing as specified for "Type E" grate inlet.

- d. When circular structures are precast in accordance with ASTM C-478, minimum wall thickness shall be six inches (6") thick or as specified in ASTM C-478 for larger diameter structures.
 - e. The location of the pipe holes and adequate basic substructures height, unless directed otherwise by the Engineer, shall be the responsibility of the Contractor.
 - f. The Contractor shall submit shop drawings only as specified below:
 - (1) One each-typical for different type of structures.
 - (2) For structures directed by the Engineer, and/or requiring change with respect to design plans, or as otherwise required by these specifications.
 - g. Provide schedule of manufacture of the structures. No compensation shall be paid to the Contractor for unusable precast drainage structures.
 - h. Provide material testing acceptance reports by a licensed private laboratory verifying:
 - (1) that the structures were constructed in accordance with details shown on the Plans and/or Shop Drawings;
 - (2) the exact design criteria adhered to; if more than one, identify which criteria applies to which structures;
 - (3) the project title, project number, file number, date cast, structure, plan sheet number and station;
 - (4) reinforcement size, spacing and amount;
 - (5) concrete placement, curing and strength, and verification of concrete cover on reinforcement; and
 - (6) that the testing laboratory stamp is placed on each structure prior to shipment.
 - i. Cooperate with Department personnel regarding periodic inspection of the precast units and the precast operations.
12. All manhole and inlet structures shall be set on a minimum 6-inch thick layer of compacted number 57 size coarse aggregate unless noted otherwise in the Plans or Specifications, or unless the Engineer determines a thicker layer is required due to soil and/or water conditions. All such coarse aggregate shall be completely enveloped in non-woven filter fabric as directed by the Engineer.

Payment for the 6-inch thick layer of stone shall be included in the price of the structure. Payment for thicker layers of stone shall be made from the select bedding material (stone) pay item, if available, or as extra work.

13. All casting covers, such as for inlets and manholes, shall bear the appropriate City of Tampa identification for storm sewers and for sanitary sewers, as shown on the Plans and directed by the Engineer.

* * *

SECTION 16010

GENERAL PROVISIONS - ELECTRICAL

1.0 GENERAL

1.01 Scope of Division:

- A. Work shall include all materials, equipment and labor necessary for a complete and properly functioning electrical installation in accordance with local and state codes, and contract drawings and specifications. Work shall be understood to include all work specified in Division 16, electrical section numbers 16000 through 16999, inclusive, of the specifications.
- B. It is the intent of the specifications that all materials and equipment shall be installed by the CONTRACTOR in accordance with the good practice of the several trades involved, ready to operate in the manner indicated or manifestly implied, irrespective of whether or not such completeness, workmanship or practices are detailed herein. Any item not specifically required by the specifications, drawings and plans but which is necessary for a complete, working installation shall be provided by the CONTRACTOR at no additional cost to OWNER.
- C. Motors specified in Division 16 shall be furnished and installed as specified in other divisions, unless otherwise noted.
- D. The term "CONTRACTOR" as used in these Division 16 sections refers to the Contractor that is responsible for the work in accordance with the agreement with the OWNER. Any reference to the "electrical subcontractor" or to other subcontractors is intended only to provide technical requirements for the electrical work to be performed within the CONTRACTOR's scope of work.

1.02 Examination of Site:

- A. Bidders shall visit the site and familiarize themselves with existing conditions and satisfy themselves as to the nature and scope of the work and the difficulties that attend its execution. The submission of a bid will be construed as evidence that such an examination has been made, and that existing conditions have been allowed for in his bid.
- B. CONTRACTOR shall be responsible for field verification of scale dimensions, exact equipment locations, cable lengths, bills of materials and other construction data.

- C. All fees and permits in connection with electrical services shall be included in this contract.

1.03 Codes and Standards:

- A. Materials and installation, as a minimum, shall conform with local and state codes and ordinances. Equipment, where applicable, shall be Underwriters Laboratories, Inc. listed and shall conform to National Electrical Manufacturers Association (NEMA) Standards. Do not reduce standards of quality and workmanship established by Drawings and Specifications by any of these codes and ordinances.
- B. The following codes set minimum requirements for work specified in Division 16:
 - 1. National Fire Protection (NFPA) 70-2011.
 - 2. Occupational and Safety Hazard Act (OSHA).
 - 3. State and local ordinances.
 - 4. Others as specified.

1.04 Drawings and Specifications:

- A. Drawings and specifications are intended to agree and be mutually explanatory. Specific notes on drawings take precedence over general terminology of the specifications.
- B. Electrical drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.
- C. Because of the small scale of the drawings, it is not possible to indicate all of the offsets, fittings and accessories required. CONTRACTOR shall investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels and accessories required to meet such conditions.
- D. Field coordinate with other trades in ample time to build all chases and openings, set all sleeves, inserts and concealed materials, and provide clearances that may be required to accommodate materials and equipment. Electrical work shall be laid out so that in case of interference with other items, the layout may be altered to suit conditions encountered.
- E. The Engineer reserves the right to make any reasonable changes (approximately 6 feet) in the location of outlets, fixtures, switches, receptacles or equipment, prior to the rough-in of such, without additional cost to the OWNER.

- F. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Engineer. Should the CONTRACTOR find, at any time during the progress of the work, that, in his judgment, a modification of the requirements of any particular item is necessary, he shall report such item promptly to the Engineer for his decision and instruction.
- G. CONTRACTOR shall notify all other Contractors of any deviations or special conditions necessary for the installation of his work. Interferences between the work of various Contractors shall be resolved prior to installation. Work installed not in compliance with the drawings and specifications and without properly checking and coordinating as specified above shall, if necessary, be removed and properly reinstalled by the CONTRACTOR without additional cost to the OWNER. The Engineer or his Representative shall be the mediating authority in all deviations and conflicting disputes arising on the project.
- H. Insofar as it is possible to determine in advance, the CONTRACTOR shall consult with the masonry contractor and others so as to leave the proper chases and openings for his work; and he shall place all of his outlets, anchors, sleeves and supports prior to pouring concrete or installing masonry work. Should the CONTRACTOR neglect doing this, any cutting and/or patching shall be done at the CONTRACTOR's expense.

1.05 Cutting and Patching:

- A. Any routine damage caused by cutting or in any other way caused by the electrical contractor in the performance of his contract shall be repaired or replaced under the separate heading for the type material included and in a manner satisfactory to the Engineer.
- B. Any unnecessary damage caused by the CONTRACTOR, due to installation of the electrical work, brought about through carelessness or lack of coordination, shall be corrected under the separate heading for the type of materials involved and paid for by the CONTRACTOR.

1.06 Access Panels: The CONTRACTOR's attention is called to access panels. It is a requirement of these specifications that all access panels required in architectural finishes or surfaces to provide access to junction boxes, smoke detectors, strip heaters, ballasts or other devices be provided and located by the trade requiring access. The access panel shall be installed by the trade constructing the base to which the access panel will be anchored.

1.07 Structural Support:

- A. Provide shop drawings for fabrication and erection of structure framing required for attachment of hangers or other devices to support electrical equipment.
- B. Framing members shall be standard rolled steel shapes, ASTM 36 steel, except those members welded to main structural member. Framing shall be "simple beam" type with end connections welded or bolted for shear loads. Cantilevers may be used only when detailed or specifically approved. Location of supplementary framing shall be subject to approval. Welding shall be done by certified welders.
- C. Framing members shall be designed for their actual loads, with allowable stresses set forth in the AISC code, without excessive deflection and with consideration for rigidity under vibration, in accordance with standard structural practices.
- D. Supplementary framing, including design loads, member size and location, shall be clearly shown on shop drawings.
- E. When supplementary framing is indicated, the CONTRACTOR shall verify that dimensions are suitable and that framing is structurally adequate for the equipment furnished.
- F. No cutting or drilling of holes in structural members will be permitted, except where written permission has been obtained from the Engineer.

1.08 Operations and Maintenance:

- A. Furnish required copies of manufacturer's operating and maintenance manuals. Include for each piece of equipment; product data sheets, wiring diagrams, maintenance recommendations, parts lists, and instruction sheets. Prepare manuals to include all systems and equipment shown and/or specified.
- B. Instruct representatives of OWNER in operation and maintenance of installed systems. Furnish letter naming OWNER's personnel receiving instruction. Have maintenance manual available, and acquaint OWNER's representatives with its contents during instruction.
- C. Operating and maintenance manuals shall be prepared and submitted in accordance with the requirements of the section entitled "Submittal Data".

1.09 Record Drawings:

- A. Maintain one extra set of black-line or black-line print drawings for use as Record Drawings. Records shall be kept daily, using colored pencil. As the work is

completed, relevant information shall be transferred to a reproducible set, and copies made to be given to the Engineer.

B. Comply with the following for all work specified in Division 16. As-built information shall be shown to scale, using standard symbols listed in the legend. As a minimum, show the following:

1. Location of stub-outs, dimensioned from permanent building lines.
2. Location and depth of under-slab and in-slab raceways.
3. All routing of raceways.
4. Corrected panelboard and equipment schedules.
5. Corrected circuit numbers as they appear on panelboard directories.
6. Corrected motor horsepower and full load amperages.
7. Number, size, type of insulation and number of wires in each conduit or multi-conductor cable whether in conduit or exposed.
8. Location of junction boxes, pullboxes and splices.
9. Location of access panels.

C. Each "as-built" drawing provided by the CONTRACTOR shall be signed and dated with changes clearly noted in red. Additionally, the printed name of the individual signing the "as-built" drawings along with that person's company affiliation shall be included. If no change was made during construction, a note designating "no changes" shall be included on the drawing, as well as, the previously stated information and signature.

1.10 Electrical Service:

- A. Electrical service characteristics shall be as indicated on drawings. Furnish metering and service entrance arrangement in accordance with requirements of the utility. Consult with representatives of the utility immediately after award of construction contract, and reach agreement with its representatives as to details of service for this project. See drawings for additional requirements.
- B. CONTRACTOR shall leave the required length of free cable in the transformer's secondary compartment of the utility transformer(s) or in the utility company connection pedestal at the base of the utility power pole, as applicable. Furnish suitable connectors for attaching cables to the secondary bushings in the utility transformer(s) or secondary conductors from pole-mounted transformers in accordance with utility company requirements. See drawings for additional requirements.

1.11 Interface With Work Specified In Other Divisions: Note that work specified under other divisions requires coordination and cooperation of the subcontractor performing work

under Division 16. Attend necessary coordination and scheduling meetings and be informed so interfacing is accomplished to result in complete and operating systems.

1.12 Temporary Lights and Power:

- A. CONTRACTOR shall provide a temporary electrical distribution system of 120/240 volt, 3-phase, 200 amp minimum. All temporary work shall be installed in a neat and safe manner.
- B. The CONTRACTOR shall furnish and install power outlets and lighting necessary for construction. Power outlets shall be 30-amp, 1-phase; fused disconnect switches shall be for 120/240 volts as necessary for construction activities.
- C. The service and panelboards required for the above light and power outlets shall be furnished and installed by CONTRACTOR, and power consumption shall be paid for by the CONTRACTOR.
- D. Temporary electrical power distribution and wiring shall be removed when no longer required.

1.13 Applicable Documents: The listed publications form a part of this specification and, where referred to by basic designation only, are applicable to the extent indicated.

- A. American Society for Testing and Materials (ASTM).
 - 1. (A 36-75) Specification for Structural Steel.
 - 2. (A 153-73) Specification for Zinc Coating (Hot dip) on iron and steel hardware.
- B. American Institute of Steel Construction (AISC).
 - 1. "Specification for the design, fabrication and erection of structural steel for the buildings", with commentary, herein, designated as the AISC Specification.

2.0 PRODUCTS

2.01 Uniform Products:

- A. Equipment and materials of the same type or classification and used for the same purpose, shall be products of the same manufacturer.
- B. Materials and equipment shall conform in all respects to the requirements set forth in these specifications and the accompanying drawings. However, wherever a

product is identified by name, equal products which meet the Engineer's written approval may be used.

- C. Except as otherwise specified, materials and equipment shall be new and bear the approval label of Underwriters Laboratories, Incorporated.

2.02 Shipping Dates for Major Items of Equipment: Not later than six weeks after the Notice to Proceed is issued to the CONTRACTOR, the CONTRACTOR shall furnish to the Engineer a complete list of all major items of electrical equipment including pad mounted transformers, primary switchgear, unit substation, low voltage switchboards, panelboards, bus duct, dry type transformers, lighting fixtures, etc., along with vendors, dates orders were placed and scheduled delivery dates.

2.03 Shop Drawings:

- A. As soon as practical, after the notice to proceed is issued, in order that work under this contract will not be delayed, submit to the Engineer, for review, complete descriptive and dimensional data on the following, as applicable:

1. Wire (600 volts and below).
2. Conduit.
3. Outlet cover plates.
4. Wiring devices.
5. Wiring.
6. Time switches.
7. Panelboards.
8. Magnetic contactors.
9. Safety switches.
10. Light poles.
11. Enclosures.
12. Transformers.

- B. Corrections or comments made on shop drawings during the review do not relieve CONTRACTOR from compliance with requirements of contract documents, plans and specifications. Shop drawings will be checked for general conformance with the design concept of the project and general compliance with information given in the contract documents. Review of the shop drawings shall not relieve the CONTRACTOR from responsibility for confirming and correlating all quantities and dimensions, coordinating his work with that of all other trades, and performing his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviation from plans and specifications.

- C. See Division 1 - General Requirements for number of copies of shop drawings to be submitted.

2.04 Equipment Manuals:

- A. Before the project is finally accepted, the CONTRACTOR shall furnish to the Engineer three bound sets of descriptive, dimensional parts data on the following, as applicable:
 - 1. Wire (600 volts and below).
 - 2. Conduit.
 - 3. Outlet cover plates.
 - 4. Wiring devices.
 - 5. Wiring.
 - 6. Time switches.
 - 7. Panelboards.
 - 8. Magnetic contactors.
 - 9. Safety switches.
 - 10. Light poles.
 - 11. Enclosures.
 - 12. Transformers.
- B. Each set of this literature shall be bound in a permanent type hard cover ring binder and shall be suitably indexed.
- C. Equipment manuals shall include complete details of equipment such as primary switchgear, switchboards and unit substations, complete with wiring diagrams and bus ratings, and trip curves for power air circuit breakers, fuses and molded case circuit breakers (600 amp and larger).
- D. Equipment manuals shall also include warranties, guarantees, and manufacturer's instructions shipped with equipment.

3.0 EXECUTION

3.01 General:

- A. The CONTRACTOR shall, at his own cost, obtain all necessary permits, pay all legal fees and charges, and comply with all state and local building and safety laws, ordinances, and regulations relating to building and public health and safety. A final inspection certification from the local inspection authorities shall be furnished to the Engineer.
- B. The CONTRACTOR shall keep the work installed by him in perfect working order for one year from date of final written acceptance of the project, said guarantee to be based upon defective materials and/or workmanship. CONTRACTOR shall

furnish to the OWNER materials and labor necessary to comply with this guarantee.

- C. All defects with the equipment which develop during the testing or during the initial installation shall be repaired and corrected by the CONTRACTOR at no cost to the OWNER. After each/any repair or correction, the CONTRACTOR must retest the equipment. The CONTRACTOR shall bear the expense of any repair or retest necessitated by his faulty workmanship or material. The OWNER shall not bear the expense of repairs, readjustment and retest resulting from the use of faulty materials supplied by the CONTRACTOR.
- D. All work shall be neat and installed in a craftsmanlike manner. Return calls (second or later trips) or installation revisions which are necessary to repair equipment/correct installation obviously made necessary as a result of incorrect work by the CONTRACTOR will be the responsibility of and at the expense of the CONTRACTOR.
- E. The CONTRACTOR shall inspect all electrical equipment upon receipt. Any damaged or missing items shall be reported by the CONTRACTOR to the Engineer.
- F. Erection of all equipment and materials shall be done in a neat and workmanlike manner, aligned, leveled and adjusted for satisfactory operation. Equipment shall be installed so that all functional parts are easily accessible with adequate clearance for inspection, operation, maintenance, repair and replacement. Coordinate layout with all trades.
- G. Work required to pierce any waterproofing shall be done with care and after the part piercing the waterproofing has been set in place, the opening made for this purpose shall be sealed and made absolutely watertight in accordance with recommendations of waterproofing manufacturer.

3.02 Fire Rating:

- A. Installation under this division shall be so made that the fire-protective rating of firewalls and fire-resistant or fire-stopped walls, partitions, ceilings and floors will be substantially equivalent to its original rating.
- B. CONTRACTOR shall review architectural plans and specifications for approved fire rating materials and installation methods.

3.03 Protection and Finish:

- A. Where marring or disfigurement has occurred, replace or refinish the damaged surfaces as directed.
- B. Equipment or components exposed to the weather shall be sealed weather-tight. All equipment outlets and conduit openings shall be protected with temporary plugs or caps at all times that work is not in progress.
- C. Prepare all exposed raceways, fittings, boxes, supports and panelboards for painting by removing all oil, grease and dirt. Employ the necessary precautionary methods to prevent painting over or obscuring any nameplates or designations on all electrical apparatus and devices.
- D. All surfaces of ferrous metal on equipment exposed to the weather and all ferrous metal not otherwise specified shall be given a rust inhibiting treatment, consisting of hot-dipped galvanizing after fabrication followed by the application of rust inhibiting primer and finish paint. Weight of the coating shall be in accordance with ASTM A153.

3.04 Storage of Materials: Prior to and during installation, store materials to protect them from damage, ingress of dust, moisture or deterioration. Material shall not be stored in contact with ground or floor. In determining required protection for stored materials, consider use for which the equipment was designed. If suitable storage areas are not available at the job site, provide temporary construction or store materials off-site in suitable warehouses. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced.

3.05 Tests and Inspections: Prior to acceptance inspection, clean and where required, paint all equipment installed under Division 16. Factory applied finishes that have been scratched or otherwise damaged shall be touched up with color matched paint furnished by the manufacturer.

(End of Section 16010)

SECTION 16050

BASIC MATERIALS AND METHODS - ELECTRICAL

1.0 GENERAL

1.01 Applicable Sections:

- A. Drawings and general provisions of the contract, including general and supplementary conditions and all division specification sections, apply to work of these Division 16 sections.
- B. Excavation and backfill for work under this Section shall conform to the requirements specified in the division entitled W-1, Excavation.

1.02 Wiring Methods: All wiring for power, control and signal systems shall be installed in raceway systems specified herein, unless specifically exempted.

1.03 Equipment Connections:

- A. In general, provide electrical power and control system connections to all equipment shown on the drawings. Included are wiring, raceways, disconnects and other devices shown. Excluded are devices furnished integrally with the manufacturer's package and work specified in other sections of these specifications.
- B. Control wiring and temperature control wiring shall be installed under the supervision of the mechanical subcontractor.
- C. All electrical work required for the installation of the temperature control system shall be provided as shown on the electrical drawings or called for in the electrical specifications.

1.04 Applicable Publications: NFPA No. 70 - National Electrical Code.

(End of Section 16050)

SECTION 16095

SUBMITTAL DATA - ELECTRICAL

1.0 GENERAL

1.01 Drawings and general provisions of the contract, including general and supplementary conditions and all division specification sections, apply to work of this Section.

1.02 Standard for Materials: It is the intention of these specifications to indicate a standard of performance and quality for all materials incorporated in this work. Manufacturer's names and catalog numbers are used to designate the item of equipment or material as a means of establishing grade and quality. Where several manufacturers are named, only those named manufacturers' products will be considered and the CONTRACTOR's bid shall be on their products. The first named of several manufacturers is the manufacturer whose product was used in engineering the project. Manufacturers of products other than those specified, although acceptable as manufacturers, shall guarantee that their product will perform as specified and will meet space requirements. Where performance characteristics of such equipment differs from the equipment scheduled on the drawings, the Engineer shall reserve the right to reject it. Where use of such equipment requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit and any other equipment, the CONTRACTOR shall furnish said changes and additions and pay all costs for all changes to the work and the work of others affected by using such equipment.

1.03 Submittal Data:

A. Materials list, as applicable:

1. Disconnect switches.
2. Rigid metal conduit and fittings.
3. Rigid nonmetallic conduit and fittings.
4. Specialty conduit fittings.
5. Outlet boxes.
6. Conductors.
7. Wiring devices.
8. Lamps.
9. Materials specified on drawings.
10. Enclosures.

B. Product data, as applicable:

1. Fuses and time-current curves.
2. Circuit breakers and time-current curves.
3. Panelboards.
4. Magnetic contactors.

5. Safety switches.
6. Transformers.
7. Lighting fixtures.
8. Time switches.
9. Material specified on drawings.
10. Receptacles, switches, etc.

(End of Section 16095)

SECTION 16110

ELECTRICAL CONDUIT

1.0 GENERAL

1.01 Scope: This section includes requirements for conduit and fittings.

1.02 Submittals: Submit manufacturer's catalog data for all conduit and fittings proposed for use.

2.0 PRODUCTS

2.01 Conduit:

- A. Rigid steel conduit, elbows, couplings and nipples shall be hot dipped galvanized after fabrication. Galvanizing shall include uniform zinc coating both inside and outside, including all threads on conduit and fittings. Compliance: ANSI C80.1, UL 6.

Acceptable: Triangle-PWC, Robroy, Republic Steel, Wheatland and Allied.

- B. Electrical Metallic Tubing (EMT) and Elbows: Steel tubing, zinc coated. Compliance: ANSI-C80.3, UL 797.

- C. Flexible Steel Conduit: Continuous length, spiral wound steel strip, zinc coated inside and outside, each convolution interlocked with the following convolution. Compliance: UL 1.

- D. Liquid Tight Flexible Steel Conduit: As specified for flexible steel conduit with continuous length copper bonding strip and extruded polyvinyl chloride (PVC) jacket. Compliance: UL 360. Flexible non-metallic conduit is not acceptable.

Acceptable: American Hose Type UA Sealtite hose.

- E. Electrical Plastic Conduit: Polyvinyl chloride, Schedule 40, heavy wall, UL listed for application. NEMA designation EPC-40-PVC. Compliance: NEMA TC-2, UL 651. Use only below grade unless specifically indicated otherwise.

- F. Rigid Aluminum Conduit: Rigid aluminum conduit shall be 6063 aluminum alloy, T-1 temper. Compliance: ANSI C80.5, UL 6.

Acceptable: Wheatland, Robroy, and Allied.

- G. PVC Coated Conduit: Polyvinyl chloride (PVC) coated conduit shall be rigid aluminum coated with a 40 mil (0.040") PVC coating on the exterior and a 2 mil (0.002") urethane coating on the interior. The conduit shall meet the requirements of ANSI C80.5 and UL Standard #6. The PVC coating shall be UL listed for UV resistance.

Acceptable: Robroy Industries Plasti-Bond Red, Thomas & Betts Ocal-Blue.

2.02 Conduit Fittings:

- A. Rigid Steel Conduit Fittings: Zinc coated steel or cadmium coated, malleable iron for steel conduit. Compliance: ANSI-C80.4, UL 514.
1. Ells, Tees and Entrance Fittings: Malleable iron with tapered threads with neoprene gasket and screw on metal cover.

Acceptable: Appleton series L, T, and X.
 2. Offsets and Reducers: Tapered threads.

Acceptable: Appleton series OFN, RB, and ME.
 3. Expansion Couplings: Tapered thread, weatherproof with neoprene gland and copper bonding jumper, 4 inch movement.

Acceptable: Appleton series XJ; Crouse-Hinds, OZ.
 4. Union Couplings: Tapered thread.

Acceptable: Appleton series UN.
 5. Lock Nuts: Steel, 2 inches smaller. Malleable iron, larger than 2 inches.

Acceptable: Appleton series BL.
 6. Bushings: Malleable iron, insulated throat. Provide grounding type where necessary. Plastic bushings are not acceptable.

Acceptable: Appleton series BU and G1B.
 7. Clamps: Malleable iron.

Acceptable: Appleton series CL and CLB.
- B. EMT Fittings: Zinc coated steel, inside/outside including threads. Rain-tight, compression gland type or concrete tight, set screw type fittings. Compliance: ANSI-C80.4.
1. Ells: Compression coupling with neoprene gasket and screw fastened steel cover.

Acceptable: T&B series.
 2. Connectors and Couplings: Compression or set screw type. Connectors shall have insulated throat.

Acceptable: T&B series.
 3. Rigid Conduit Adapters: Tapered threads and compression coupling.

Acceptable: Appleton series TWR.

4. Clamps: Steel alloy, 1 inch and smaller. Malleable iron, larger than 1 inch.

Acceptable: Appleton series TWCL.

- C. Flexible Steel Conduit Fittings: Steel alloy, zinc coated, with insulated throat. Slip-proof, positive grip type with screw tightened, double gripping steel wedge set at an angle to grip tighter under strain. Set screw type, squeeze type and clamp type fittings shall not be used. Rigid conduit adapters shall have beveled threads at one end.

Acceptable: T&B "Tite-Bite" series.

- D. Liquid Tight Flexible Conduit Fittings: Steel alloy, zinc coated with molded nylon compression ring and insulated throat. Liquid tight beveled thread, gland nut design with ground cone and sealing ring.

Acceptable: T&B series 5300.

- E. Plastic Conduit Fittings: Polyvinyl chloride, UL approved for application. Manufacturer's standard solvent cement. Compliance: NEMA TC-3, UL 514B.

- F. Expansion Fittings: Designed for use across structural expansion joints and meeting NEC code requirements for electrical continuity.

Acceptable: O-Z/Gedney.

- G. Aluminum Conduit Fittings: Couplings and fittings for use with the rigid aluminum conduit shall be 6063 alloy, T-1 temper and of the same manufacturer as the conduit.

Acceptable: Wheatland, Robroy and Allied.

- H. PVC Coated Conduit Fittings: Couplings and fittings for use with PVC coated conduit shall be of the same manufacturer as the conduit. The couplings and fittings shall be aluminum with a 40 mil (0.040") PVC coating bonded to the exterior and a 2 mil (0.002") urethane coating bonded to the interior. Flexible, overlapping, pressure-sealing sleeves shall be on each coupling and fitting to protect the connections. Fastening hardware for fittings shall be stainless steel and shall be encapsulated for maximum corrosion protection.

Acceptable: Robroy Industries Plasti-Bond Red, Thomas & Betts Ocal-Blue.

- 2.03 Acceptable: Manufacturer's names and series numbers listed for conduit fittings are for reference to type, materials, and finish intended for use. Equivalent fittings manufactured by Appleton, Crouse-Hinds, T&B, Racor, Efcor, O.Z. and Steel City will be acceptable provided such fittings meet the express requirements of this specification.

- 2.04 Concrete for encasing conduits shall be steel reinforced cement, lime, aggregate and all other concrete components with aggregate size not exceeding 3/8-inch. Concrete shall have a minimum compressive strength at 28 days of 3,000 psi.

There shall be not less than 3-inches of concrete between the outside of a duct and the earth. There shall be not less than 2-inches of concrete between adjacent ducts. All duct line concrete pours shall be continuous between manholes or hand holes and between manholes or hand holes and structures. Where duct lines pass through concrete walls, the concrete envelopes shall be extended through and finished flush with inside surfaces. Water-tight construction joints of an approved type shall be provided.

Duct banks shall be reinforced with steel as shown in the drawings. Install No. 4 steel reinforcing bars on 6" centers each way, extending the length of the concrete encasement. Additionally, No. 4 steel hoops surrounding the ducts shall be placed on 24" centers along the length of the duct bank.

Duct bank lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded. The minimum cover for duct lines shall be 24-inches unless otherwise permitted by the Engineer.

Concrete for duct bank encasement shall be dyed red for easy identification.

3.0 EXECUTION

- 3.01 General: Conduits concealed below finish level of floors which have water barriers shall be located within slab, where practicable, to avoid penetrating water barriers. Where electrical conduits are completely concealed in concrete slab, conduits shall be secured to the upper side of the bottom reinforcing steel or to the lower side of the top reinforcing steel. Conduit shall not interfere with the functioning of the concrete or the reinforcing steel.

Install exposed conduits plumb where vertical and parallel to floors and walls where horizontal. Group parallel conduits where possible with spaces between adjacent conduits kept to a minimum. Support individual conduits with standard conduit straps.

Where conduits are not adjacent to structure, support by adjustable galvanized steel pipe hangers or trapeze hangers. Perforated strap hangers or tie wire will not be permitted. Install conduit to clear all piping, ductwork, structural members and equipment. Independently support conduit from the structure and not from ductwork, piping, ceiling framing members or equipment without written permission from Engineer. All conduit fittings shall be properly installed and made up mechanically and electrically tight. Provide grounding type bushings where necessary. Branch circuit conduits for recessed lighting in suspended ceilings may be supported from the ceiling suspension system if the suspension system is not compromised, and provided suitable fasteners, intended for the purpose, are used.

Conduits shall be supported at maximum intervals of 10 feet. Additional supports shall be provided at bends, fittings, and fixtures as necessary to keep the conduit system rigid and vibration free. Supports shall be adequate for the loads imposed.

Pull-points shall be installed so that no conduit run has more than four 90-degree bends.

If conduit runs exceed the equivalent of a 150-foot straight run or contain more than the equivalent of three 90-degree bends, pull fittings shall be provided. One 90-degree bend shall be considered equivalent to 50 feet of straight run.

Underground conduit bends shall be "long radius" bends. Radius of bends for special cases shall be calculated.

Where bends or offsets are required, they shall be made with suitable conduit bending equipment. Uniform circular cross section of the conduit shall be maintained at such bends. No single bend shall be greater than 90 degrees.

Couplings or other fitting shall not be installed in the curved portion of bends. Where unions are required because of a bend, they shall be installed at least one joint from bends.

All conduits (including those installed underground) shall be installed at right angles to or parallel to equipment and building base lines unless otherwise noted on the drawings.

Underground conduits shall be installed a minimum of twenty-four (24) inches below grade. The backfill shall be free from refuse, scrap and boulders. The backfill shall be tamped about the conduit and in successive six-inch (6") layers. Whenever conduit is stubbed vertically out of the ground, provision shall be made to ensure that the conduit is rigidly fixed.

All underground conduits for feeders, instrumentation wiring, control wiring, and communication wiring shall be PVC conduits and shall be encased in reinforced concrete as shown, unless otherwise noted. Conduits shall be installed as shown and shall be sloped approximately 3-inches per 100 feet uniformly between the elevations shown. Manufactured fitted plastic duct spacers shall be used for installation spacing of conduits.

Concrete for the encasement shall be Class B using aggregate not exceeding 3/8-inch and shall be reinforced as shown. Ducts shall drain to the manholes or end structures. End bell fittings shall be provided on the ducts in manholes.

Appropriate expansion fittings or other approved methods shall be used in the installation of plastic ducts so as to avoid expansion and distortion prior to encasement in concrete. Spacers shall be located a maximum of 8 feet on centers and the duct spacings center-to-center shall not vary in excess of 1/16 inch from the specified spacings shown, prior to and after encasement.

Each duct shall be carefully cleaned before and after installation. All inside surfaces shall be free from imperfections likely to injure the cable. After installation of complete duct runs in sizes 2 inches and larger, ducts shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the duct. Ducts through which the mandrel will not pass shall not be incorporated in the work. After snaking, the ends of dead-ended ducts shall be protected with standard conduit caps to prevent the entrance of water or other foreign matter.

Where ducts enter buildings or at stub-ups to equipment, transitions to metallic conduits (rigid aluminum or rigid steel as designated in the drawings) shall be made. Where it is not otherwise shown, all ducts entering buildings and structures, exclusive of manholes, shall have transitions to metallic conduit at least 5 feet from the outermost edge of the pile cap or footing supporting the outermost vertical wall of the building or structure.

Transition from above-grade metallic conduit to nonmetallic conduit shall be accomplished with a threaded adapter. Metallic conduit installed above grade and extending below grade shall include the first 90° elbow. All metallic conduit extending below grade shall be coated with two coats of an

asphaltum-type paint along its entire length below grade and extending 6" above grade or above the top of the finished slab. The asphaltum-type paint shall conform to Fed. Spec. TT-V-51 and equivalent to Koppers Bitumastic Super Service Black.

Install a warning ribbon approximately 12-inches below finished grade and a minimum of 12-inches above all underground duct banks. The identifying ribbon shall be a PVC tape, 3-inches wide, yellow color, permanently imprinted with, "CAUTION BURIED ELECTRIC LINE BELOW" in black letters. Cut tape every 15 feet.

Use of Electrical Metallic Tubing (EMT) shall be limited to areas where specifically noted on the drawings as an acceptable wiring method. Use of EMT shall not extend beyond an interior space which is not conditioned.

All metallic conduit shall be terminated with insulated bushings to prevent damage to wire during pulling operations, except in enclosures where hub design is adequate to prevent insulation damage.

PVC coated conduit and fittings shall be installed with tools specifically designated for the installation of coated conduit systems. All damages to the PVC coating, including nicks and abrasions, shall be repaired with touch-up coating compounds recommended by the manufacturer of the PVC coated conduit.

(End of Section 16110)

SECTION 16120

LOW VOLTAGE ELECTRICAL WIRE AND CABLE

1.0 GENERAL

- 1.01 Scope: The work of this Section includes wiring for systems operating at 600 volts or less.
- 1.02 Cooperation with Other Trades: It shall be the responsibility of the CONTRACTOR to coordinate all electrical power, control and interlock wiring and installation between the various trades involved so that all equipment and devices furnished under other Sections are properly wired and installed to perform their intended functions. All necessary materials, equipment and labor to perform this work shall be provided without change in the contract amount.
- 1.03 Submittals: Submit list of material proposed for use.
- 1.04 Applicable Standards: Provide only UL listed or labeled products.

2.0 PRODUCTS

- 2.01 600 Volt Power and Control Wiring:
 - A. General: New, copper, soft drawn, annealed, wiring free of kinks, cuts and abrasions, single conductor type. All conductors shall be stranded unless otherwise designated or approved in writing. All wiring insulation shall be color coded.
 - B. Insulation:
 - 1. Building Wires: The following types are acceptable: Type THHN/THWN polyvinyl chloride insulation, nylon jacket, 600 volt listed by UL for 75°C operation in wet locations. Type THHW, cross link polyethylene insulation, 600 volt, listed by UL for 75°C operation in wet locations. Minimum size building wires, No. 12 AWG conductor.
 - 2. Direct Current Carrying Wires: For circuits operating at 50 volts or more in direct current (DC) applications, Type RHH/RHW hypalon insulation, 600 volt listed by UL for 75°C operation in wet locations. Minimum size conductor, No. 12 AWG.
 - 3. Fixture Wires: In accordance with Article 402 of the NEC. Minimum size, #16 AWG.
 - 4. Ground Wires: Bare or Type TW, green, thermoplastic, 600 volt, listed by UL for 60°C operation, wet or dry locations.
 - 5. Control Wires: Except for specialized multi-conductor control systems, type TW thermoplastic, 600 volt, listed by UL for 60°C operation, wet or dry locations. Minimum size, #14 AWG except where permitted otherwise.

2.02 600-Volt Instrumentation Cables: Wiring for instrumentation signals (e.g. 1-5 VDC, 4-20 mA DC) shall be shielded two-conductor no. 16 AWG cables. Instrumentation cables shall have stranded copper conductors with 600-volt insulation. Cable pairs shall be twisted and shielded. Conductor insulation shall be polyethylene. Shields shall be overlapped metalized tape providing 100% coverage with tinned copper drain wire. Cable outer jacketing shall be of polyvinyl chloride. Cables shall be as manufactured by Belden, Dekoron, or equal.

2.03 Wire Connectors:

A. Compression Type: Solderless, UL approved compression type.

B. Twist Type: Insulated shell, helical spring steel twist-on type connector for connection only in dry locations. No. 10 AWG maximum conductor size.

3.0 EXECUTION

3.01 General: Install all wire and cable in conduit. Size as indicated on drawings. Identify feeders and branch circuit building wires as follows:

<u>Wire</u>	<u>120/208 Volt</u>	<u>120/240 Volt</u>	<u>277/480 Volt</u>
Phase A	Black	Black	Black
Phase B	Red	Orange	Orange
Phase C	Blue	Blue	Yellow
Neutral	White	White	Gray
Switch Leg	Purple	Purple	Purple
Ground	Green	Green	Green

Motor control circuits shall be identified as follows:

<u>Wire</u>	<u>Color</u>
Stop	Red
Start	Blue
Common	Yellow
Pilot Light	Orange *

* Use white when connected to control circuit neutral.

3.02 Identification of Conductors: Identification shall be by colored insulation on conductors or by use of colored, non-aging plastic tape. Tape shall be permitted only for #8 AWG and larger conductor sizes. Where tape is used to identify conductors, apply at all terminations, junction boxes, pull boxes and wireways. Apply tape, butt lapped, for a minimum distance of 2 inches and, where applied to ends of conductors, start at cut end of the conductor insulation. Signal and control conductors shall be color coded or labeled as necessary for clear identification. Use terminal strips for terminating control wiring in all control equipment and terminal cabinets. The conductivity and insulation of all joints in wire and cables shall not be less than that of the original conductors. Use solderless lugs and compression type connectors only.

When pulling wires, use appropriate wire pulling lubricants recommended by conductor manufacturer. Do not pull wire or cable through any box, fitting or enclosure where change of raceway alignment or direction occurs; do not cut strands from conductors to fit lugs or terminals; and do not bend conductors to less than recommended radius.

- 3.03 Wiring in Enclosures: Train in a neat and orderly manner all conductors in panelboards, cabinets, control panels, motor controllers, motor control centers, wireways and wiring troughs. Where conductors cannot be properly trained otherwise, secure with "Ty-Raps" or other suitable lacing. Identify all control, instrumentation and alarm wiring at cabinets and boxes using suitable conductors tags.
- 3.04 Terminations: Lugs shall be required for stranded wire #10 AWG and larger and where so designated in the drawings.

(End of Section 16120)

SECTION 16195

ELECTRICAL EQUIPMENT IDENTIFICATIONS

1.0 GENERAL

1.01 Nameplates:

- A. Engraved phenolic nameplates shall be installed on each panel, disconnect (safety) switch, motor starter, dry transformer, equipment cabinet, terminal cabinet, and circuit breaker in main switchboard hereinafter specified.
- B. Nameplates for 120/208 volt (or 120/240 volt) shall be white letters on a black background.
- C. Nameplates for 277/480 volt shall be black letters on a white background.
- D. Nameplates for equipment on emergency equipment shall be similar to those specified in 1.01 B and 1.01 C, except that background shall be red.
- E. Nameplates shall include equipment designation as indicated on drawings, branch of service, and voltage.
 - 1. Typical panelboard nameplate (example):

Panel A
120/208 volt - 3Ø, 4W.
LIFE SAFETY
 - 2. Nameplates for disconnect (safety) switches and motor starters shall be similar to those indicated in E. 1 above.
- F. Nameplates shall be three-ply phenolic - black-white-black, white-black-white or red-white-red, as required - engraved through the first layer. Lettering shall be 0.5 cm (3/16") minimum. Edges of all nameplates shall be beveled at 45 degrees.

2.0 EXECUTION

- 2.01 Nameplates shall be secured by screws to the equipment. Use of glue is not permitted.

(End of Section 16195)

SECTION 16400

ELECTRIC DISTRIBUTION AND SERVICE

1.0 GENERAL

- 1.01 Scope: This Section includes requirements for providing electric distribution and service to all elements of the project as indicated on the drawings and as specified within the various sections of Division 16 specifications.
- 1.02 Shop Drawings and Data: As required under the various sections of Division 16 specifications.
- 1.03 Coordination: The CONTRACTOR shall coordinate the electrical distribution system with the local utility company to ensure suitable locations and type of instrument transformers, meters, cable terminations, conduit and other necessary materials and equipment.
- 1.04 Tests: Upon completion of installation of the complete electric distribution and service, CONTRACTOR shall demonstrate to the Engineer that the complete system is properly installed and properly functioning. All factory certifications and field test reports as required under various sections of Division 16 specifications shall be submitted to the Engineer prior to demonstration of system.
- 1.05 Description of Systems:
 - A. General: Electrical power for the project will be provided by the local utility company to the on-site utility transformer. The CONTRACTOR shall provide all elements of the system on the load side of the utility transformer and shall assist the utility as necessary to ensure a properly working system. CONTRACTOR shall provide underground ductbank and manholes as indicated on the drawings.
 - B. Voltages: Voltage at the secondary terminals of the utility power transformer(s), as provided by the local utility company, will be as shown on the drawings. This system voltage shall be connected to the main disconnects and distributed to various loads as shown on the drawings.
 - C. Distribution: Electric power for the project shall be distributed generally as indicated on the drawings. Distribution shall include bus and cables, as specified in various sections of Division 16 specifications.

2.0 PRODUCTS

- 2.01 As specified in various sections of Division 16 specifications.

3.0 EXECUTION

- 3.01 As specified in various sections of Division 16 specifications and in conformance with all regulatory codes, the National Electrical Code.

(End of Section 16400)

SECTION 16450

ELECTRICAL SYSTEM GROUNDING

1.0 GENERAL

- 1.01 Scope: All grounding shall be in accordance with Article 250 of the NEC, except where specifically indicated otherwise. In no case shall a grounding conductor be smaller than #12 AWG.
- 1.02 Submittals: Submit to Engineer a list of all materials plus manufacturer's catalog data for all connection devices.

2.0 PRODUCTS

- 2.01 General: Use copper and copper alloy materials specifically intended for electrical grounding.
- 2.02 Conductors: Grounding conductors shall be copper only, solid or stranded, and sized as indicated or as necessary. Conductors may be bare or have type TW insulation unless otherwise indicated. Insulated conductors shall have green color insulation.
- 2.03 Connections: Copper and copper alloy only.
 - A. Mechanical Type:
 - 1. Connection to water pipe shall be copper alloy body, single conductor, "U" bolt clamp.
 - 2. Connection to bus or other flat surfaces shall be copper body, compression type, two bolt lug.
 - 3. Acceptable: O.Z. C.G. series, Thomas and Betts and Burndy.
 - B. Welded Type: All grounding connections made below grade (or which are made in inaccessible locations) shall be made by exothermic welds (such as Cadweld).

3.0 EXECUTION

- 3.01 General: All grounding shall be electrically continuous to grounding electrodes. Provide grounding type bushings and copper jumpers at switchboard and elsewhere to provide suitable raceway grounding where conduits cannot be properly terminated with lock nuts at sheet metal enclosures.
- 3.02 Ground the Following: All non-current carrying metal parts of all electrical apparatus, conduits and cabinets for power, lighting and communications shall be grounded. Provide additional grounding where indicated or specified and as required by code.
- 3.03 Equipment Grounds: All circuits, including feeders and 3-phase motors, shall have a separate green colored insulated grounding wire pulled in same conduit with power wires. Ground wires

shall be solidly grounded at all termination points, panelboards, and other equipment as necessary and shall be solidly grounded to system ground.

3.04 Conduit Bonding:

- A. The conduit shall not serve as the sole ground connection. However, the conduit shall be provided with proper fittings to bond the conduit to the associated power equipment.
- B. Conduits that enter switchgear, motor control center and similar open-bottom or top entry enclosures shall be terminated in the insulated ground-type bushings that are bonded together by a minimum AWG size of number 6 bare copper conductor and connected to the equipment ground bar or to the enclosure.

3.05 Receptacles: Receptacles shall be grounded with a self-grounding clip on the receptacle except where separate green ground is indicated on drawings.

3.06 Separately Derived Systems: The neutral of all separately derived systems shall be solidly grounded at the points designated only. These shall be the only points in the entire electrical distribution system where the neutral is grounded. The neutral at all other points shall be fully insulated from ground.

(End of Section 16450)

SECTION 16475

MOLDED CASE CIRCUIT BREAKERS

1.0 GENERAL

- 1.01 Scope: This Section includes provisions for molded case circuit breakers rated up to 1200 amperes.
- 1.02 Submittals: Submit manufacturer's catalog data for each frame size circuit breaker proposed for installation.
- 1.03 Tests: Each circuit breaker used as main service entrance equipment, and each circuit breaker 225 ampere frame size and larger shall be tested for proper operation.

2.0 PRODUCTS

- 2.01 General: Molded case circuit breakers shall have a molded insulated case and shall be bolt-on or plug-in style of the frame size and trip rating indicated on the drawings. Circuit breakers shall be listed by UL and shall conform to the applicable standards of NEMA publication AB 1-1993 and Federal Specification W-C-375b. Circuit breakers used as main service entrance equipment shall be so listed by UL. Operating handles shall be toggle style, operable at the front of the circuit breaker.
- 2.02 Contacts: Circuit breaker contacts shall be silver plated and rated for the continuous current indicated by the circuit breaker frame size.
- 2.03 Operator: Mechanism for operation shall be quick-make, quick-break and of trip free design so that contacts cannot be held closed against a short circuit or overload. Units shall be designed for common tripping of all poles.
- 2.04 Trip Mechanism: The trip mechanism shall be a combination thermal-magnetic type. Thermal elements shall have inverse time characteristics for overload conditions and magnetic element shall protect against short circuits by providing instantaneous trip. Magnetic trip shall be adjustable for all circuit breakers of 225 amperes or larger frame size.
- 2.05 Voltage Ratings: Circuit breaker shall be rated for use at the voltages indicated on the drawings.
- 2.06 Interrupting Ratings: Circuit breakers shall be rated for short circuit duty at not less than the RMS symmetrical current values indicated on the drawings, but in no case less than the following ratings:

Interrupting Rating in RMS Symmetrical Amperes

<u>Frame Size</u>	<u>Poles</u>	<u>120 Volts</u>	<u>240 Volts</u>	<u>277 Volts</u>	<u>480 Volts</u>
100 amp.	1-P	10,000	----	14,000	----
100 amp.	2,3-P	----	10,000	----	14,000
225 amp.	2,3-P	----	25,000	----	22,000
400 amp.	2,3-P	----	42,000	----	30,000
600 amp.	2,3-P	----	42,000	----	30,000
800 amp.	2,3-P	----	42,000	----	30,000
1200 amp.	2,3-P	----	42,000	----	30,000

2.07 Enclosures: Circuit breakers shall be suitable for and rated for use in panelboards, switchboards and other enclosures.

2.08 Individual Enclosures: Where indicated, circuit breakers shall be installed in separate steel enclosures. Enclosures shall be NEMA 1 for general indoor use, NEMA 3R for general outdoor use, and NEMA 4X stainless steel, where indicated on the drawings.

2.09 Acceptable: Siemens, Eaton, GE and Square D.

3.0 EXECUTION

3.01 Panelboards and Switchboards: Circuit breakers shall be factory installed in panelboard or switchboard assemblies as indicated on the drawings. Devices shall be bolted in place. Make up all conductor terminations.

3.02 Individual Enclosures: Circuit breaker enclosures shall be suitably supported on structures using framing channel as necessary. Where practical, locate the top of the enclosure 6 feet above the floor. The circuit breaker operating handle shall not be less than 4 feet above the floor. Make up all conductor terminations and conduit.

3.03 Trip Adjustment: Magnetic trip adjustments on all adjustable trip breakers shall be set in accordance with the manufacturer's directives and in accordance with the drawings.

(End of Section 16475)

SECTION 16940

CONTROL PANELS

1.0 GENERAL

1.01 Scope: This Section includes requirements for providing a stormwater pumping station control panel and related equipment to control the pumps, levels, processes, etc., as indicated within the drawings.

1.02 Related Work:

- A. Section 16010; General Provisions
- B. Section 16475; Molded Case Circuit Breakers

1.03 Quality Assurance:

- A. Unit Responsibility: The control panel, frame and cover shall be supplied by the panel manufacturer to ensure unit responsibility.
- B. Guaranteed Parts Stock Program: The panel supplier shall have a guaranteed parts stock program in the State of Florida.

1.04 Submittals:

- A. Shop Drawings: The CONTRACTOR shall provide shop drawings prepared by the manufacturer and submitted to the Engineer for review prior to the manufacture of the equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, control panel one-line wiring diagram, specifications, and a copy of the manufacturer's warranty shall be included with the submitted data. In addition, the shop drawings shall include the following:
 - 1. Control panel drawing, including material, showing components on the door front, showing components on the back panel and showing wiring diagram.
 - 2. Warranties.
- B. Operating Instructions: For all control panels furnished under this Section, the CONTRACTOR shall submit operation and maintenance manuals which include the following items:
 - 1. General - equipment function, description and normal and limiting operating characteristics.
 - 2. Installation instructions - assembly procedures and alignment and adjustment procedures.
 - 3. Operation instructions - start-up procedures, normal operating conditions, emergency and normal shutdown procedure.
 - 4. Maintenance instructions.
 - 5. Trouble-shooting guide.
 - 6. Parts list and predicted life of parts subject to wear.

7. Drawings - cross sectional view, assembly and wiring diagrams.

- C. Factory Performance Test Data: A factory representative who has complete knowledge of proper operation and maintenance of the control panel, shall be provided for one day to instruct representatives of the CITY and the Engineer on proper operation and maintenance. With the permission of the CITY, this work may be conducted in conjunction with the inspection of the installation and test run as provided in this Section. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional services shall be provided at no cost to the CITY.
- D. Certifications: The CONTRACTOR shall furnish the Engineer with a written certification signed by the manufacturer's representative that the equipment has been properly installed, tested, calibrated and operated under full load conditions, and satisfactory operation has been obtained.

1.05 Delivery, Storage And Handling:

- A. Deliver a complete system ready to install as job progress requires.
- B. Store in weathertight building or suitable covering to protect against damage of any nature.
- C. Handle during delivery, storage and installation in a manner to prevent damage of any nature.

1.06 Warranty and Guarantees: All equipment shall be guaranteed against defects in material and workmanship for a minimum period of one year from the date of the CITY's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the CITY.

2.0 PRODUCTS

2.01 General: A control panel shall be provided as noted above.

- A. Control panel shall be designed, constructed and tested in accordance with applicable NEMA, UL and ISA standards. The latest edition of the NEC, as well as, all state and local codes and regulations, shall govern the materials, fabrication and installation of the control panel.
- B. All components used within the control panel shall bear a UL label.

2.02 Operating Voltage: The control logic shall operate at the power characteristics specified on the drawings.

2.03 Enclosure: The control panel enclosure shall be NEMA 3 and constructed of 14 gauge minimum 304 stainless steel with a deadfront aluminum inner door.

- A. A stainless steel, heavy-duty, padlocking-type, door handle with a three-point latch shall be provided.

- B. The outer door shall be hinged continuously along its length.
 - C. A white 12 gauge steel backplate shall be provided for internally mounted components.
 - D. A door stop kit shall be provided.
 - E. The enclosure shall be mounted on a concrete pedestal as shown on the drawings.
 - F. All exterior mounted hardware, fasteners and accessories shall be constructed of stainless steel or copper-free aluminum.
 - G. The following devices, as applicable, shall be mounted inner door (SP2):
 - 1. Pump run lights.
 - 2. Seal/temperature alarm lights.
 - 3. HOA switches.
 - 4. Elapsed time meters.
 - 5. Alarm lights shown on the drawings.
 - 6. Alarm reset pilot light push buttons.
- 2.04 Control circuits, including motor contactor coils, shall operate at 120 volts AC.
- 2.05 Circuit Breakers: The control power circuit breaker(s) shall be a thermal-magnetic molded case circuit breaker of the ampere rating shown in the drawings with a minimum of 25,000 AIC unless otherwise specified. The control power circuit breakers shall be Square D KAL and FAL series or equal, as designated in the drawings.
- 2.06 Protective Relaying:
- A. A phase voltage monitor relay shall be provided and connected to the line side of the panel main circuit breaker in the control panel.
 - B. An undervoltage/phase failure condition shall de-energize the motor(s) controlled by the panel and prevent the motor(s) from running again until the phase failure/undervoltage condition has been corrected.
 - C. The relay shall be preset to operate when voltage on any phase falls to <380 VAC.
 - D. Provide a Motor Controls Corp. PM-440-118A or equal.
- 2.07 Motor Circuit Breaker: Each motor controlled by the panel shall be equipped with a thermal magnetic circuit breaker. Square D (FA, KA, or LA) or equal. The circuit breaker shall be provided with provisions for locking it in the "off" position.
- 2.08 Magnetic Starters:

- A. Each motor controlled by the panel shall be controlled with a NEMA sized, full voltage non-reversing (FVNR), AC magnetic starter complete with Class 20 solid state type overload relays.
- B. The motor starters shall be across the line starters with individual overload protection on each power phase.
- C. Contactor coils shall be 120 VAC unless otherwise noted.
- D. Starters shall be Square D Class 8536 or equal.

2.09 Motor Run Lights:

- A. Each motor shall have a pilot light to indicate the motor running status. When the motor is on, the pilot light shall be on.
- B. The pilot lights shall operate from the 120 VAC control voltage.
- C. The pilot lights shall be 30.5 mm, heavy duty, oiltight, NEMA 4X (watertight), push-to-test, light emitting diode (LED) type with yellow colored lenses. Square D SKT38LYY9 or equal.

2.10 Alarm Lights:

- A. Alarm statuses shall be indicated through pilot lights as noted on the drawings and within these specifications.
- B. The pilot lights shall operate from the 120 VAC control voltage.
- C. The pilot lights shall be 30.5 mm, heavy duty, oiltight, NEMA 4X (watertight), push-to-test, light emitting diode (LED) type with red colored lenses. Square D SKT38LRR9 or equal.

2.11 Illuminated Push Button:

- A. Alarm Reset push buttons shall be illuminated.
- B. Push buttons shall have 1 - N.O. & 1 - N.C. contacts with AC - NEMA A600 ratings, 30.5 mm and NEMA 4X, momentary, fully guarded, black operators with light emitting diode (LED) type pilot light with lenses. Square D catalog number SK2L38LRRH13 or equal.

2.12 Hand-Off-Automatic (HOA) Selector Switch:

- A. A HOA Selector Switch to control each pump shall be mounted on the panel inner door as designated in the drawings.
- B. HOA Switches shall have contacts with AC - NEMA A600 ratings with a 30.5 mm, NEMA 4X, maintained 3-position selector operators and standard black knob. Square D catalog number SKS43BH13 or equal.

- 2.13 Elapse Time Meter: Elapse time meters shall be 120 VAC non-reset type to indicate pump total running time in hours and tenths of hours to 99999.9 hours. Cramer 635 or equal.
- 2.14 Duplex Service Receptacle: A duplex 15 amps, 125 volt AC, specification grade ground fault receptacle ivory in color shall be provided. Hubbell catalog number GF 5262 or equal.
- 2.15 Control Elements:
- A. The control system components shall include, but not be limited to, a 120 volt AC transformer, plug-in relays with plug-in screw terminal sockets and conductivity alarm relays.
 - B. All control wiring shall be color coded (minimum 18 colors) AWG 12, rated for 600 volts, stranded tinned copper, 90°C rated PVC insulated and installed in plastic wiring duct with cover.
 - C. Each wire shall be identified at each end with wire markers.
- 2.16 Terminals:
- A. Terminals shall be provided and labeled for all field wiring connections by others, including float switches, control contacts, 120 VAC power and 480 VAC power.
 - B. Control wiring terminals shall be Square D type GC6 or equal, complete with end barriers, end clamps and mounting channel.
 - C. Grounding lugs shall be provided for grounding conductors.
 - D. Field connected power conductors will be terminated directly on the circuit breakers and motor starters as shown on the drawings.
- 2.17 Nameplates:
- A. Pilot lights, push buttons, switches, circuit breakers, components and devices shall be labeled with nameplates as noted on the drawings. Internal panel control components shall be labeled, identifying the component tag or function as applicable.
 - B. All nameplates shall be three-ply phenolic, black-white-black, engraved through the first black layer. Lettering shall be 0.5 cm (3/16") minimum. Edges of all nameplates shall be beveled at 45 degrees.
 - C. Nameplates shall be fastened to the equipment by means of two stainless steel screws or by means of epoxy cement.
 - D. A permanently affixed 11" x 17" (minimum) 20 gauge anodized aluminum plate, photographically etched shall be attached to the inside of the enclosure door. This etched plate shall detail the panel wiring schematic.
- 2.18 Pump Controller / SCADA / Radio (PCSR):

- A. The Pump Controller / SCADA / Radio subassembly comprises a programmable logic controller (PLC) based system engineered to provide pump control, supervisory control and data acquisition (SCADA), and radio telemetry in one assembled package. The components shall be mounted on an aluminum sub-panel and be fully wired, tested, and ready for field connections via conveniently located interface terminals. The subassembly shall operate on a 120 volt, 60 Hertz, single-phase power supply and shall have integral transient voltage protection.
- B. The PCSR shall be a Motorola ACE 3600 package as distributed by DCR Engineering Services Inc. or ScadaOne, LLC. Both are currently under contract to install radio telemetry systems at all City of Tampa pumping stations. The Contractor shall coordinate his efforts to ensure system compatibility, performance, and security. The Contractor shall provide and install a complete control system package, as assembled, programmed and configured by DCR or ScadaOne.
- C. The following is a partial list of PCSR features:
 - 1. Motorola ACE 3600 remote terminal unit (RTU) with surge / lightning protection for power line and antenna shall be provided.
 - 2. Digital input and output modules and analog input and output modules shall be provided as shown on the drawings.
 - 3. Motorola MTS conventional radio: 403-470, 450-512 MHz shall be provided.
 - 4. The pump controller shall operate independently of the SCADA / telemetry system in the event of communications loss.
 - 5. DC power circuits derived from the RTU and feeding external loads shall be individually fused as required. Fuses shall have indicator LED's to indicate fuse has blown.
 - 6. A back-up pump controller shall be provided to facilitate emergency overflow protection in the event of RTU failure.
 - 7. Interposing control relays shall be provided as required.
 - 8. Terminal blocks shall be arranged, and separated as follows: main power distribution block; 120 VAC power; 24 VDC power; RTU DC power bus.
 - 9. All wires shall be permanently identified using a computer generated labeling system. All terminal numbers and identifying nomenclature shall correspond to and be shown on the electrical diagrams and schematics.
 - 10. All external wiring shall terminate on terminal blocks.
 - 11. The RTU shall provide both digital and analog inputs for use in monitoring and control. Simultaneous monitoring of analog and digital level sensing devices shall be supported where the analog level sensing device shall be primary. The

RTU shall contain routines for detecting sensor failures and utilize the alternate level sensing device(s).

12. Battery back-up power shall be provided for the RTU so that monitoring is maintained during utility power failures. The batteries shall have the capacity of operating the RTU for a minimum of four hours. The power supply shall keep the batteries at float charge. The RTU shall contain a low battery cutout circuit, and the batteries shall not be damaged by deep discharges.
13. Local manual pump control is provided by Hand-Off-Auto (HOA) switches located in the pump control panel. In the absence of RTU power or in the case of RTU failure, the pump motor starters shall remain operational in the HAND position. In no case shall the RTU have the capability to operate or override the pumps in the HAND or OFF positions.
14. The capability to remotely override or disable individual pumps shall be provided (local switches must be in the AUTO position).
15. The RTU shall have the capability to test the back-up pump controller by creating a high level condition and verifying that the back-up controller functions properly. In the event of a controller failure, the RTU will send an alarm to the Central HMI.
16. Capability shall be provided to configure from one to three pumps.
17. Individual pump run status shall be reported to the Central HMI.
18. The following pump failures shall be reported to the Central HMI: fail to start; fail to stop; premature stop; motor controller fault; and stator overtemperature.
19. RTU configuration parameters shall be adjustable locally and remotely from the Central HMI.
20. A fail-safe input shall be provided indicating cabinet intrusion.
21. The RTU shall have the latest RTU SCADA application license compatible with the existing Central HMI configuration.

2.19 Wet Well Level Monitoring System:

- A. The wet well level monitoring system shall be of the ultrasonic type. It shall consist of a transducer element and a transmitter/electronics package.
- B. The transducer shall use a PZT ceramic element with a nominal operating frequency of 50 kHz. The transducer shall have a range of 1 to 32.8 ft. The transducer shall convert a 24-volt input from the electronics package to a 3,000-volt peak-to-peak echo pulse. The transducer shall be Factory Mutual (FM) approved for use in a Class I, Division 1, Group A, B, C or D location. The transducer shall be rated intrinsically safe for zone 0.

- C. The transmitter/electronics package shall operate from 115 VAC, 60 Hertz or 10 to 28 VDC power source. The unit shall automatically switch to the dc source when utility power is lost. The transmitter shall be compatible with a full line of transducers. The unit shall be simple to program with a hand-held programmer or laptop computer. Basic set-up and advanced echo analysis and diagnostics software shall be provided. A 4-20 mA output and two alarm relays shall be provided. A flashing LED shall indicate healthy status. The accuracy shall be 0.25% of measured range and the resolution 0.1% of measured range. The unit shall be housed in a NEMA 4X enclosure.
- D. The wet well monitoring system shall be tropicalized as manufactured by Pulsar, Inc., or equal (Transducer - DB10-30-0-000-0-0; Transmitter - Blackbox 130-110-300-00P-KP-TROP).

2.20 Surge Protective Device (SPD):

- A. The SPD shall be able to suppress lightning induced voltage surges three times greater than the industry standards. The rated line voltage for SPD shall be 277/480 VAC, 3-phase, 4-wire wye. The maximum single impulse current shall be 80kA per phase.
- B. The SPD shall have line to neutral protection on all phases, and also neutral to ground protection.
- C. The SPD shall have a 5-year warranty. Under that warranty, the SPD shall be replaced if it is destroyed by lightning or other impulses.
- D. The SPD shall have an LED failure indicator on all three phases.
- E. The clamp voltages for the SPD shall be the following:
 - Line to neutral - 700 volts
 - Line to ground - 700 volts
 - Neutral to ground - 700 volts
 - Line to line - 1200 volts
- F. The Surge Protective Device shall be Advanced Protection Technologies model TE04XDS104X or equal.

2.21 Seal Leak Detector:

- A. The seal leak detector shall be compatible with the submersible pump supplied and be Underwriters Laboratories (U.L.) listed for use in pumping applications. The detector shall have the following features:
 - 1. The unit shall employ low voltage, low current, conductivity probe type liquid level detection.
 - 2. 120 VAC, 60 Hertz, operating voltage.

3. The alarm output shall be an SPDT 10 amp, 250 VAC relay contact with a minimum 2000 VAC isolation to probe.
 4. Probe supply characteristics - sensitivity, 4.7K to 100K OHM, adjustable; voltage, 24 VAC, 60 Hertz; current, 2 mA maximum.
 5. Eight pin octal-type plug (provide matching screw terminal sockets).
 6. The unit shall be housed in a high-impact plastic dust cover.
- B. The seal leak detector shall be Syrelec model PNRU110 or equal.

3.0 PANEL CONTROL OPERATIONAL REQUIREMENTS

3.01 Pump Control Panel:

- A. General: The control panel shall control the operation of two (2) stormwater pumps. Liquid levels within the Wet Well will determine the running statuses of the pumps.
- B. Operation:
1. The two (2) pumps shall operate in a lead/backup configuration.
 2. The backup pump shall operate if the lead pump fails to start or shuts down prematurely.
 3. The lead pump and the backup pump shall be alternated automatically on a periodic basis to equalize the run time of each pump. When alternated, the lead pump will assume the backup pump status and the backup pump will then become the lead pump.
 4. Liquid Level Controls:
 - a. Liquid level set points shall be inferred by the Pump Controller / SCADA / Radio (PCSR) from the Wet Well Level Monitoring System.
 - b. The float switch (FL1) shall provide control actions independent of the PCSR.
 - c. The "all pumps off" set point shall ensure all pumps are off.
 - d. The "lead pump on" set point shall turn the first pump on.
 - e. The "pump on" set point elevations are at NAVD datum. The "lead pump on" set points shall be as follows:

Dry Season (October 1 to
April 30):

33.3' NAVD pump on
32.8' NAVD pump off

Wet Season (May 1 to
September 30):

31.8' NAVD pump on
30.6' NAVD pump off

- f. In the event the lead pump fails to start or shuts down prematurely, the second pump shall turn on.
- g. A contact closed signal from Float Switch (FL1) shall turn pump 1 on through the backup pump controller PC-1.

5. Pump Control:

- a. Provide a normally open contact from the PSCR to control the "on/off" operation of each of the two (2) pumps.
- b. Each of the normally open contacts shall be field connected to an interposing control relay, associated with each pump motor starter.
- c. A closed contact will allow the pump motor to operate. Opening this same contact will turn the pump motor off.
- d. The pump control contacts shall be wired to terminals for field connections.

4.0 EXECUTION

4.01 Installation:

- A. All materials and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer.
- B. Additional items of construction necessary for the complete installation of the system shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these Specifications.

4.02 Inspection and Testing:

- A. Personnel: The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustments necessary to place the system in trouble-free operation, and instruct the operating personnel in the proper care and operation of the equipment prior to the final acceptance of the control panel and its associated installation.
- B. Field Test: When the pumping facility is complete and ready for operation, then the control panel shall be inspected and tested for compliance with the Contract Documents. Test of the equipment shall be made by the CONTRACTOR in the presence of the CITY's Engineer, the Electrical Subcontractor, the equipment manufacturer's representative, and the CITY's representative. The equipment tests shall include, but not be limited to, the following:

Contract 14-C-00006; Lake Eckles Pump Station and Force Main Replacement

1. Controls: Controls shall be tested to determine satisfactory performance for starting and stopping at the proper liquid levels, pump sequence and alarm actuation.
2. Electrical: CONTRACTOR shall record readings of voltage and amperage on all electrical components at start and steady state operating conditions. Such readings shall be recorded on a form provided by the manufacturer and the results shall meet the manufacturer's prescribed limits. If a tested item fails to meet its requirements, then it shall be replaced. Results of the tests, including the serial number of the accessories tested, shall be given to the Engineer.
3. Inspection: A thorough inspection of all mechanical and electrical equipment and controls, fittings, brackets, mountings, seals, conduit, painting, components and features shall be made while the station is being tested to determine performance and compliance with design requirements and specifications.
4. Repairs, Adjustments and Replacements: The CONTRACTOR shall make any and all necessary repairs, adjustments and replacements until performance has been demonstrated to the satisfaction of the Engineer. The CONTRACTOR shall bear the cost of any repair, adjustment and replacement.

(End of Section 16940)

CONTRACT ITEMS

CONTRACT ITEM 0100-1 - CONTINGENCY

The work covered by this item consists of unforeseen items of work not included in other bid items but necessary for accomplishing the work and shall apply only to extra work or additional items over and above those specified or shown on the plans. The Contractor shall negotiate with the Owner regarding the construction cost of additional work. The cost of this additional work shall be agreed upon in writing and approved by the Owner or his authorized representative prior to starting this additional work.

CONTRACT ITEM 0101-1 – MOBILIZATION/DEMOBILIZATION

The Contractor shall furnish all equipment, labor, and materials necessary to mobilize his forces as necessary to perform all the work under this Contract.

Work under this section includes permits, bonding and insurance; construction stakeout and as-built documentation; transportation, and otherwise movement of all personnel, equipment, supplies, materials and incidentals to the project site; establishment of temporary offices, buildings, safety equipment and first aid supplies, sanitary and other facilities; providing a continuous color audio-video tape of existing conditions along the pipeline and at the pump station and intake structure locations; providing a surface water pollution protection plan; and all other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, to be constructed under this Contract as shown on the Plans and directed by the Engineer.

Payment for Mobilization will be made at the appropriate Contract Lump Sum Price.

Payment for mobilization will be made on an incremental basis. Payment of 75% of the applicable lump sum price shall be made for the preparatory work and operations in mobilizing for the beginning work on the project. Payment of the remaining 25% shall be made for finalization of this project, including demobilization, contract closeout documents, removal of field office, and final site clean-up. Retainage requirements as stated in the General Conditions shall apply to this pay item.

Payment for mobilization/demobilization will be made on an incremental basis in accordance with the following:

<u>Percent of Original Contract Amount Earned</u>	<u>Allowable Percent of the Lump Sum Price for the Item</u>
5	25
10	50
25	75
100	100

CONTRACT ITEM 0102-1 - MAINTENANCE OF TRAFFIC

The Contractor shall furnish all materials, equipment, and labor to establish and maintain all traffic maintenance devices and personnel as shown on the Plans, specified, and directed by the Engineer.

The work includes installation of all signs, barricades, lights and flagmen, additional earth excavation, selected fill, temporary wearing surfaces, temporary bridges, detour facilities, access to residences and businesses and all appurtenant work complete in place as necessary to control traffic and provide for safety to the public, all in compliance with the Manual on Uniform Traffic Control Devices, "MUTCD", with subsequent revisions and additions, and to the satisfaction of the Engineer.

The Contractor will be required to have a licensed Professional Engineer sign and seal a M.O.T plan to be submitted to the City's Right-of-Way Department for permit.

Payment for Maintenance of Traffic will be made at the appropriate Contract Lump Sum Price.

Payment for Maintenance of Traffic will be made on an incremental basis in accordance with the following:

<u>Percent of Original Contract Amount Earned</u>	<u>Allowable Percent of the Lump Sum Price for the Item</u>
10	10
20	20
30	30
40	40
50	50
60	60
70	70
80	80
90	90
100	100

CONTRACT ITEM 0104-1 – EROSION CONTROL AND TREE PROTECTION

This bid item describes measurement and payment for construction of temporary and permanent erosion control features to protect the work areas and adjacent property.

The lump sum to be paid for under this item, furnished and installed where shown on the SWPPP plans or where directed by the Project Representative, shall include artificial coverings, mowing, sandbagging, slope drains, sediment basins, cleanouts, baled hay and straw, floating silt barrier, floating turbidity barrier, staked silt barrier, staked silt fence, and seeding. Contractor is responsible for obtaining a NPDES permit and subsequent documentation required under the permit and should include those costs under this Contract Item.

This item also includes tree protection barriers as shown on the plans. The lump sum price includes furnishing and installing material, routine maintenance, mowing, and removal of temporary erosion control and tree protection features upon completion of construction.

Payment for erosion control will be made on an incremental basis in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item
10	10
20	20
30	30
40	40
50	50
60	60
70	70
80	80
90	90
100	100

CONTRACT ITEM 0105-1 – TREE AND ROOT PRUNING

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to prune trees and tree roots within the limits of construction as shown in the Contract Drawings and properly dispose of material off site.

The work includes, but is not limited to, the following: removal of stumps and brush, pruning of trees and brush, prune the roots of trees and the removal of any undesirable material within the limits of construction as shown in the Contract Drawings. All pruning of trees and roots must be done under the direction of a Certified Arborist and in coordination with Planning and Development, Natural Resource Division.

Payment for the Tree and Root Pruning will be made at the appropriate Contract Lump Sum Price.

CONTRACT ITEM 0108-1 – DEWATERING AND BY-PASS PUMPING

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to dewater the work site or bypass the stormwater flow, if necessary, to facilitate work activities and to maintain rain event flow in the stormwater system within the limits of construction as shown in the Contract Drawings.

The work includes, but is not limited to, the following: pumps, piping, hoses, generators, erosion BMP, fuel, temporary diversion dams within the limits of construction as required in the Contract Drawings. This work also includes the cost to pump down the wetwell and obtain information on the sluice gate and record the condition of the sluice gate for future reference.

Payment for the Dewatering will be made at the appropriate Contract Lump Sum Price.

CONTRACT ITEM 0113-1 – IRRIGATION REPAIRS

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to repair and replace all irrigation systems damaged as a result of construction activities within the work site as depicted on the Contract Drawings.

The work includes, but is not limited to, the following: repair, installation, and maintenance of the existing irrigation system including pipes, valves, tubing, bubblers, sprinklers, controller and tie-in to potable water supply within the work area as depicted on the Contract Drawings.

Payment for the irrigation repairs will be made at the appropriate Contract Lump Sum Price

CONTRACT ITEM 0120-3 - GRADING

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to establish the elevations and grades in the area adjacent to the pump station in accordance with the grading plan in the Contract Drawings.

No payment will be made for importing fill material for grading purposes. Any material needed to establish the grades, should be from existing mounded fill on site. Payment for the Grading will be made at the appropriate Contract Lump Sum Price.

CONTRACT ITEM 0127-10 – DEMOLITION

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to demolish, dismantle, remove, and properly dispose of all existing structures and equipment as on the Contract Drawings.

The demolition work includes, but is not limited to, the following: existing masonry pump building, earthen and steel roof, generator, control panels and wiring, electric and lighting system, vertical turbine pump and piping, steps in wetwell, above ground fuel storage tank and associated piping, and concrete top slab. Existing wetwell walls to be sawcut to elevation 34.5 NAVD and removed along with the entire concrete top slab. Existing sluice gate valve and operating stem in wetwell to be removed and replaced with like valve and stem, except the existing operator pedestal is to be reused in new station. All soil mounded around the existing pump building to be regarded to proposed elevations and excess fill removed from the site. All diesel fuel and sludge in fuel tank to be properly disposed in accordance with local, state and Federal guidelines. Wetwell to be pumped out, cleaned if required, and sludge removed and properly disposed.

Payment for the Demolition will be made at the appropriate Contract Lump Sum Price.

CONTRACT ITEM 0285-7 - PERMANENT PAVEMENT BASE

The Contractor shall furnish all materials, equipment and labor to replace and maintain all permanent pavement base removed or damaged by installation of Stormwater forcemain and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

Permanent pavement base replacement shall conform to the requirements of the Workmanship and Materials section headed "Restoration of Street Pavements."

The quantity of Permanent Pavement Base, in cubic yards, to be measured for payment will be the actual compacted volume of pavement base material within payment limits for surface restoration shown on the Plans, or specified and ordered by the Engineer.

Payment for permanent pavement base replacement along pipelines shall include removal and replacement of permanent pavement base incidental to construction of manholes and structures. All permanent pavement base removed or damaged and requiring replacement outside payment limits will not be measured for payment and shall be replaced by the Contractor at his own expense.

Where the existing pavement is nonpermanent type consisting of shell, gravel, limerock, crushed stone, or other similar material, or is specified to be temporary, no payment will be allowed for replacement of pavement base. Replacement of material for such nonpermanent or temporary pavement will be included in the various classified unit price Contract Items for pipelines and no separate payment will be made therefore.

Payment for Permanent Pavement Base Replacement will be made at the Contract Item Unit Price per cubic yard of pavement base replaced.

CONTRACT ITEM 0327-1 – MILLING 1 INCH ASPHALT

The Contractor shall furnish all labor, equipment, and materials to mill existing westbound lane of Country Club Dr. and Overpar Dr. and southbound lane of Rome Ave. from centerline to edge of pavement between Station 10+50 and Station 34+50 and appurtenant work as shown on the Plans, or as specified and directed by the Engineer.

Milling shall conform to the requirements of the Workmanship and Materials Section 327 – Milling of Existing Asphalt Pavement.

The quantity of Milling to be measured for payment will be the actual area and thickness of pavement surface milled in the work area within payment limits for surface restoration shown on the Plans, or as specified and ordered by the Engineer.

Payment for milling of pavement surface shall include removal millings from the site. Permanent pavement surface removed or damaged and requiring replacement outside payment limits will not be measured for payment and shall be replaced by the Contractor at his own expense.

Replacement of permanent pavement surface will be included in Item 0334-1 Permanent Pavement Surface Replacement.

Payment of Permanent Pavement Surface Replacement will be made at the Contract Item Unit Price per square yard per inch of asphalt surfaced milled.

CONTRACT ITEM 0334 - PERMANENT PAVEMENT SERIES

0334-1 – PERMANENT PAVEMENT SURFACE REPLACEMENT - 1" S-3

0334-4 – PERMANENT PAVEMENT REPLACEMENT – 1.5" S-1

The Contractor shall furnish all labor, equipment, and materials to replace and maintain all permanent pavement surface removed or damaged by pipeline construction and appurtenant work as shown on the Plans, or as specified and directed by the Engineer.

Permanent pavement surface replacement shall conform to the requirements of the Workmanship and Materials Section 16 – Restoration of Street Pavements.

The quantity of Permanent Pavement to be measured for payment will be the actual area of permanent pavement surface placed in the work within payment limits for surface restoration shown on the Plans, or as specified and ordered by the Engineer.

Payment for permanent pavement replacement along pipelines shall include removal and replacement of permanent pavement incidental to construction of manholes, inlets, and structures and portions of the roadway shown to be milled and resurfaced. All permanent pavement surface removed or damaged and requiring replacement outside payment limits will not be measured for payment and shall be replaced by the Contractor at his own expense.

Where the existing pavement surface is nonpermanent type consisting of shell, gravel, limerock, crushed stone, or other similar materials, or is specified to be a special temporary pavement surface, no payment will be allowed for replacement of permanent pavement surface. Replacement of surface for such nonpermanent or special temporary pavement will be included in the various classified unit price Contract Items for pipelines, and no separate payment will be made therefore.

Payment of Permanent Pavement will be made at the Contract Item Unit Price per ton of asphalt material installed.

CONTRACT ITEM 0350-20 - CONCRETE DRIVEWAY REPLACEMENT

The Contractor shall furnish all labor, equipment and materials to construct the concrete driveway and appurtenant work as shown on the Contract Plans, specified, and directed by the Engineer.

The concrete driveway shall conform to the requirements of the FDOT Specification 346, except Section 346.6.1.

The work includes all excavation, formwork, shoring, bracing, filling, shaping, grading, steel reinforcement, and all appurtenant work complete in place.

The quantity of Concrete Driveway Replacement to be measured for payment will be the number of square yards of driveway replaced as shown on the Contract Plans, or as specified and directed by the Engineer.

Payment for Concrete Driveway Replacement will be made at the Contract Item Unit Price per square yard of the concrete driveway placed.

CONTRACT ITEM 0400 – REINFORCED CONCRETE CONSTRUCTION SERIES

0400-10 – WETWELL CONSTRUCTION

0400-15 -- VALVE VAULT CONSTRUCTION

0400-20 – WETWELL AND VALVE VAULT TOP SLAB

0400-25 – METER VAULT AND TOP SLAB

The Contractor shall furnish all labor, equipment and materials to construct and maintain the reinforced concrete construction and appurtenant work as shown on the Contract Plans, specified, and directed by the Engineer.

The Wetwell Construction will include the extension of wetwell walls, coring of walls for new piping, bulkheading of penetration of old pipe, construction of baffle wall and drain pipes, and pouring and contouring of new bottom of wetwell. Valve Vault Construction will include construction of all vault walls and bottom, including doweling into existing wetwell walls and grouting the connection. Wetwell and Valve Vault Top Slab will include construction of a reinforced concrete top slab extending over both the structures and including accommodations for the access hatches and vent pipe, where applicable. Meter Vault may be constructed using a standard City of Tampa Type "E" inlet and Meter Vault Top Slab will be of reinforced concrete construction, including accommodation of access hatch.

The work includes all excavation, formwork, shoring, bracing, filling, shaping, steel reinforcement, pipe penetration sealing system, grouting and all appurtenant work complete in place. All concrete shall conform to the FDOT Specifications 346, except Section 346.6.1.

Payment for Reinforced Concrete Construction will be made at the Contract Lump Sum Price for each item in the series.

CONTRACT ITEM 0405-1– ALUMINUM ACCESS HATCHES

The Contractor shall furnish all labor, equipment and materials to construct and install all Aluminum Access Hatches and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

The work includes all assembly, casting into concrete top slabs, hardware, access levers, drain piping and coring wetwell for drain, and all appurtenant work complete in place.

The following is a list of access hatches rated for occasional AASHTO H-20 wheel loads depicted on the plans:

- 48" x 96" double w/o frame trough
- 36" x 36" single w/o frame trough
- 48" x 72 " double w/ frame trough
- 24" x 36" single w/o frame trough and watertight

Payment for Aluminum Access Hatches will be made at the Contract Item Lump Sum Price.

CONTRACT ITEM 0410 – FORCEMAIN PIPING AND FITTINGS SERIES

- 0410-10 – 10 INCH PVC C900 FORCEMAIN
- 0410-15 – 10" DUCTILE IRON FORCEMAIN
- 0410-20 – 10" DUCTILE IRON FITTINGS

The Contractor shall furnish all materials and equipment, construct, test, and maintain complete all forcemain pipes and fittings as shown on the Contract Plans, or as specified and directed by the Engineer.

All pipes, bends and fittings shall be manufactured and installed in accordance with the requirements of the respective Workmanship and Materials sections.

The work includes all excavation, short tunnels, backfill, sheeting, shoring, bracing, dewatering, pipe bedding, pipe fittings, pipe work, making all pipe connections, anchors, sealants, restraining, installation and removal of plugs and bulkheads, testing, protection, repair and replacement of utilities and house services, protection of existing structures, making joints between pipes and manholes or structures and all other work incidental to the installation of all pipe forcemains complete in place.

The quantity of forcemain pipe, in linear feet, to be measured for payment shall be the actual length of new pipelines placed in the work, as shown, specified and directed beginning at the emergency pump connection at the pump station and continuing to the manhole at Overpar Dr. Pipelines will be measured horizontally along the centerline of the pipe. The quantity of pipe fittings shall be the actual number of fittings, regardless of the type, placed in the work, specified and directed. Any required restraining shall be included in the cost of the pipe per linear foot.

Payment for Forcemain Piping and Fittings will be made at the appropriate Contract Item Unit Price per linear foot of pipe or per each for number of fittings installed.

CONTRACT ITEM 0415-1 – PLUG EXISTING FORCEMAIN AND BULKHEAD INLET

The Contractor shall furnish all materials, equipment, and labor to plug the existing 8 inch forcemain at a point east of the inlet located east of the intersection of Overpar Dr. and Oakleaf Ave. and bulkhead hole in said inlet as shown on the Contract Plans.

The work includes all excavation, short tunnels, backfill, sheeting, shoring, bracing, dewatering, pipe bedding, pipe fittings, pipe work, making all pipe connections, grouting, installation of plugs

and bulkheads, testing, protection, protection of existing structures, and all other work incidental to the plugging of existing forcemain complete in place.

Payment for plugging of existing forcemain and bulkheading of inlet will be made at the appropriate Contract Item Lump Sum Price.

CONTRACT ITEM 0416-3 – WASTEWATER SERVICE PLUG AND REMOVAL

The Contractor shall furnish all materials and equipment, construct, test, and maintain complete all wastewater service laterals uncovered during construction as shown on the Contract Plans.

All wastewater service piping, including fittings, shall be manufactured and installed in accordance with the requirements of the respective Workmanship and Materials sections.

The work includes all removal of existing wastewater service pipe within the limits of construction, excavation, short tunnels, backfill, sheeting, shoring, bracing, dewatering, pipe bedding, pipe fittings, pipe work, making all pipe connections, grouting, sealants, jackets and coupling bands, installation and removal of plugs and bulkheads, testing, protection, protection of existing structures, and all other work incidental to the plugging and removal of wastewater service laterals complete in place.

Payment for plugging and removal of wastewater service laterals will be made at the appropriate Contract Item Unit Price per each service plugged and removed.

CONTRACT ITEM 0420-2 – DUCTILE IRON PUMP STATION PIPING

The Contractor shall furnish all materials and equipment, construct, test, and maintain complete all ductile iron pump station piping as shown on the Contract Plans, or as specified and directed by the Engineer.

All flanged ductile iron pipe, including fittings, shall be manufactured and installed in accordance with the requirements of the respective Workmanship and Materials sections.

The work includes all excavation, short tunnels, backfill, sheeting, shoring, bracing, dewatering, pipe bedding, pipe fittings, pressure gauge and tapping, pipe work, making all pipe connections, wall sleeves, vent piping and screen, anchors, gaskets, pipe supports, restraining, installation and removal of plugs and bulkheads, testing, protection, protection of existing structures, and all other work incidental to the installation of all pump station piping complete in place.

Payment for Ductile Iron Pump Station Piping will be made at the appropriate Contract Item Lump Sum Price.

CONTRACT ITEM 0432 – PUMP STATION VALVES

CONTRACT ITEM 0432-10 – 6" & 8" PLUG VALVES

CONTRACT ITEM 0432-15 – 8" CHECK VALVES

CONTRACT ITEM 0432-20 – SLUICE GATE VALVE

The Contractor shall furnish and install all labor, materials, services, equipment and appurtenances to install the Plug Valves, Check Valves and Sluice Gate Valve as shown in the Contract Plans.

The work includes all valves, hardware, gaskets, painting, and all appurtenant work complete in place in compliance with Contract specifications and plans.

It is presumed the existing sluice gate valve is a Waterman Model C-20 and the valve can be removed from the wall thimble. This Contract Item should include the replacement of the sluice gate, frame, gaskets, spacers, stainless steel stem, and all required stainless steel hardware and labor to remove old sluice gate, and assemble and connect the new sluice gate to the existing wall thimble and operator pedestal.

Payment for Pump Station Valves will be made at the Contract Item Lump Sum Price for each item.

CONTRACT ITEM 0435-2 – LAKE INTAKE STRUCTURE GRATE

The Contractor shall furnish all labor, equipment, and materials to expose, repair or replace the existing Lake Intake Structure Grate as included on the Contract Plans, or as specified and directed by the Engineer.

It is presumed that the intake structure grate is in poor condition and will need to be replaced. The original structure design is shown on the Contract Plans and the new grate, which is similar to an inlet grate, should be fabricated with aluminum or fiberglass. The cost to expose the structure should be included in this Contract Item.

Payment of Lake Intake Structure Grate will be made at the Contract Item Lump Sum Price.

CONTRACT ITEM 0438-10 – FLYGT SUBMERSIBLE PUMPS

The Contractor shall furnish all labor, equipment, and materials to install and maintain all submersible pumps and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

The work includes all pumps, lifting chains, level floats, seals, sensors, motor wires, wire hangers, hardware, pump bases, spare parts, manuals, testing, and other appurtenant work complete in place.

Payment of Flygt Submersible Pumps will be made at the Contract Item Lump Sum Price.

CONTRACT ITEM 0520-10 -- CONCRETE CURB TYPE "F"

The Contractor shall furnish all labor, equipment, and materials to install and maintain all permanent concrete curb, transitions, and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

Permanent concrete curb shall conform to the requirements of the FDOT Index 300.
All concrete shall conform to the FDOT Specifications 346, except Section 346.6.1.

The work includes all excavation, filling, shaping, formwork, grading, base material, concrete, and other appurtenant work complete in place.

The length of Concrete Curb to be measured for payment will be the actual length of curbing placed in the work within payment limits for surface restoration shown on the Contract Plans, or ordered by the Engineer.

All curb and gutter removed or damaged and requiring replacement outside payment limits will not be measured for payment and shall be replaced by the Contractor at his own expense. Payment of Concrete Curb will be made at the Contract Item Unit Price per linear foot of curb placed.

CONTRACT ITEM 570-1 – SOD

The Contractor shall furnish all labor, equipment, and materials to install and maintain all sod and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

All sod work under this series shall conform to Workmanship and Materials Section 17 Lawn Replacement.

The work includes all excavation, filling, shaping, grading, mulch, fertilizer, soil amendments, water, mowing, and other appurtenant work complete in place.

The amount of sod to be measured for payment will be the actual area of sod placed within the work area as shown on the Contract Plans, or directed by the Engineer.

Payment of Sod will be made at the Contract Item Unit Price per square yard of sod installed.

CONTRACT ITEM 6940-10 – CONTROL PANELS

The Contractor shall furnish all labor, equipment, and materials to install and maintain all Control Panels and appurtenant work as shown on the Contract Plans, or as specified and directed by the Engineer.

The work includes all permitting; enclosures; instrumentation; electrical components, sensors, and relays required to operate the pump station; flowmeter and associated wiring and enclosure; wires; terminals; conduit; manuals; testing; and other appurtenant work complete in place.

Payment of Control Panels will be made at the Contract Item Lump Sum Price.

END OF SECTION

Sign-In Sheet ☐ Please Print

City of Tampa, Contract Administration Department

	Name	Organization	E-Mail OR Phone
1	Jody Gray	Tampa Contract Administration Dept.	jody.gray@tampagov.net
2	Bob Robinson	Carl Jenkins, Inc.	bobr@tampabay.fl.com
3	Helia Yazdian	Wharton-Smith, Inc.	813-288-0068 estimating@whartonsmith.com
4	JASON DE GAGLIA	GLASGOW EQUIPMENT SERVICE	jason@glasgowequipment.com 813-842-7236
5	ANWAR AKHLAQ	KIMMINS	aakhlag@kimmins.com
6	Lara Thigpen	TB Landmark	lthigpen@tblandmark.com
7	Timberly Weeks	RTO Const	btw@rtoconstruction.com
8	Jed Church	Godwin Pumps Xylem	jed.church@xylemna.com
9	Mike Keenan	Holland Pump	mikek@hollandpump.com
10	Manny Suncal	Rain for Rent	mjsuncal@RainforRent.com
11	Linda Moore	TLC Diversified, Inc	lmoore@tlcdiversified.com
12	MIKE DEKKER	KAMMINGA PRODUCTS	QUOTES@KANDRINCFL.COM
13	Ed Harris	Dallas 4 construction	Ed.Harris@D1CD.com
14	Tom Secord	Secord Contracting Corp	tsecord@verizon.net
15	Michael Miller	City of Tampa	michael.miller@tampagov.net
16	Jerry Combs	City of Tampa	Jerry.Combs@tampagov.net
17	Robb Baker	DURA Seal Paving	RBaker@DURASEALFLA.com
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			