

MORNINGSIDE PARK TENNIS CENTER AT 750 NE 55th TERRACE

PROJECT MANUAL & SPECIFICATIONS

PERMIT SET
SEPTEMBER 21, 2016

PROJECT No. B-40534
750 NE 55th TERRACE
MIAMI, FLORIDA 33137

CITY OF MAIMI
CAPITAL IMPROVEMENTS PROGRAM

Thomas P. Regalado

Keon Hardemon
Ken Russell
Wilfredo Gort
Frank Carollo
Francis Suarez

Daniel J. Alfonso



Mayor

Chairman
Vice-Chairman
Commissioner
Commissioner
Commissioner

City Manager

STATEMENT OF COMPLIANCE

To the best of my knowledge, these drawings and the project manual area complete and comply with the Florida Building Code – 2010.

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See Attached Report prepared by NV5, Inc.

END OF SECTION



Miami Office

GEOTECHNICAL ENGINEERING | FOUNDATION ENGINEERING | GEOTECHNICAL TESTING | SOIL BORINGS/MONITORING WELLS | CONSTRUCTION MATERIALS TESTING

January 11, 2016

Michael D. Kroll, RLA FASLA, President
Miller Legg
5747 North Andrews Way
Fort Lauderdale, FL 33309-2364

Re: **Tennis Court Reconstruction**
Morningside Park
750 NE 55th Terrace
Miami, FL 33139
NV5 Project Number-112615-15018.00

Dear Mr. Kroll:

NV5, Inc. has completed the geotechnical consulting services for the referenced project, as described in our Proposal # 15-0696 dated November 30, 2015. NV5 has not performed any optional, additional field exploration. Therefore, the recommendations we provide in this report are based on the data provided in the "Report of a Geotechnical Exploration" prepared by HR Engineering Services, Inc. (HRES) and dated November 18, 2015, as provided to us by the City of Miami Capital Improvements Program, the named client in that report. A copy of the HRES report is attached for convenient reference.

On December 11, 2015, Steven E. Black, P.E. of NV5 met at the site with Jose Caldeira and Jose Oliveros of the City of Miami, as well as Enrique Gomez of Miller Legg to perform a visual inspection of the existing tennis courts. We discussed existing conditions of the seven current courts and the grass area to the south and east which will become part of the footprint of the eight new tennis courts. Mr. Caldeira stated that park management has decided that the entire depth of the existing tennis court pavement shall be demolished and removed from the site. This eliminates the option of rehabilitation of the four northern courts. Further, NV5 understands that the new courts will have final surface elevations that are relatively close to that of the existing courts.

PROJECT INFORMATION

The project site is located in the northwestern corner of Morningside Park at 750 NE 55th Terrace, Miami, FL. A copy of the current site survey, which shows the locations of the current court complex, is attached to this report. The survey shows that the court surface elevations range from +4.37' to +6.0' (NGVD29), while the grass areas to the south and east range from +3.2' to +4.7' (NGVD29). All of the existing fencing and light poles are to be removed and replaced with new construction.

OFFICES NATIONWIDE

14486 COMMERCE WAY | MIAMI LAKES, FL 33016 | WWW.NV5.COM | OFFICE: 305.666.3563 | FBPE CA #29065

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A copy of the proposed site plan is attached to this report. As shown, the proposed 8-court configuration has a courtyard 46 feet wide separating the two sets of four courts. This courtyard is to be finished with concrete, pavers and grass and will be centered on the existing tennis kiosk building, which will remain at its current location.

The existing courts were reportedly constructed prior to 1994 and are now exhibiting cracks, which in some cases have rendered the courts unusable. The cracks appear to be a combination of settlement and reflection-cracks in the asphaltic concrete surface layer above the control joints in the underlying concrete slab. In some cases, there are small humps at the cracks, probably due to differences in the expansion and contraction characteristics between the asphalt surface layer and the underlying concrete slab on grade.

SUBSURFACE CONDITIONS

Based on the HRES report there are two sets of existing subsurface conditions which are summarized by the following boring descriptions.

Summary of Subsurface Conditions – Test Boring B-4

Average Range in Depth, feet	Soil/Rock Description
0 to 0.2	Asphalt (2.0")
0.2 to 0.6	Concrete (4.8")
0.6 to 3.0	Loose-brown fine SAND with traces of shells, SP
3.0 to 4.0	Very Soft gray sandy SILT, ML
4.0 to 5.0	Very Loose gray silty fine SAND, SM
5.0 to 7.0	Loose to Medium Dense brown fine SAND, SP
7.0 to 30.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Test Boring B-5

Average Range in Depth, feet	Soil/Rock Description
0 to 0.7	Dark brown organic silty fine SAND (topsoil), SM-OL
0.7 to 3.0	Loose to Very Loose brown fine SAND with traces of shells, SP
3.0 to 5.0	Very Soft to Stiff dark brown organic SILT, OL
5.0 to 7.0	Medium Dense brown fine SAND with traces of limestone lenses, SP
7.0 to 20.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Test Boring #4 represents the paved areas, while Test Boring #5 represents the unpaved grass areas to the south and east sides of the existing courts. The ground surface elevation at Test Boring #5 is about +4' (NGVD29), while at Test Boring #4 it is +4.9' (NGVD29). The groundwater elevation shown at the time of the boring operation was +2' (NGVD29). We would expect the groundwater elevation to vary due to tidal influence as well as seasonal rains. As described below, this high water level may be problematic during construction.

RECOMMENDATIONS

NV5 is providing the recommendations below based on the project information described in this report, the field test data in the HRES report, our evaluation of all this data and our past experience with pavement engineering in South Florida. Please advise NV5 of any changes in pertinent project information.

NV5 considers the site suitable from a geotechnical perspective for the proposed facility. In addition to the tennis courts a primary concern for foundation design and construction is support of the proposed light poles. NV5 has reviewed the light pole design prepared by MUSCO, a copy of which is attached for convenient review, and find the soil parameters provided by the design to be acceptable based on the soil data in the HRES report.

We understand that the new tennis courts will be constructed to approximately the same grade as the existing courts. It is important to note that any increase in the surface elevation above current levels may result in additional settlement as a result of compression of the underlying loose silt layer that was found by the HRES geotechnical exploration. See item #13 below for further discussion of the potential for future settlement.

To support the proposed tennis courts, NV5 recommends the following site preparation steps and pavement cross section.

1. The contractor should clear the site of all existing pavement (approximately six inches of asphalt and concrete), fence and light pole foundations, vegetation, trees/shrubs, topsoil, major root systems, buried utility conduits, drainage trenches, buried structures and rubble and other deleterious materials.
2. After the demolition and site clearing operations are complete the contractor should compact the exposed loose brown sand sub-base with a vibratory roller weighing not less than ten (10) tons. Due to the loose density of the sub-base, NV5 recommends a minimum of three (3) passes in each direction with this roller. The vibratory compactor will impart enough energy into the ground to cause damage to the tennis building kiosk, so the contractor should use the utmost care and not operate this equipment too close to the building. The equipment manufacturer should be able to provide the contractor with a safe working distance.
3. The compaction effort should be observed by an NV5 geotechnical technician to identify any weak or loose areas, which may need to be removed and replaced. If the vibration of the compactor results in "pumping" of the subgrade soil due to high pore pressure, the rate and magnitude of the compaction operation may need to be reduced while the pore pressure subsides. The contractor should

- expect this due to the high groundwater level at the site and the silty nature of the subsoil material.
4. The NV5 technician will perform field density tests on the top 12 inches of the compacted sub-base. He will compare the test results to the maximum density obtained by the laboratory test ASTM D1557. The compaction level should be at least 95%.
 5. The final grade elevations for court areas should be used to establish the depth of fill, if required, to reach the elevation at which the limerock base layer described below is to be placed. Granular fill used for this purpose should meet the material and placement specifications outlined below. All filling, compacting, grading, and leveling required shall be performed so that the finished court surface has a slope of 1% or 1.2" per ten feet (10') on a true plain from side-to-side or end-to-end.
 6. Granular fill should consist of well-graded sand and gravel with a maximum rock size of 3-inches and with less than 10% silt (material passing the number 200 sieve.) Fill should be placed in lifts of not more than 12-inch loose thickness. The moisture content of the fill should be within 2% of the optimum moisture content based on ASTM D-1557 Modified Proctor laboratory test to obtain the best compaction results.
 7. Granular fill should be compacted to 95% of maximum dry density determined with ASTM D-1557. The compaction level should be confirmed by performing at least one field density test per each 1,500 square feet of fill area and each lift of fill above the sub-base.
 8. On the surface of the compacted sub-base or leveling fill, the contractor should install a geogrid, such as Tensar TX130S or equivalent, in accordance with the manufacturer's specifications. The geogrid will distribute the superimposed loads more evenly and reduce the potential for localized pavement failure. Information on this product and its installation is attached for convenient review.
 9. Due to the type of subsoil conditions found at the site, NV5 recommends that the asphaltic concrete surface layers of the tennis courts should be supported by a limerock base layer having a minimum compacted thickness of six (6") inches. It should consist of crushed limestone having a Limerock Bearing Ratio (LBR) of 100. This layer may be placed directly on the geogrid described in #8. The base layer should be compacted to 95% of maximum dry density determined with ASTM D-1557.
 10. Above the limerock base layer, a leveling course of hot plant mix with a maximum aggregate size of three-quarters of an inch (3/4") should be placed in accordance with the specifications of the Asphalt Institute. This layer should be constructed to a compacted thickness of about one and one half inches (1-1/2").

11. The tennis courts should be finished with a surface course of hot plant mix having a maximum aggregate size of three-eighths of an inch (3/8") also placed in accordance with the specifications of the Asphalt Institute. This layer should be constructed to a compacted thickness of about one and one half inches (1-1/2") giving a total asphaltic concrete thickness of about three inches (3"). The surface of the asphalt should be coated with appropriate materials that will deflect rain water and still maintain adequate coefficient of friction. Specification of these materials is beyond the scope of this document.
12. The total asphaltic concrete and limerock base of about nine inches (9") will replace the current six inches (6") of combined concrete and asphaltic concrete pavement. The compaction of the loose brown sand sub-base material should provide adequate room in the elevation section for the additional three inches (3") of pavement without the need for significant fill placement.
13. As previously stated, future settlement of the new tennis courts is possible since the organic silt layer is being left in-place. There is also the possibility of differential settlement due to the current lower elevation of the grass areas to the south and east that are to be incorporated in the new tennis court footprint. Therefore, it may be advisable to preload these two areas with 2 feet of fill as early in the construction sequence as possible. The preload will force some settlement of the organic silt layer prior to placement of the final pavement. The magnitude of the settlement will be dependent on the amount of time that the preload is allowed to act on the organic silt layer. This preload will help reduce the potential differential settlement between the two conditions. The above recommendations should minimize damage due to potential future settlement, but cannot completely eliminate the settlement.

CLOSURE

This report has been prepared for the exclusive use of the Owner and other members of the design/construction team for the specific projects discussed in this report. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

The evaluation and recommendations submitted in this report are based in part upon the data collected from the HRES field exploration. The nature or extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to evaluate our recommendations as provided in this report. In the event changes are made in the nature, design or locations of the proposed project construction, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by NV5.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, sinkholes, chemically hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

We should be provided the opportunity to review final foundation specifications and review foundation design drawings, in order to ascertain whether our recommendations have been properly interpreted and implemented. If NV5 is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report, we can accept no responsibility for the interpretation of our recommendations made in this report or for foundation performance.

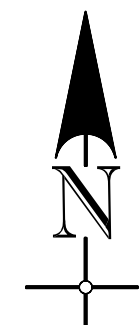
If you have questions about recommendations contained in this report, please contact the writer at 305-666-3563 x226 or 954-445-2040.

Respectfully submitted,
NV5, Inc.



Steven E. Black, P.E.
Vice President

Attachments: Triangle Surveying and Mapping, Inc. - Site Survey – May 4, 2015
Proposed Tennis Court Plan – File Date November 3, 2015
HRES report – November 18, 2015
MUSCO Light Pole Design Drawing – January 5, 2016
Tensar TriAx-130S Specification Sheet – File Date April 30, 2014
Tensar TriAx Installation Guide – File Date January 5, 2016



- ABBREVIATIONS:**
- (M) = Measured
 - (P) = Platted Dimension
 - BLDG = Building
 - C/B = Catch Basin
 - CBS = Concrete Block and Stucco
 - CONC = Concrete
 - FIP = Found 1/2" Iron Pipe
 - FND = Found
 - MH = Manhole
 - NGVD = National Geodetic Vertical Datum 1929
 - LB = Licensed Business
 - ORB, PG = Official Records Book and Page
 - O/H = Overhead
 - PB, PG = Plat Book and Page
 - PRM = Permanent Reference Monument
 - SIP = Set 1/2" Iron Pipe w/ cap LB 7388
 - STY = Story

- LEGEND:**
- Barbecue Grill
 - Bench
 - Picnic Table
 - Existing Elevation
 - Centerline
 - Monument line
 - Tree
 - Catch basin
 - Clean out
 - Concrete light pole
 - Concrete power pole
 - Electric box
 - Fire hydrant
 - Guard post
 - Guy anchor
 - Street light pole
 - Light pole
 - Electrical meter
 - Gas meter
 - Drainage manhole
 - Electrical manhole
 - Sanitary sewer manhole
 - Single sign support
 - Palm
 - Sewer valve
 - Water valve
 - Water meter
 - Wood power pole
 - Wire pull box

BOUNDARY SURVEY

**5215 NE 7th Avenue
 MIAMI, FL 33137**

This document is intended only for the specific purpose and client for which it was prepared. Not valid without the signature and original raised seal of a Florida licensed surveyor and mapper.

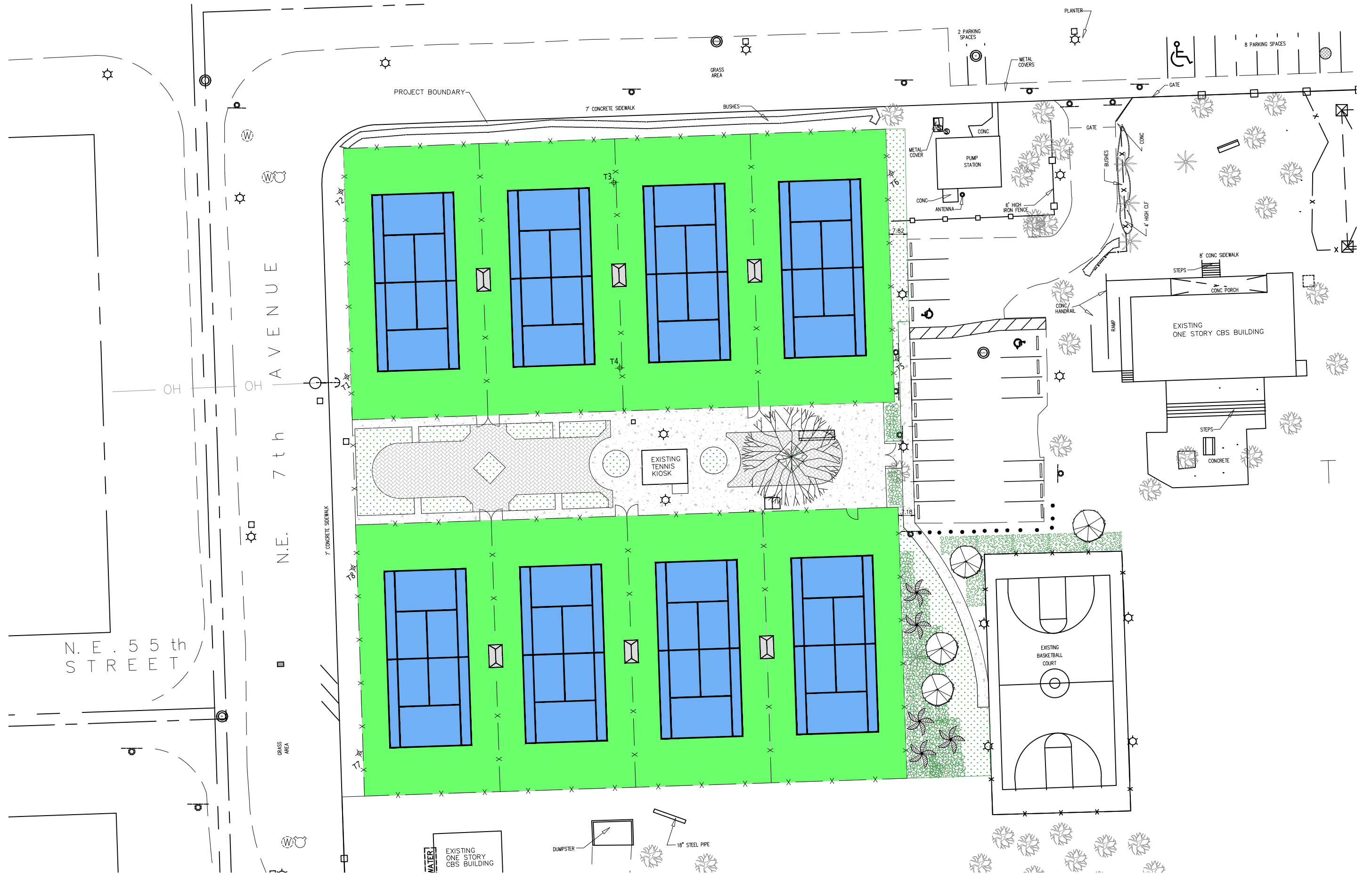
MATCH LINE - SEE PAGE 3 OF 10

SEE PAGE 4 OF 10 FOR DETAILS

Date: 05/04/2015	Project: 2750-02
Scale: 1"=50'	Checked by: ADR
F.B. N/A	Drawn by: JP
Sheet: 2 of 10	Sketch: 2294
Ref:	

Drawing name: P:\Proj\2750 City of Miami\2750-02 Morningstar Park\dwg\2750-02 Morningstar TPOB-PAGE 2-4-82.dwg PAGE 2 Oct 29 2015 3:13pm jpryans

2/10/29/2015	Revised to add elevations	JP
1/08/18/2015	Revised to add elevations	JP





November 18, 2015

Capital Improvements and Transportation Program - CITP
City of Miami
Miami Riverside Center
444 SW 2nd Avenue, 8th Floor
Miami, Florida 33130

Attention: Mr. Jose Otavio Caldeira
Project Manager

Subject: Report of a Geotechnical Exploration
Morningside Park Tennis Center at 750 NE 55th Terrace
City of Miami
Miami-Dade County, Florida
Project No. B-40534
HRES Project No. HR15-1091R

Dear Jose:

HR Engineering Services, Inc. (HRES) is pleased to provide this Report of a Geotechnical Exploration for the subject project. This report presents our understanding of the project, outlines our exploratory procedures, and documents the field test data and provides preliminary geotechnical recommendations for site preparation.

We have enjoyed assisting you on this project and look forward to serving as your geotechnical consultant on the remainder of this project and on future projects. If you have any questions concerning this report, please call our office at (305) 888-8880.

Sincerely,

HR ENGINEERING SERVICES, INC.

Nikhil D. Hegde, E.I.
Staff Geotechnical Engineer

Distribution: Addressee (3)
Mr. Javier Rodriguez, P.E. - R.J. Behar & Company, Inc. (1)
File (1)



7815 N.W. 72nd Avenue
Medley, FL 33166
Phone: (305) 888-8880
Fax: (305) 888-8770

APPENDIX A:

Site Location Map..... A-1
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Summary of Test Boring and Percolation Test Locations A-3
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Project Information

The project consists of the construction of six new tennis courts at Morningside Park Tennis Center, at 750 NE 55th Terrace, in Miami-Dade County, Florida.

The new tennis courts are planned to be constructed approximately within the locations of the existing tennis courts. Based on our site visit, we observed cracking of the existing tennis courts which may be caused by settlements of the court slabs due to the consolidation of underlying unsuitable soils (muck).

The city is planning to remove the existing concrete and asphaltic slabs and constructing a new limerock base and asphaltic layer over the limerock base.

Subsurface Conditions

Five (5) test borings and one (1) percolation test were performed at selected locations for the proposed new tennis courts. The test borings were each drilled to a depth of 20 feet, measured from the existing ground surface.

The test borings were performed by HRES. The test borings were conducted at the approximate locations shown on the Field Exploration Plan in Appendix A. The Report of Core Borings in Appendix A should be consulted for a detailed description of the subsurface conditions encountered at each boring location. When reviewing the Report of Core Borings, it should be understood that soil/rock conditions might vary even in short distances.

The following tables summarize the general conditions encountered by the test borings:

Summary of Subsurface Conditions – Test Boring B-1

Average Range in Depth, feet	Soil/Rock Description
0 to 0.2	Asphalt (2.0’)
0.2 to 0.5	Concrete (4.0’)
0.5 to 5.0	Loose brown silty fine SAND with traces of limerock (fill), SM
5.0 to 6.0	Very Soft dark brown organic SILT, OL
6.0 to 7.0	Medium Dense brown fine SAND with traces of limestone lenses, SP
7.0 to 20.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Test Boring B-2

Average Range in Depth, feet	Soil/Rock Description
0 to 0.2	Asphalt (2.0’)
0.2 to 0.5	Concrete (4.0’)
0.5 to 3.0	Loose brown silty fine SAND with traces of limerock (fill), SM
3.0 to 5.0	Soft gray sandy SILT, ML
5.0 to 6.0	Very Soft dark brown organic SILT, OL
6.0 to 7.0	Loose brown fine SAND with traces of limestone lenses, SP
7.0 to 20.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Test Boring B-3

Average Range in Depth, feet	Soil/Rock Description
0 to 0.2	Asphalt (2.0’)
0.2 to 0.5	Concrete (4.0’)
0.5 to 2.0	Medium Dense light brown silty fine SAND with some limerock (fill), GM
2.0 to 4.5	Loose to Very Loose light brown fine SAND with traces of shells, SP
4.5 to 5.0	Very Soft dark brown organic SILT, OL
5.0 to 7.0	Very Loose to Loose brown slightly organic fine SAND, SP
7.0 to 20.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Test Boring B-4

Average Range in Depth, feet	Soil/Rock Description
0 to 0.2	Asphalt (2.0’)
0.2 to 0.6	Concrete (4.8’)
0.6 to 3.0	Loose brown fine SAND with traces of shells, SP
3.0 to 4.0	Very Soft gray sandy SILT, ML
4.0 to 5.0	Very Loose gray silty fine SAND, SM
5.0 to 7.0	Loose to Medium Dense brown fine SAND, SP
7.0 to 30.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Test Boring B-5

Average Range in Depth, feet	Soil/Rock Description
0 to 0.7	Dark brown organic silty fine SAND (topsoil), SM-OL
0.7 to 3.0	Loose to Very Loose brown fine SAND with traces of shells, SP
3.0 to 5.0	Very Soft to Stiff dark brown organic SILT, OL
5.0 to 7.0	Medium Dense brown fine SAND with traces of limestone lenses, SP
7.0 to 20.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Summary of Subsurface Conditions – Percolation Test P-1

Average Range in Depth, feet	Soil/Rock Description
0 to 0.8	Dark brown organic silty fine SAND (topsoil), SM-OL
0.8 to 3.0	Dark gray silty fine SAND, SM
3.0 to 6.0	Dark gray sandy organic SILT, OL
6.0 to 11.0	Gray silty fine SAND with traces of limestone lenses, SP
11.0 to 15.0	Light brown porous sandy LIMESTONE and calcareous fine sand

Percolation Testing

One (1) South Florida Water Management District constant head percolation test was performed on October 8, 2015 at the location shown on the Field Exploration Plan in Appendix A. The test location was marked in the field by HRES personnel using tape measurements from existing landmarks. The percolation test was performed in general accordance with the procedures shown below:

- The percolation test was performed in a 6.0-inch diameter borehole, drilled to a depth of 15 feet below the existing ground surface.

To perform the 0 to 15 feet percolation test, a 3.2-inch outside diameter PVC slotted casing was placed in the hole and then water was pumped out as an attempt to clean the borehole before testing. Prior starting the test, water was pumped into the hole as an attempt to raise the water level in the borehole to the ground surface. Once the inflow stabilized with the outflow rate, the average pumping rate and the maximum level of the water obtained in the borehole (with this stabilized flow) was recorded.

- The hydraulic conductivity value was then calculated and reported in units of cubic feet per second, per square foot, per foot of head (cfs/ft²-ft of head). The calculated hydraulic conductivity value is presented as follows:

0 to 15 feet: 1.9E-04 cfs/ft²-ft of head

This conductivity value is an ultimate value. An appropriate factor of safety should be employed in any storm water or other subsurface drainage design computations. The percolation test results are presented in Appendix A.

Laboratory Testing

In order to aid in classifying and estimate engineering characteristics of the subsurface materials encountered, laboratory classification tests were performed on representative soil samples obtained from the test borings. The laboratory testing program included the following:

- 4 Fines content tests
- 6 Organic content tests

In addition, a total of 10 moisture content tests were performed on the samples. The soil laboratory test results were classified following the United Soil Classification System. The test results are presented in Appendix B.

Groundwater

The groundwater level was measured at the boreholes locations at the time of drilling. The groundwater was encountered at an approximate average elevation of 2.0 feet (NGVD29). A seasonal High Ground Water Table (SHGWT) of 3.0 feet, (NGVD29), is recommended for design (based on the USGS Average Yearly High Water Levels 1990-1999).

Fluctuation in the observed groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff and a storm surge. Since groundwater level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur.

Recommendations

Test Borings B-1 through B-5 and Percolation Test P-1 encountered the following unsuitable soils under the existing tennis courts:

Summary of Subsurface Conditions – Unsuitable Soils

Borehole No.	Average Range in Depth, feet	Soil/Rock Description
B-1	5.0 to 6.0	Very Soft dark brown organic SILT, ML
B-2	3.0 to 5.0	Soft gray sandy SILT, ML
	5.0 to 6.0	Very Soft dark brown organic SILT, OL
B-3	4.5 to 5.0	Very Soft dark brown organic SILT, OL
B-4	3.0 to 4.0	Very Soft gray sandy SILT, ML
B-5	3.0 to 5.0	Very Soft to Stiff dark brown organic SILT, OL
P-1	3.0 to 6.0	Dark gray sandy organic SILT, OL

This unsuitable materials are of natural origin (this area was reclaimed from Biscayne Bay long time ago). Fill materials were placed on top of the unsuitable soils and the Morningside Park was constructed, including the existing tennis courts. The test borings encountered on top, a layer of asphalt over 4 to 4.8 inches of a concrete slab. It is possible that the original tennis courts construction only included the concrete slab. The asphaltic layer was probably added later to help correct the cracking and settlement of the concrete slab. However, the cracking has now reflected in the asphaltic surface.

It is our opinion that the settlements of the tennis courts are attributed to the underlying unsuitable soils (muck). The organic content of the unsuitable materials ranged from 16 to 28 percent, the fines content, from 41 to 74 percent and the water content ranged from 65 to 182 percent. These test results are a clear indication that these underlying soils are very unsuitable.

Based on the above, we recommend the following site preparation for the new tennis courts to minimize cracking of the new tennis courts:

- Total removal of the unsuitable materials, to a minimum depth of 6 feet, measured from the existing ground surface. At some locations, the depth of removal may increase and can only be determined during excavation.
- The excavation footprint is equivalent to the total tennis court areas, extending a minimum of 6 feet beyond the tennis court footprints.

Since the muck removal will extend below the groundwater, the backfilling operation will involve the following:

- Fill material should consist of free drainage material (A-3) with a maximum passing # 200 sieve of 10 percent.
- The fill material should be extended in loose layers with a thickness not exceeding 8 inches. Use of a bulldozer is highly recommended to distribute the fill material evenly in the area. Placement of the select fill by a truck load and then pushing the material in thicknesses greater than 8 inches is not acceptable.
- After spreading each layer with the bulldozer, it is required to provide several overlapping passes (a minimum of 8 passes in each direction) with the bulldozer as an attempt to accommodate and densify the select fill. Field densities are not required in the fill placed under water.
- Repeat this backfilling operation until the select fill material is 8 inches above the groundwater elevation. Then, the entire footprint should be compacted with overlapping passes of a heavy weight vibratory drum roller having a total operating static weight (including fuel and water) of 10 tons and a drum diameter of at least 5 feet.

- Field densities should be taken if the fill top elevation is about 12 inches above the groundwater elevation.
- The vibration caused by the vibratory compactor should be monitored inside nearby structures/residences in order to determine its intensity and be able to adjust the compactor's vibration to minimize any possible damage to these existing structures.
- After completing the placement of the select free drainage material (A-3), we recommend to switch to limerock material (A-1-a/A-1-b) placed in layers not exceeding 12 inches in loose thickness. This material should comply with FDOT LBR 100. Each lift should be thoroughly compacted with the heavy compactor with high vibration indicated above. The vibration monitoring program should continue every time the vibrator is used.
- When densifying the free drainage material and limerock fill, densities equivalent to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) should be uniformly obtained to a depth of at least 12 inches below the compacted surface.

Regardless of the degree of compaction achieved, a minimum of eight complete coverages should be made with the roller in the area of the new tennis courts order to help increase the density and improve the uniformity of the underlying bearing soils. The roller coverages should be divided evenly into two perpendicular directions.

- A minimum of three field density to be taken per lift of fill, per tennis court.
- Due to the proximity of the ocean and the potential for a storm surge, it is recommended to provide a key around the tennis courts to minimize erosion.
- Construct the asphaltic layer.

Sample Storage

We shall retain the soil samples retrieved for this exploration program at our office for a period of 60 days from the date of this report. Following this period, the samples will be discarded.

APPENDIX A

SITE LOCATION MAP	A-1
FIELD EXPLORATION PLAN	A-2
SUMMARY OF TEST BORING AND PERCOLATION TEST LOCATIONS	A-3
REPORT OF CORE BORINGS	A-4 AND A-5
SUMMARY OF PERCOLATION TEST RESULTS	A-6
FIELD EXPLORATION TESTING PROCEDURES	A-7



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**MORNINGSIDE PARK TENNIS CENTER
AT 750 NE 55TH TERRACE
CITY OF MIAMI
MIAMI-DADE COUNTY, FLORIDA**

HRES
HR Engineering Services, Inc.

SITE LOCATION MAP

A-1

DRAWN BY: NH

DATE: 11/18/15

PROJECT No: HR15-1091R

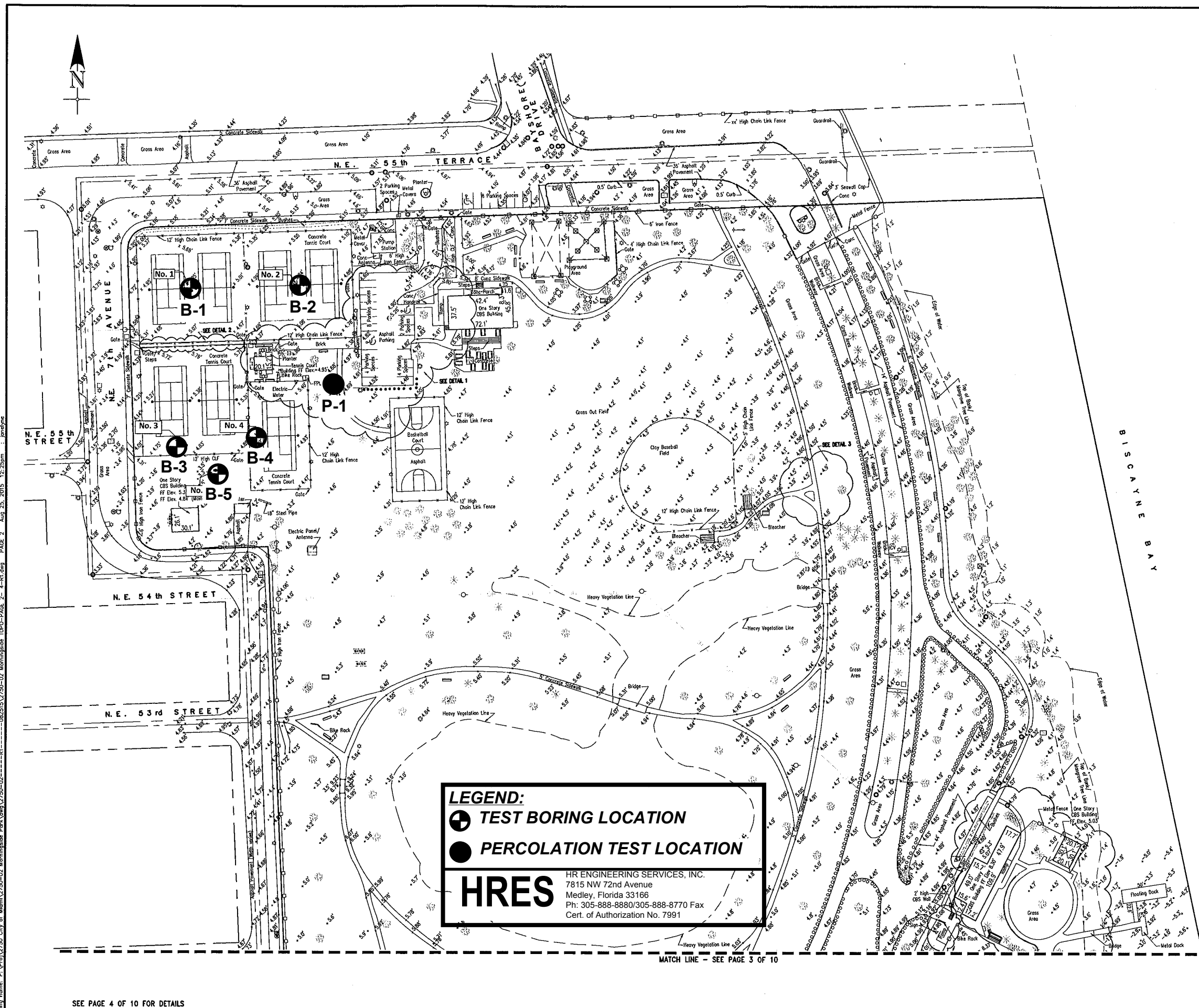
SCALE: NTS

BOUNDARY SURVEY

This document is intended only for the specific purpose and client for which it was prepared.

**5215 NE 7th AVENUE
 MIAMI, FL 33137**

Not valid without the signature and original raised seal of a Florida licensed surveyor and mapper.



- ABBREVIATIONS:**
- (M) = Measured
 - (P) = Platted Dimension
 - BLDG = Building
 - C/B = Catch Basin
 - CBS = Concrete Block and Stucco
 - CONC = Concrete
 - FIP = Found 1/2" Iron Pipe
 - FND = Found
 - MH = Manhole
 - NGVD = National Geodetic Vertical Datum 1929
 - LB = Licensed Business
 - ORB, PG = Official Records Book and Page
 - O/H = Overhead
 - PB, PG = Plat Book and Page
 - PRM = Permanent Reference Monument
 - SIP = Set 1/2" Iron Pipe w/ cap LB 7388
 - STY = Story

- LEGEND:**
- Barbeque Grill
 - Bench
 - Picnic Table
 - Existing Elevation
 - Centerline
 - Monument line
 - Tree
 - Catch basin
 - Clean out
 - Concrete light pole
 - Concrete power pole
 - Electric box
 - Fire hydrant
 - Guard post
 - Guy anchor
 - Street light pole
 - Light pole
 - Electrical meter
 - Gas meter
 - Drainage manhole
 - Electrical manhole
 - Sanitary sewer manhole
 - Single sign support
 - Palm
 - Sewer valve
 - Water valve
 - Water meter
 - Wood power pole
 - Wire pull box

LEGEND:

- ⊕ TEST BORING LOCATION
- PERCOLATION TEST LOCATION

HRES HR ENGINEERING SERVICES, INC.
 7815 NW 72nd Avenue
 Medley, Florida 33166
 Ph: 305-888-8880/305-888-8770 Fax
 Cert. of Authorization No. 7991

Date: 05/04/2015	Project: 2760-02
Scale: N/A	Checked by: ADR
F.B.: N/A	Drawn by: JP
Sheet: 2 of 10	Sketch: 2294
Ref:	

Drawing name: P:\Pro\2760-City of Miami\2760-02 Morningglade Park\2760-02-Morningglade Topo-PAGE 2-4-RT.dwg PAGE 2 Aug 25, 2015 12:28pm j. janszke
 1 05/19/2015 Revised to add elevations JP

SEE PAGE 4 OF 10 FOR DETAILS

MATCH LINE - SEE PAGE 3 OF 10

**SUMMARY OF TEST BORING AND PERCOLATION TEST LOCATIONS
MORNINGSIDE PARK TENNIS CENTER AT 750 NE 55TH TERRACE
CITY OF MIAMI
PROJECT NO. B-40534
MIAMI-DADE COUNTY, FLORIDA
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR15-1091R
NOVEMBER 18, 2015**

TEST BORING No.	STATION	OFFSET ft.	PLANE COORDINATES	
			NORTHING	EASTING
B-1	NA	NA	543530.884	925323.226
B-2	NA	NA	543538.952	925451.472
B-3	NA	NA	543356.316	925307.864
B-4	NA	NA	543356.869	925396.681
B-5	NA	NA	543338.409	925350.741
P-1	NA	NA	543415.556	925481.847

Notes:

Plane coordinates were obtained using a hand-held GPS and are approximate to a distance of 10 feet.

B-1

NORTHING: 543530.884
 EASTING: 925323.226
 STATION: N/A
 OFFSET: N/A
 ELEVATION: 5.2 FT
 DATE: 10/08/15

B-2

NORTHING: 543538.952
 EASTING: 925451.472
 STATION: N/A
 OFFSET: N/A
 ELEVATION: 5.2 FT
 DATE: 10/08/15

B-3

NORTHING: 543356.316
 EASTING: 925307.864
 STATION: N/A
 OFFSET: N/A
 ELEVATION: 4.8 FT
 DATE: 10/09/15

LEGEND:

- ASPHALT
- CONCRETE
- LIMEROCK FILL
- SILTY SAND
- FINE SAND
- SANDY SILT
- ORGANIC SILT
- LIMESTONE WITH SOME FINE SAND OR AND FINE SAND

▽ GROUND WATER LEVEL AT BORING COMPLETION

B.T. BORING TERMINATED

N: STANDARD PENETRATION RESISTANCE (AUTOMATIC HAMMER)

W.C.: WATER CONTENT

O.C.: ORGANIC CONTENT

>200: PASSING PERCENTAGE #200 SIEVE

HAMMER WEIGHT = 140 LB

DROP HEIGHT = 30 IN

THE TEST BORINGS WERE PERFORMED BY HRES USING A CME-55 TRUCK MOUNTED RIG.

GRANULAR MATERIALS:

RELATIVE DENSITY	SPT N-VALUE (BLOWS/12 INCHES)
VERY LOOSE	<3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	>40

SILTS AND CLAYS:

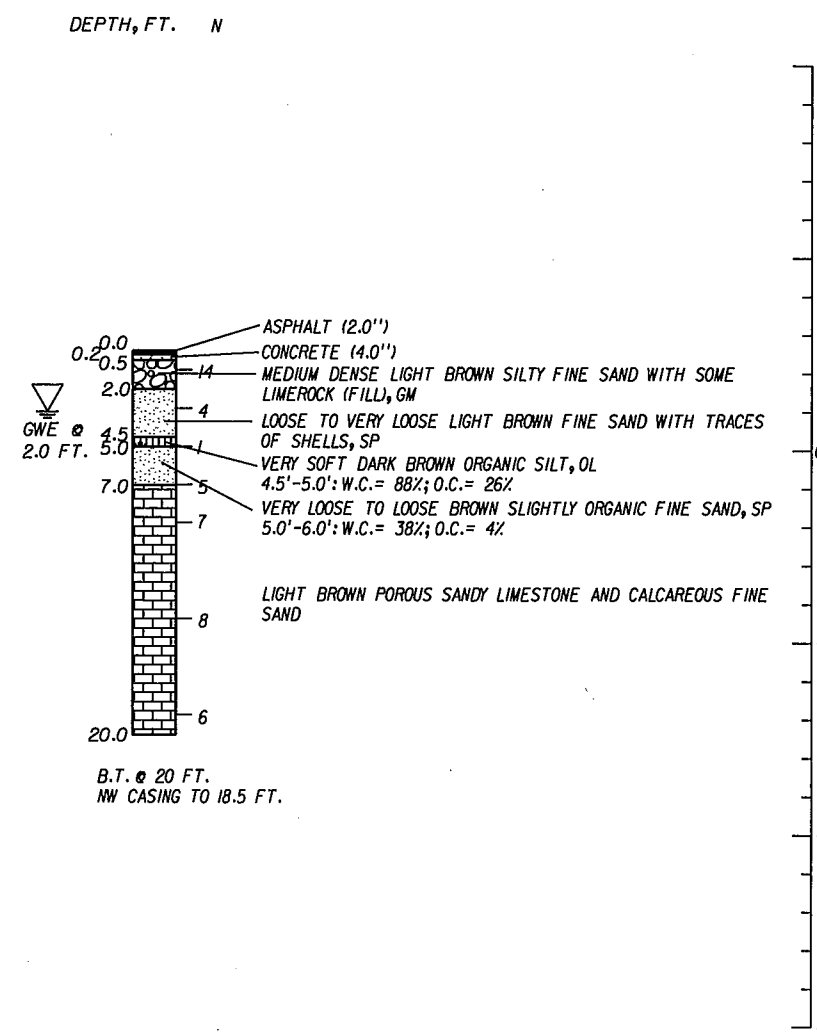
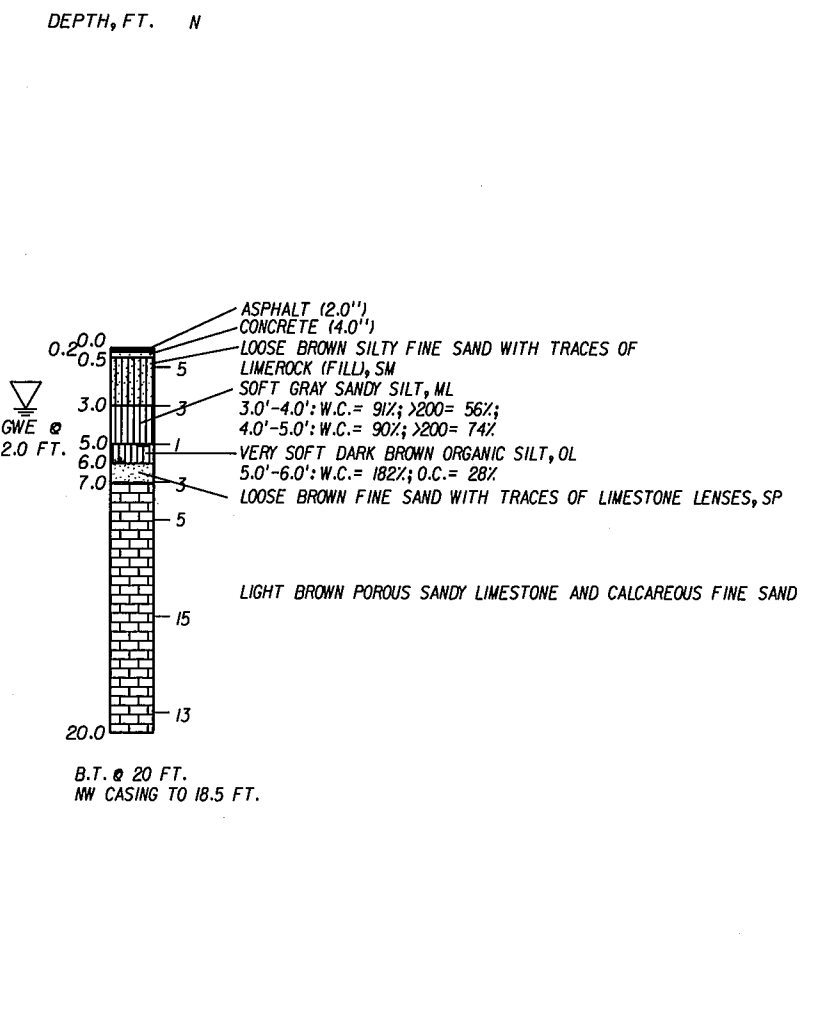
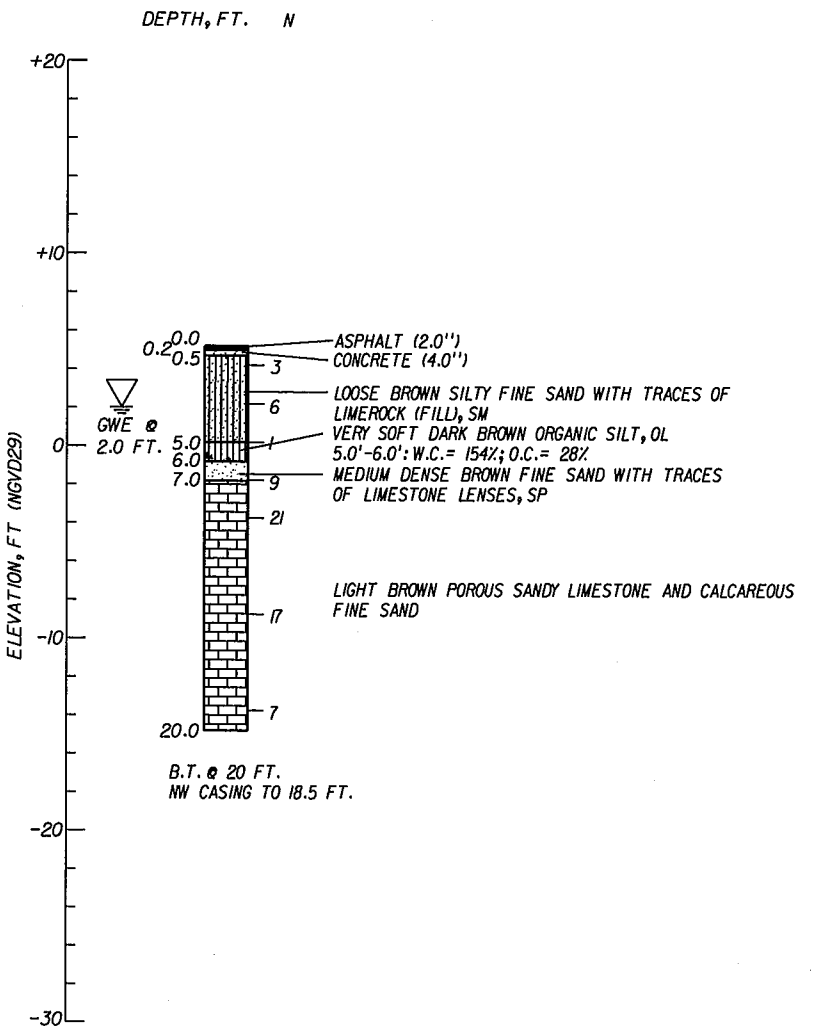
CONSISTENCY	SPT N-VALUE (BLOWS/12 INCHES)
VERY SOFT	<1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	>24

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
 STEEL: EXTREMELY AGGRESSIVE
 CONCRETE: EXTREMELY AGGRESSIVE
 SUPERSTRUCTURE: MODERATELY AGGRESSIVE

Resistivity ohms-cm	pH	Sulfates ppm	Chlorides ppm
N/A	N/A	N/A	N/A

A-4



VERTICAL SCALE: 0 2 10
 HORIZONTAL SCALE: N.T.S.
 HRES PROJECT No.: HR15-1091R

PREMISES				DATE		BY		DESCRIPTION	

HR ENGINEERING SERVICES, INC. Hernando R. Ramos P.E. License No. 42045 7815 NW 72nd Avenue Medley, Florida 33166 Phone: (305) 888-8880 - Fax: (305) 888-8770 Certificate of Authorization No. 7991				DRAWN BY: ME 10-15 CHECKED BY: NH 10-15 DESIGNED BY: NH 10-15 CHECKED BY: HRR 10-15	CITY OF MIAMI MIAMI-DADE COUNTY, FLORIDA ROAD NO. COUNTY FINANCIAL PROJECT ID MIAMI-DADE	SHEET TITLE: REPORT OF CORE BORINGS PROJECT NAME: MORNINGSIDE PARK	REF. DWG. NO. SHEET NO.
--	--	--	--	--	---	---	----------------------------

B-4

NORTHING: 543356.869
 EASTING: 925396.681
 STATION: N/A
 OFFSET: N/A
 ELEVATION: 4.9 FT
 DATE: 10/09/15

B-5

NORTHING: 543338.409
 EASTING: 925350.741
 STATION: N/A
 OFFSET: N/A
 ELEVATION: 4.0 FT
 DATE: 10/09/15

LEGEND:

- ASPHALT
- CONCRETE
- SANDY SILT
- SILTY SAND
- FINE SAND
- TOPSOIL
- ORGANIC SILT
- LIMESTONE WITH SOME FINE SAND OR AND FINE SAND

▽ GROUND WATER LEVEL AT BORING COMPLETION

B.T. BORING TERMINATED

N: STANDARD PENETRATION RESISTANCE (AUTOMATIC HAMMER)

W.C.: WATER CONTENT

O.C.: ORGANIC CONTENT

>200: PASSING PERCENTAGE #200 SIEVE

HAMMER WEIGHT = 140 LB

DROP HEIGHT = 30 IN

THE TEST BORINGS WERE PERFORMED BY HRES USING A CME-55 TRUCK MOUNTED RIG.

GRANULAR MATERIALS:

RELATIVE DENSITY	SPT N-VALUE (BLOWS/12 INCHES)
VERY LOOSE	<3
LOOSE	3-8
MEDIUM DENSE	8-24
DENSE	24-40
VERY DENSE	>40

SILTS AND CLAYS:

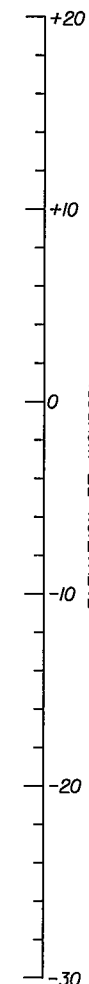
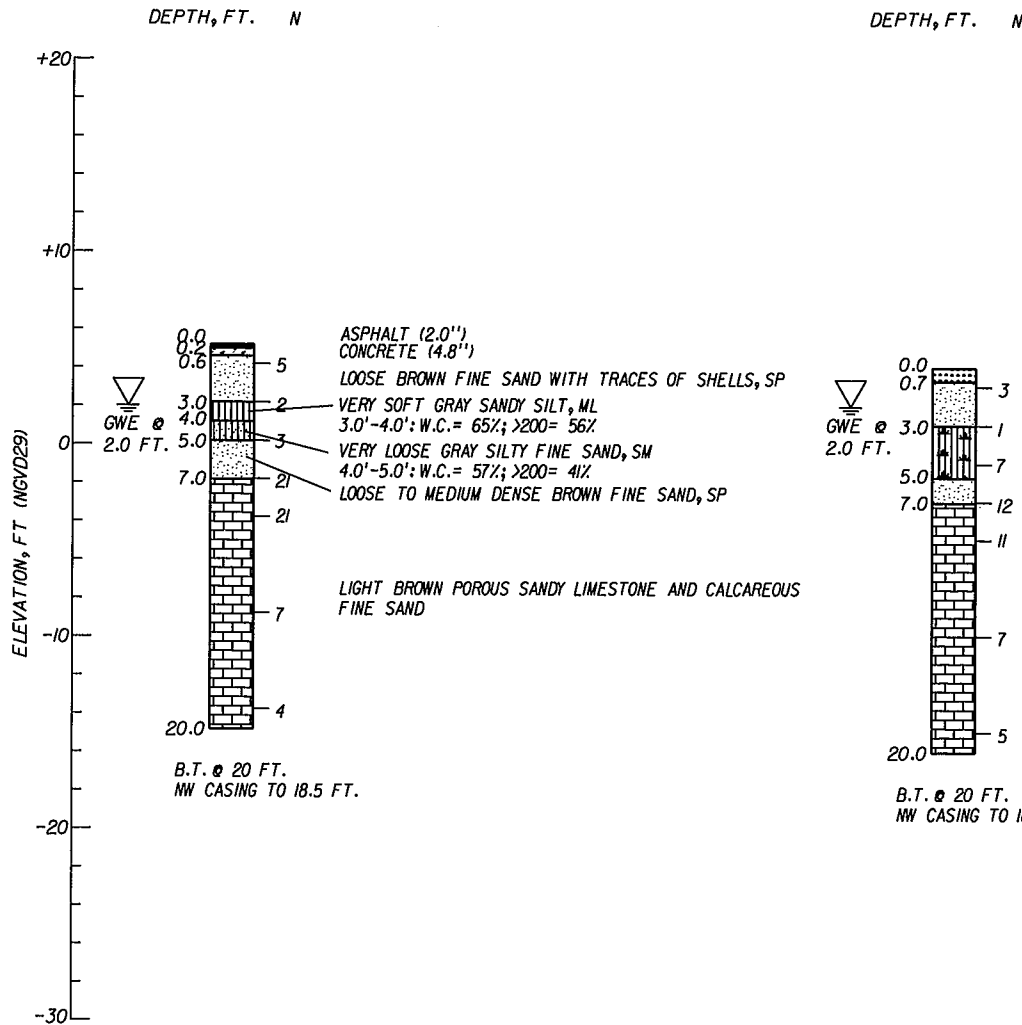
CONSISTENCY	SPT N-VALUE (BLOWS/12 INCHES)
VERY SOFT	<1
SOFT	1-3
FIRM	3-6
STIFF	6-12
VERY STIFF	12-24
HARD	>24

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE:
 STEEL: EXTREMELY AGGRESSIVE
 CONCRETE: EXTREMELY AGGRESSIVE
 SUPERSTRUCTURE: MODERATELY AGGRESSIVE

Resistivity ohms-cm	pH	Sulfates ppm	Chlorides ppm
N/A	N/A	N/A	N/A

A-5



VERTICAL SCALE: 0 2 10
 HORIZONTAL SCALE: N.T.S.
 HRES PROJECT No.: HR15-1091R

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HR ENGINEERING SERVICES, INC.
 Hernando R. Ramos
 P.E. License No. 42045
 7815 NW 72nd Avenue Medley, Florida 33166
 Phone: (305) 888-8880 - Fax: (305) 888-8770
 Certificate of Authorization No. 7891

DRAWN BY: ME 10-15
 CHECKED BY: NH 10-15
 DESIGNED BY: NH 10-15
 CHECKED BY: HRR 10-15

CITY OF MIAMI
 MIAMI-DADE COUNTY, FLORIDA

ROAD NO. COUNTY FINANCIAL PROJECT ID
 MIAMI-DADE

SHEET TITLE: **REPORT OF CORE BORINGS**

PROJECT NAME: **MORNINGSIDE PARK**

REF. DWG. NO. SHEET NO.

**SUMMARY OF PERCOLATION TEST RESULTS
 USUAL OPEN-HOLE - FDOT METHOD
 MORNINGSIDE PARK TENNIS CENTER AT 750 NE 55TH TERRACE
 CITY OF MIAMI
 PROJECT NO. B-40534
 MIAMI-DADE COUNTY, FLORIDA
 HR ENGINEERING SERVICES, INC.
 HRES PROJECT NO. HR15-1091R
 NOVEMBER 18, 2015**

TEST No.	TEST DATE	DEPTH TO WATER BEFORE TEST, H ft	DEPTH TO WATER DURING TEST ft	HEAD, Du ft	HOLE DEPTH ft	HOLE DIAMETER, d inches	RATE OF FLOW, P		k, HYDRAULIC CONDUCTIVITY cfs/ft ² -ft. Head
							gpm	cfs	
P-1	10/08/15	2.0	0.0	2.0	15.0	6.0	3.8	0.00838	1.9E-04

A-6

for 0 to 15 ft., $K_{15} = P / 3.1416 * d * Du \{ Du/2 + Ds \}$, where $Ds = \text{Hole Depth} - H$

FIELD EXPLORATION TESTING PROCEDURES

Test Borings - The test borings were made in general accordance with ASTM D-1586, "Penetration Test and Split-Barrel Sampling of Soils." The borings were advanced using a 3-inch ID casing and a rotary drilling process. At regular intervals, the drilling tools were removed and soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated six inches and then driven an additional foot with blows of a 140-lb hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance". The penetration resistance, when properly interpreted, is an index to the soil strength and density.

Representative portions of the soil samples, obtained from the sampler, were placed in glass jars and transported to our laboratory. An engineer then examined the samples in order to confirm the field classifications.

APPENDIX B

**SUMMARY OF LABORATORY TEST RESULTS
LABORATORY TESTING PROCEDURES
LABORATORY TESTING RESULTS**

**B-1
B-2
B-3 THRU B-12**

SUMMARY OF LABORATORY TEST RESULTS
MORNINGSIDE PARK TENNIS CENTER AT 750 NE 55TH TERRACE
CITY OF MIAMI
PROJECT NO. B-40534
MIAMI-DADE COUNTY, FLORIDA
HR ENGINEERING SERVICES, INC.
HRES PROJECT No. HR15-1091R
NOVEMBER 18, 2015

B-1

Test Boring No.	USCS Class.	Sample Depth (ft)	Grain Size Distribution - Percent Passing								Organic Loss on Ignition %	Moisture Content %	Material in Sample, %		
			3/4"	3/8"	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200			Gravel	Sand	Fines
B-1	OL	5.0-6.0	-	-	-	-	-	-	-	-	28	154	-	-	-
B-2	ML	3.0-4.0	-	-	-	-	-	-	-	56	-	91	-	-	56
B-2	ML	4.0-5.0	-	-	-	-	-	-	-	74	-	90	-	-	74
B-2	OL	5.0-6.0	-	-	-	-	-	-	-	-	28	182	-	-	-
B-3	OL	4.5-5.0	-	-	-	-	-	-	-	-	26	88	-	-	-
B-3	SP	5.0-6.0	-	-	-	-	-	-	-	-	4	38	-	-	-
B-4	ML	3.0-4.0	-	-	-	-	-	-	-	56	-	65	-	-	56
B-4	SM	4.0-5.0	-	-	-	-	-	-	-	41	-	57	-	-	41
B-5	OL	3.0-4.0	-	-	-	-	-	-	-	-	20	103	-	-	-
B-5	OL	4.0-5.0	-	-	-	-	-	-	-	-	16	88	-	-	-

LABORATORY TESTING PROCEDURES

Percent Fines Content – In this test, the sample is dried and then washed over a # 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in general accordance with ASTM D-1140.

Percent Organics (Organic Loss on Ignition) – The amount of organic material in a sample is determined in this test. The sample is first dried and weighed, then ignited and reweighed. The amount of organic material is expressed as a percentage.

Water Content – The water content is the ratio, expressed as a percentage of the weight of water in a given mass of soil to the weight of the soil particles. This test was conducted in general accordance with ASTM D-2216.

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-1 Sample No.: 3B Depth: 5.0'-6.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	300.10
Wt. of Dry Soil + Can, grams	123.50
Wt. of Can, grams No. 600	8.90
Wt. of Dry Soil, grams	114.60
Wt. of Moisture, grams	176.60
Water Content, w%	154%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	26.80
Weight of Crucible and Sample After Ignition:	23.70
Weight of Crucible: No. 165	15.70
Weight of Oven-Dried Soil:	11.10
Weight Loss due to Ignition:	3.10
Percent Organics:	28%

Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,

HR Engineering Services, Inc.

Herrando R. Ramos, P.E.

Florida Registration No. 42045

USCS Classification:

OL

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

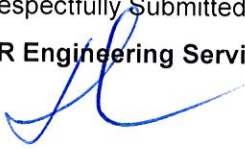
Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-2 Sample No.: 2B Depth: 3.0'-4.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	302.40
Wt. of Dry Soil + Can, grams	162.70
Wt. of Can, grams No. 602	8.90
Wt. of Dry Soil, grams	153.80
Wt. of Moisture, grams	139.70
Water Content, w%	91%
Wt. of Dry Soil + Can Before Wash, grams	162.70
Wt. of Can, grams No. 602	8.90
Wt. of Dry Soil Before Wash, grams	153.80
Time in / Out of Oven :	10/20/15 6:30 AM TO 10/21/15 6:30 AM
Wt. of Dry Soil + Can After Wash, grams	77.30
Wt. of Dry Soil After Wash, grams	68.40
Total Loss, grams	85.40
Percent Finer Than No. 200 Sieve	56%

Moisture Content Test performed in general accordance with ASTM D 2216

Fines Content Test performed in general accordance with ASTM C 136

Respectfully Submitted,
HR Engineering Services, Inc.



USCS Classification:

ML

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-2 Sample No.: 3A Depth: 4.0'-5.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	226.90
Wt. of Dry Soil + Can, grams	123.50
Wt. of Can, grams No. 603	9.00
Wt. of Dry Soil, grams	114.50
Wt. of Moisture, grams	103.40
Water Content, w%	90%
Wt. of Dry Soil + Can Before Wash, grams	123.50
Wt. of Can, grams No. 603	9.00
Wt. of Dry Soil Before Wash, grams	114.50
Time in / Out of Oven :	10/20/15 6:30 PM TO 10/21/15 6:30 PM
Wt. of Dry Soil + Can After Wash, grams	38.70
Wt. of Dry Soil After Wash, grams	29.70
Total Loss, grams	84.80
Percent Finer Than No. 200 Sieve	74%

Moisture Content Test performed in general accordance with ASTM D 2216

Fines Content Test performed in general accordance with ASTM C 136

Respectfully Submitted,

HR Engineering Services, Inc.



USCS Classification:

ML

Hernando R. Ramos, P.E.

Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-2 Sample No.: 3B Depth: 5.0'-6.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	155.70
Wt. of Dry Soil + Can, grams	61.10
Wt. of Can, grams No. 601	9.00
Wt. of Dry Soil, grams	52.10
Wt. of Moisture, grams	94.60
Water Content, w%	182%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	24.30
Weight of Crucible and Sample After Ignition:	22.00
Weight of Crucible: No. 227	16.00
Weight of Oven-Dried Soil:	8.30
Weight Loss due to Ignition:	2.30
Percent Organics:	28%

Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,
HR Engineering Services, Inc.



USCS Classification:

OL

Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

**REPORT OF MOISTURE AND
ORGANIC CONTENT BY LOSS ON IGNITION**

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-3 Sample No.: 3B Depth: 4.5'-5.0'
Date: 10/19/15

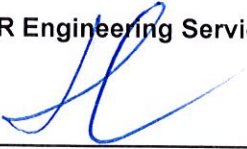
Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	205.20
Wt. of Dry Soil + Can, grams	113.10
Wt. of Can, grams No. 604	9.00
Wt. of Dry Soil, grams	104.10
Wt. of Moisture, grams	92.10
Water Content, w%	88%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	25.40
Weight of Crucible and Sample After Ignition:	22.80
Weight of Crucible: No. 209	15.40
Weight of Oven-Dried Soil:	10.00
Weight Loss due to Ignition:	2.60
Percent Organics:	26%

Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
OL


Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-3 Sample No.: 3C Depth: 5.0'-6.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	255.40
Wt. of Dry Soil + Can, grams	188.20
Wt. of Can, grams No. 605	9.00
Wt. of Dry Soil, grams	179.20
Wt. of Moisture, grams	67.20
Water Content, w%	38%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	28.40
Weight of Crucible and Sample After Ignition:	27.90
Weight of Crucible: No. 28	15.60
Weight of Oven-Dried Soil:	12.80
Weight Loss due to Ignition:	0.50
Percent Organics:	4%

Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,

HR Engineering Services, Inc.



Hernando R. Ramos, P.E.
Florida Registration No. 42045

USCS Classification:

SP

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

**REPORT OF MOISTURE AND
PERCENT PASSING THE No. 200 SIEVE**

Project Name: Morningside Park Project No.: HR15-1091R
 Boring No.: B-4 Sample No.: 2B Depth: 3.0'-4.0'
 Date: 10/19/15

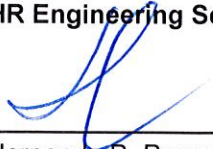
Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	231.90
Wt. of Dry Soil + Can, grams	144.40
Wt. of Can, grams No. 606	9.00
Wt. of Dry Soil, grams	135.40
Wt. of Moisture, grams	87.50
Water Content, w%	65%
Wt. of Dry Soil + Can Before Wash, grams	144.40
Wt. of Can, grams No. 606	9.00
Wt. of Dry Soil Before Wash, grams	135.40
Time in / Out of Oven :	10/20/15 6:30 PM TO 10/21/15 6:30 PM
Wt. of Dry Soil + Can After Wash, grams	68.60
Wt. of Dry Soil After Wash, grams	59.60
Total Loss, grams	75.80
Percent Finer Than No. 200 Sieve	56%

Moisture Content Test performed in general accordance with ASTM D 2216

Fines Content Test performed in general accordance with ASTM C 136

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
ML



Hernando R. Ramos, P.E.
Florida Registration No. 42045

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND PERCENT PASSING THE No. 200 SIEVE

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-4 Sample No.: 3A Depth: 4.0'-5.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	458.30
Wt. of Dry Soil + Can, grams	295.20
Wt. of Can, grams No. 607	8.90
Wt. of Dry Soil, grams	286.30
Wt. of Moisture, grams	163.10
Water Content, w%	57%
Wt. of Dry Soil + Can Before Wash, grams	295.20
Wt. of Can, grams No. 607	8.90
Wt. of Dry Soil Before Wash, grams	286.30
Time in / Out of Oven :	10/20/15 6:30 PM TO 10/21/15 6:30 PM
Wt. of Dry Soil + Can After Wash, grams	177.80
Wt. of Dry Soil After Wash, grams	168.90
Total Loss, grams	117.40
Percent Finer Than No. 200 Sieve	41%

Moisture Content Test performed in general accordance with ASTM D 2216

Fines Content Test performed in general accordance with ASTM C 136

Respectfully Submitted,
HR Engineering Services, Inc.

Hernando R. Ramos, P.E.
Florida Registration No. 42045

USCS Classification:
SM

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7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

REPORT OF MOISTURE AND ORGANIC CONTENT BY LOSS ON IGNITION

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-5 Sample No.: 2B Depth: 3.0'-4.0'
Date: 10/19/15

Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	104.50
Wt. of Dry Soil + Can, grams	56.10
Wt. of Can, grams No. 608	8.90
Wt. of Dry Soil, grams	47.20
Wt. of Moisture, grams	48.40
Water Content, w%	103%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	26.90
Weight of Crucible and Sample After Ignition:	24.80
Weight of Crucible: No. 299	16.40
Weight of Oven-Dried Soil:	10.50
Weight Loss due to Ignition:	2.10
Percent Organics:	20%

Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,

HR Engineering Services, Inc.



Hernando R. Ramos, P.E.

Florida Registration No. 42045

USCS Classification:

OL

HR ENGINEERING SERVICES, INC.

7815 N.W. 72nd Avenue - Medley, Florida 33166

Phone (305) 888-8880, Fax (305) 888-8770

**REPORT OF MOISTURE AND
ORGANIC CONTENT BY LOSS ON IGNITION**

Project Name: Morningside Park Project No.: HR15-1091R
Boring No.: B-5 Sample No.: 3A Depth: 4.0'-5.0'
Date: 10/19/15


Technician:	H.C.
Date Sample Placed in Oven:	10/19/2015
Time in / Out of Oven :	10/19/15 5:00 PM TO 10/20/15 5:00 PM
Wt. of Wet Soil + Can, grams	215.90
Wt. of Dry Soil + Can, grams	119.10
Wt. of Can, grams No. 609	8.90
Wt. of Dry Soil, grams	110.20
Wt. of Moisture, grams	96.80
Water Content, w%	88%
Date Sample Placed in Furnace:	10/21/15
Time in / out of furnace (minimum 6 hrs):	10/21/15 8:00 AM TO 10/21/15 2:00 PM
Weight of Crucible & Oven-Dried Sample:	27.60
Weight of Crucible and Sample After Ignition:	25.80
Weight of Crucible: No. 83	16.30
Weight of Oven-Dried Soil:	11.30
Weight Loss due to Ignition:	1.80
Percent Organics:	16%

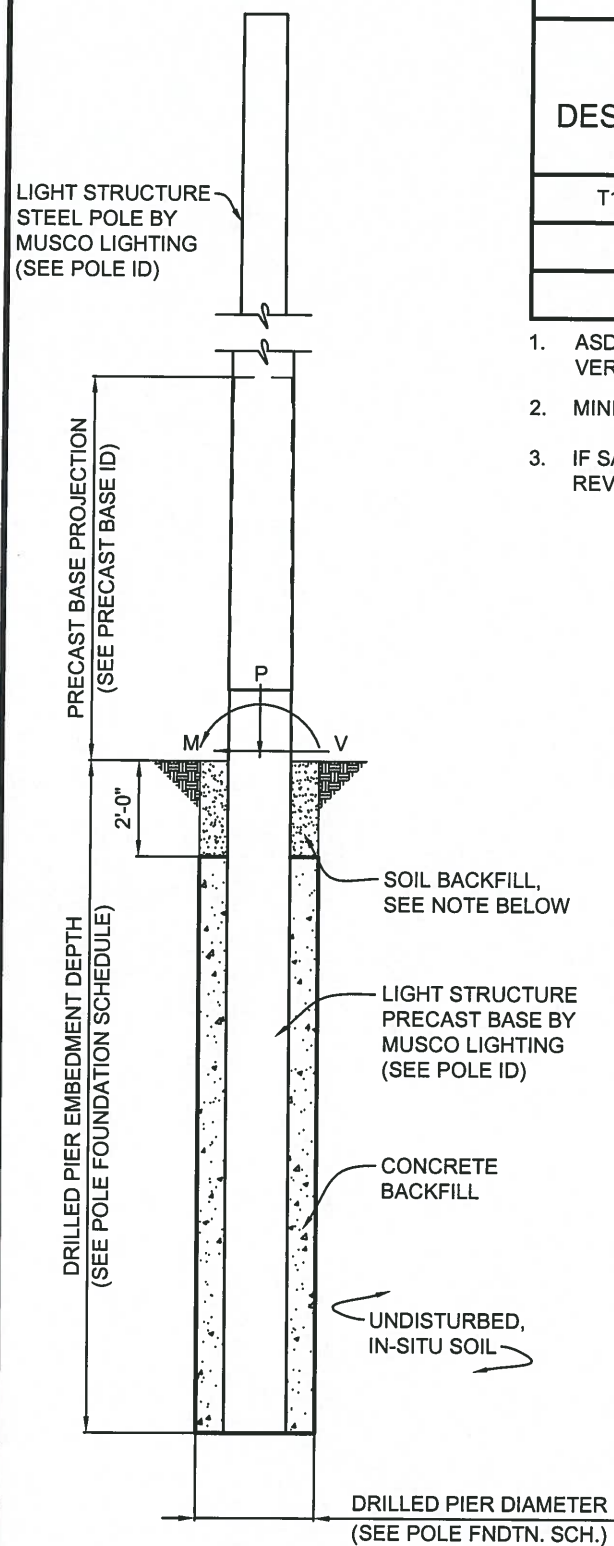
Moisture Content Test performed in general accordance with ASTM D 2216

Organic Content Test performed in general accordance with ASTM D 2974

Respectfully Submitted,
HR Engineering Services, Inc.

USCS Classification:
OL


Hernando R. Ramos, P.E.
Florida Registration No. 42045



POLE FOUNDATION SCHEDULE						
POLE DESIGNATION	FORCES (1.)			DRILLED PIER		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS	DIAMETER INCHES	EMBEDMENT DEPTH (3.)	CONCRETE BACKFILL YD ³ (2.)
T1, T2, T5, T6	37,425	1,535	1,025	30	12'-0"	1.5
T3, T4	46,995	1,785	1,205	30	12'-0"	1.5
T7-T10	68,697	2,194	1,314	30	12'-0"	1.5

- ASD LOAD COMBINATION D + 0.6W
VERTICAL FORCE IS WEIGHT OF DRESSED POLE (DOES NOT INCLUDE PRECAST BASE WEIGHT).
- MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.
- IF SANDY LIMESTONE AND / OR CALCAREOUS SAND IS NOT REACH AT OR BEFORE -7'-0", CONTACT ENGINEER FOR REVISED FOUNDATIONS.

PRECAST BASE IDENTIFICATION					
PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER
3B	2,470 LBS	20'-0"	8'-0"	12'-0"	13.38"

POLE IDENTIFICATION				
POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)
T1, T2, T5, T6	LSS40B	3B	2 (2)	4.2
T3, T4	LSS40B	3B	4 (2) / (2)	7.6
T7-T10	LSS50C	3B	3 (3)	5.7

POLE FOUNDATION ELEV.

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:

THE TOP TWO FEET OF ANNULUS SHALL BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 3 (TABLE 1819.6) OR BETTER. COMPACTION, 95% FOR COHESIVE SOIL AND 98% FOR A COHESIONLESS SOIL BASED UPON STANDARD PROCTOR TESTING (ASTM D698).

DESIGN NOTES

DESIGN PARAMETERS:

WIND: Vult = 175 MPH, Vasd = 136 MPH (EXPOSURE C, RISK CATEGORY II)
PER FBC, 2014 EDITION (ASCE 7-10), SECTIONS 1609 AND 1620
DESIGN WIND PARAMETERS ARE AS NOTED, ACTUAL EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

GEOTECHNICAL PARAMETERS:

ALLOWABLE END BEARING SOIL PRESSURE: 2,000 PSF
ALLOWABLE LATERAL SOIL BEARING PRESSURE:
100 PSF/FT (GRADE TO -7'-0"); 400 PSF/FT (BELOW -7'-0")
IN ACCORDANCE WITH THE 2014 EDITION OF THE FLORIDA BUILDING CODE, CHAPTER 18.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, PROJECT NO. HR15-1091R, PREPARED BY HR ENGINEERING SERVICES, INC.; MEDLEY, FL.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT. CONCRETE BACKFILL MUST BE PLACED WITH A TREMIE WHEN SLURRY OR WATER IS PRESENT WITHIN THE EXCAVATION OR WHEN THE FREE DROP EXCEEDS 6'-0".

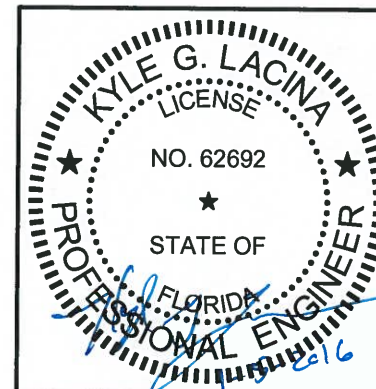
CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

CONCRETE:

CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE DESIGN STRENGTH AT 28 DAYS OF 3,000 PSI. 3,000 PSI CONCRETE SPECIFIED FOR EARLY POLE ERECTION, ACTUAL REQUIRED MINIMUM ALLOWABLE CONCRETE STRENGTH IS 1,000 PSI. ALL PIERS AND CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL.

GENERAL NOTES:

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION. POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF FLORIDA.

KYLE G. LACINA - NO. PE 62692
LICENSE RENEWAL DATE: FEBRUARY 28, 2017

STRUCTURAL ENGINEERS, P.C. - NO. 26361

DRAWING NO. COVERED BY THIS SEAL: C1

MORNINGSIDE PARK
TENNIS
LIGHTING
MIAMI, FL



STRUCTURAL
ENGINEERS, P.C.
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
PHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

DRAWING TITLE:
POLE AND FOUNDATION
SCALE: SEE PLAN
NOTES:
SCAN #131826A

PROJECT NUMBER
131826

DATE
05 JANUARY 2016

DRAWING NUMBER
C1

OF ONE

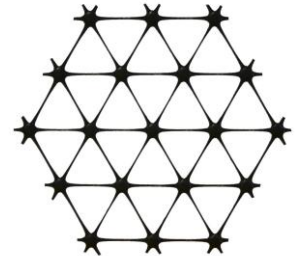
Product Specification - TriAx® TX130S Geogrid¹

Tensor International Corporation reserves the right to change its product specifications at any time. It is the responsibility of the person specifying the use of this product and of the purchaser to ensure that product specifications relied upon for design or procurement purposes are current and that the product is suitable for its intended use in each instance.

General

1. The geogrid is manufactured from a punched polypropylene sheet, which is then oriented in three substantially equilateral directions so that the resulting ribs shall have a high degree of molecular orientation, which continues at least in part through the mass of the integral node.
2. The properties contributing to the performance of a mechanically stabilized layer include the following:

Tensor TriAx® Geogrid



Index Properties	Longitudinal	Diagonal	General
<ul style="list-style-type: none"> ▪ Rib pitch⁽²⁾, mm (in) ▪ Rib shape ▪ Aperture shape 	33 (1.30)	33 (1.30)	Rectangular Triangular
Structural Integrity			
<ul style="list-style-type: none"> ▪ Junction efficiency⁽³⁾, % ▪ Overall Flexural Rigidity⁽⁴⁾, mg-cm ▪ Radial stiffness at low strain⁽⁵⁾, kN/m @ 0.5% strain (lb/ft @ 0.5% strain) 			93 500,000 200 (13,708)
Durability			
<ul style="list-style-type: none"> ▪ Resistance to chemical degradation⁽⁶⁾ ▪ Resistance to ultra-violet light and weathering⁽⁷⁾ 			100% 70%

Dimensions and Delivery

The TX geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 3.0 meters (9.8 feet) and/or 4.0 meters (13.1feet) in width and 75 meters (246 feet) in length.

Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02. Brief descriptions of test procedures are given in the following notes.
2. Nominal dimensions.
3. Load transfer capability determined in accordance with ASTM D6637-10 and ASTM D7737-11 and expressed as a percentage of ultimate tensile strength.
4. Determined in accordance with ASTM D7748-12.
5. Radial stiffness is determined from tensile stiffness measured in any in-plane axis from testing in accordance with ASTM D6637-10.
6. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
7. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355-05.

TriAx[®]

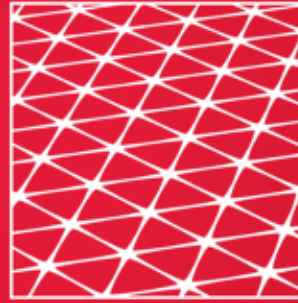
TENSAR[®] TRIAX[®] (TX) Geogrid

INSTALLATION GUIDE



Tensar[®]

➤ **Tensar® TriAx® (TX)**
Geogrids provide soil reinforcement that offers a predictable, cost-effective solution.



Tensar® Geogrids

Tensar® TriAx® (TX) Geogrids stand the test of time, offering outstanding performance due to their stiff interlocking capability. For more information, visit www.tensarcorp.com.

Introduction

When weak subgrade, heavy loads, thick fill layers, high structural fill costs, contaminated subgrades or shallow utilities disrupt your construction schedule or budget, Tensar® TriAx® (TX) Geogrids can provide the best solution.

Not only does this system allow access and construction for less than ideal situations, it also offers a predictable engineered solution. This solution relies on Tensar TriAx Geogrids and crushed aggregate base acting together to create a stronger composite structure, which increases the performance of the underlying subgrade or aggregate base course.

Tensar TriAx Geogrids have proven their performance and cost-efficiency in thousands of applications. Over soft ground, TriAx Geogrids improve the soil's effective bearing capacity by distributing applied loads more widely, similar to the way a snowshoe supports a man's weight over soft snow (Image 1). Over firmer ground, geogrids stiffen and

interlock with fill materials by confining aggregate particles within their apertures, thus yielding a stronger component for increased serviceability and durability.

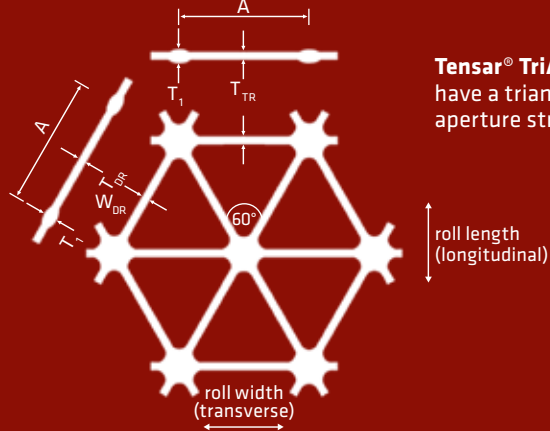
The subgrade stabilization and pavement optimization applications, and their primary mechanisms, are predetermined by ground or foundation support. Proper geogrid installation is also based on subgrade strength. We use California Bearing Ratio (CBR) to quantify this important variable.

Tensar TriAx Geogrids are used to minimize aggregate fill requirements, reduce or eliminate undercut, improve compaction, serve as a construction platform, and extend service life. These features depend upon proper installation as described in this guide.*

This guide cannot account for every possible construction scenario, but it does cover most applications. If you have questions regarding a specific project, call **800-TENSAR-1 or visit www.tensarcorp.com.*



IMAGE 1: The Snowshoe Effect – Tensar TriAx Geogrids distribute heavy loads over soft soils just like a snowshoe supports the weight of a man over soft snow.



Tensar® TriAx® Geogrids have a triangular aperture structure.

1. Getting Started

- ▶ When placing an order, communicate all pertinent project and/or application criteria, including certification requirements, if any, to your Tensar International Corporation (Tensar) representative. It is normally advisable to schedule a pre-construction meeting with this representative and any other appropriate parties at this time.
- ▶ Upon delivery, check the geogrid roll labels to verify that the intended product has been received. For instance, TX140 and TX160 Geogrids have a similar appearance, but different structural characteristics so the distinction is important. Inspect the geogrid to ensure it is free of any flaws or damage that may have occurred during shipping or handling. If variable roll widths are supplied, please confirm that the correct quantities have been delivered. Tensar Geogrid rolls are assigned distinct nomenclature to distinguish wide rolls from narrow rolls.*
 - TX130S-475 (13.1 ft)
 - TX140-475 (13.1 ft)
 - TX140-375 (9.8 ft)
 - TX160-475 (13.1 ft)
 - TX160-375 (9.8 ft)
- ▶ Store Tensar Geogrid rolls in a manner that prevents excessive mud, wet concrete, epoxy or other deleterious materials from coming in contact with and affixing to the geogrid. Store geogrids above -20°F (-29°C) and avoid handling below 14°F (-10°C) – the glass-transition temperature for polypropylene used in TX Geogrids. Tensar Geogrids may be stored uncovered for up to six months in direct exposure to sunlight without any loss in certifiable structural properties (contact Tensar if longer exposure is anticipated). Tensar Geogrids may be stored vertically (rolls stood on end) or, typically, horizontally in stacks not exceeding five rolls high (Image 2).
- ▶ Anticipate potential issues and resolve them with Tensar prior to construction. To contact the local Tensar representative for your area, call **800-TENSAR-1**.

**Additional roll characteristics can be found on page 9 of this guide under "Tensar Geogrid Roll Characteristics."*



IMAGE 2: Storing the Tensar Geogrid rolls horizontally.



IMAGE 3: Rolling out Tensor® Geogrid.

2. Site Preparation

- ▶ Clear, grub and excavate (if necessary) to the design subgrade elevation, stripping topsoil, deleterious debris and unsuitable material from the site. For very soft soils (CBR < 0.5), it may be beneficial to minimize subgrade disturbance and leave root mats in place, cutting stumps and other projecting vegetation as close and even to the ground surface as practical (Table 1). For moderately competent soils (CBR > 2), it may be prudent to lightly proof roll the subgrade to locate unsuitable materials. When possible, backdrag to smooth out any ruts.
- ▶ Smooth grade and compact the soils using appropriate compaction equipment. Swampland, peat, muskeg or marshes may be difficult to smooth grade and/or compact. In these situations, create a surface that is as uniformly smooth as possible. Grade or crown the surface for positive drainage away from the construction zone.
- ▶ Place the rolls of Tensor® Geogrid* in position, cut the roll bands and manually unroll the material over the prepared surface (Image 3). In subgrade stabilization improvement applications, this surface will always be the subgrade. In pavement optimization applications, it may be the subgrade, the subbase or at an elevation (e.g., mid-depth) within the aggregate base course.
- ▶ Fine grained non-cohesive soils such as silts present unique challenges, especially with the presence of excessive moisture. Tensor recommends that a Tensor representative be contacted so that site conditions can be analyzed to ensure that geogrid performance is optimized.

**Tensor manufactures several different types of geogrids. Selection and optimization depends on structural performance requirements, subgrade and fill parameters, economic considerations and local availability.*

NOTE: Routine construction procedures are normally recommended for site preparation. Special measures are rarely required to accommodate Tensor Geogrids.

Summary of Tensor® Geogrid Installation Parameters

Subgrade Strength	Clear All Vegetation?	Geogrid Orientation ³	Geogrid Overlap ⁴	Nylon Zip Ties? ^{1,2}	Direct Traffic? ⁵	Geotextile? ⁶
CBR ≤ 0.5	N	T or L	3 ft	Y	N	Analysis Req'd
0.5 ≤ CBR ≤ 2	Usually	L	2-3 ft	N	N	Analysis Req'd
2 ≤ CBR ≤ 4	Y	L	1-2 ft	N	Limited	Analysis Req'd
4 ≤ CBR	Y	L	1 ft	N	Y	N

NOTES:

1. Summary is a generalized presentation; see text for specifics.
2. Y = Yes, normally required; N = No, normally not required.
3. Geogrid Orientation (roll axis in relation to traffic): T = Transverse, L = Longitudinal.
4. General Geogrid Overlap Rule: Overlap = 3 ft for CBR ≤ 1; Overlap = 1 ft for CBR ≥ 4; interpolate between.
5. Direct Traffic pertains only to conventional rubber-tired equipment.
6. Analysis Required = Geotextile required only if filtration criteria is not met by aggregate fill.

TABLE 1



3. Placing and Overlapping Geogrid

- ▶ Unroll the geogrid in the direction of travel so that the long axis of the roll is parallel with channelized traffic patterns. For very soft subgrades (CBR < 0.5), unrolling geogrid transversely or perpendicular to the roadway embankment alignment, may be preferred, particularly if lateral spreading and separation of overlaps is a concern (Table 1).
- ▶ Overlap adjacent rolls along their sides and ends in accordance with Table 1.
- ▶ Overlap (“shingle”) geogrids in the direction the fill placement will be spread (Image 4) to avoid “peeling” of geogrid at overlaps by the advancing fill. To expedite “shingling,” consider placing rolls at the far end of the coverage area first, and work toward the near end from where the fill will be advanced. Weaker subgrades that are easily rutted with conventional construction traffic will require an “end-dumping” operation. Please refer to page 7 “Dumping and Spreading Aggregate Fill” for more information.
- ▶ Adjacent geogrid rolls are not normally mechanically connected to one another, particularly if fill is placed and spread as described herein (Table 1). A notable exception is over very soft subgrades (CBR < 0.5) where nylon cable

ties (or “zip ties”) can be effective in helping maintain overlap dimensions. These ties are not considered structural connections, but rather construction aids. In most applications their use is not required.

- ▶ Cut and overlap the geogrid to accommodate curves (Image 5). Cutting may be done with sharp shears, a knife-like implement or handheld power (i.e., “cutoff”) saws (Image 6). (Wear appropriate safety equipment such as gloves and eye protection.) Cut grid to conform to manhole covers and other immovable protrusions.
- ▶ Place geogrids in daily work sections so that proper alignment is maintained.
- ▶ In some cases, especially on cooler days, Tensar Geogrid will exhibit “roll memory” where the product may roll back upon cutting or reaching the end of the roll. It is recommended that the installer take appropriate measures to ensure that the product lies flat during fill placement. This can be easily achieved by using sod staples, zip ties or simply adding a shovelful of fill to weigh down the product.
- ▶ **Gloves should be worn when handling and cutting Tensar Geogrid.**



IMAGE 4: Geogrid should overlap in the direction of advancing fill.



IMAGE 5: Placing Geogrid to accommodate curves.

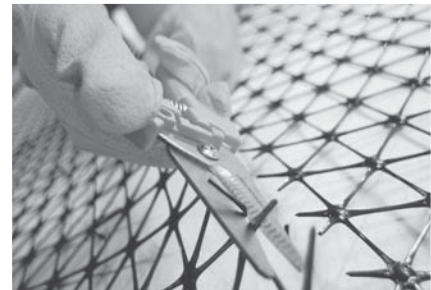


IMAGE 6: Cutting Tensar® TriAx® Geogrid is easily achieved.



4. Tensioning and Pinning

Tensar® Geogrids may be anchored in place to maintain overlaps and alignment over the coverage area.

- ▶ Before fully unrolling the geogrid, anchor the beginning of the roll, in the center and at the corners, to the underlying surface.
- ▶ Anchor the Tensar Geogrid with small piles of aggregate fill or a washer and pin (Image 7). Large, heavy-gauge staples may also be used by driving them into the subsoil through the apertures of the grid.
- ▶ Unroll the Tensar Geogrid. Align it and pull it taut to remove wrinkles and laydown slack with hand tension, then secure in place. Because of the unique manufacturing process of Tensar Geogrid, maneuvering an unrolled sheet of geogrid is very easy. **Gloves should be worn while handling and cutting Tensar Geogrids.**
- ▶ Additional shoveled piles of aggregate fill, pins or staples may be required to hold the geogrid in place prior to placement of the aggregate fill.
- ▶ When aggregate fill is spread by pushing it over the Tensar Geogrid with heavy equipment, such as bulldozers, the shoving action may create a “wave” in the sheet of geogrid ahead of the advancing fill. Shoveled fill or pins can trap this wave and force the geogrid up into the aggregate layer where it can be damaged by the spreading equipment. Pulling the geogrid taut will mitigate laydown slack, thereby removing “waving.” If significant waving occurs, the pins or shoveled material should be removed to allow the waves to dissipate at the ends and edges of the roll.

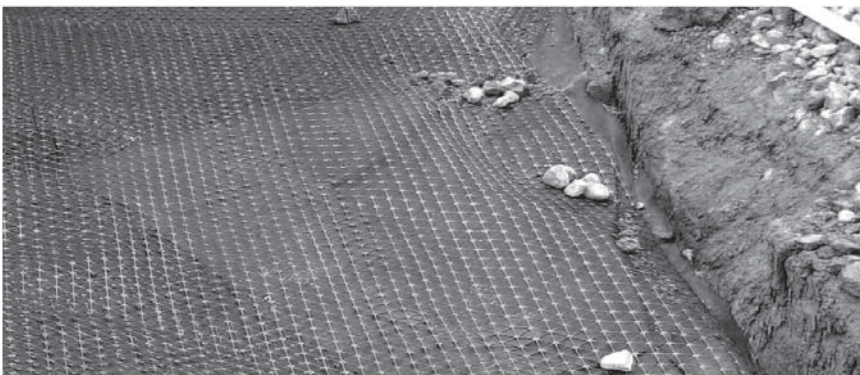


IMAGE 7: Anchoring geogrid with piles of aggregate.



IMAGE 8: Dumping aggregate fill on top of Tensor® Geogrid over competent subgrade.

5. Dumping and Spreading Aggregate Fill

- ▶ Generally, at least 6 in. is required for the initial lift thickness of aggregate fill over Tensor® Geogrids. However, for very soft conditions, a significantly thicker fill layer will be required to prevent excessive rutting and/or bearing capacity failure of the underlying subgrade soils.
- ▶ Over relatively competent subgrades (CBR > 4, see Table 1), aggregate fill may be dumped directly onto the geogrid (Image 8). **Standard, highway-legal, rubber-tired trucks (end dumps and belly dumps) may drive over the geogrid at very slow speeds (less than 5 mph) and dump aggregate fill as they advance, provided this construction traffic will not cause significant rutting upon bare subgrade. Turns and sudden starts and stops should be avoided.**
- ▶ Over softer subgrades, back trucks up and dump fill upon previously placed fill (Image 9a). For very soft subgrades (CBR < 0.5), extreme caution should be taken to avoid overstressing the subgrade soil both during and after fill placement. Please contact a Tensor representative at **800-TENSAR-1** for guidance with constructing over very soft subgrade soils (CBR < 0.5).
- ▶ Do not drive tracked equipment directly on Tensor Geogrid. Ensure at least 6 in. of aggregate fill (or required minimum design fill thickness) is spread between the geogrid and tracked equipment (Image 9b).
- ▶ Also, only operate rubber-tired equipment directly on the geogrid if the underlying subsoil is not prone to rutting under limited construction traffic.
- ▶ Over softer subgrades (CBR < 2), a lightweight, low ground pressure (LGP) dozer is recommended to evenly push out the fill over the exposed geogrid.
- ▶ Care should be taken not to catch the dozer blade or other equipment on Tensor Geogrid. The dozer blade should be raised gradually as each lift is pushed out over the geogrid. The desired effect is fill that cascades onto the geogrid, rather than being pushed into it.
- ▶ When building over a soft subgrade, it is desirable to work from stronger to weaker areas.
- ▶ Be aware of Tensor Geogrid overlaps and advance the aggregate fill with the shingle pattern.



IMAGE 9A: End dumping aggregate fill on top of Tensor Geogrid over soft subgrade.



IMAGE 9B: Spreading aggregate fill over Tensor Geogrid.



IMAGE 11: Compacting the aggregate fill.

6. Compacting

- ▶ Standard compaction methods may be used unless the soils are very soft. In these cases, static instead of vibratory compaction is prudent, particularly over fine-grained, noncohesive soils such as silt. Compaction is then achieved using a light roller. Keeping the moisture content of the fill material near optimum will make compaction more efficient. Water spray is most effective with sand fill (see Image 10). For construction over very soft soils, compaction requirements are normally reduced for the initial lift as the primary intent of the initial lift is to achieve a suitable working surface.
- ▶ If rutting or severe pumping occurs under truck or dozer traffic, fill should be added immediately to strengthen the section. Silty subgrades are particularly prone to pumping. In some cases, it may be prudent to cease operations for a period of time, allowing pore pressures to dissipate and the subgrade to stabilize. Otherwise, de-watering measures such as “bleeder ditches” should be considered to reduce the moisture content of the uppermost silty subgrade layer. Please contact a Tensar representative for more information.
- ▶ Compact aggregate fill to project specifications, after it has been graded smooth and before it is subject to accumulated traffic (Image 11). Inadequate compaction will result in surface rutting under wheel loads. This rutting reduces the total effective thickness of the fill and increases stress on the subgrade. Compaction equipment and methods should be appropriate for the type of fill being used, its thickness and the underlying subgrade conditions.
- ▶ If the aggregate fill thickness is insufficient to support imposed load(s) when constructing over soft soil, excessive subgrade and surface rutting will result. Measures should be taken to ensure the proper thickness of granular fill is placed atop the geogrid to maximize support and minimize movement at the surface.



IMAGE 10: Moistening the fill before compaction.

Tensor® Geogrid Roll Characteristics

Product	Roll Width		Roll Length		Roll Area		Roll Weight	
	(m)	(ft)	(m)	(ft)	(m ²)	(SV)	(kg)	(lb)
TX130S-475	4	13.1	75	246	300	358	52.6	116
TX140-475	4	13.1	75	246	300	358	58.6	129
TX140-375	3	9.8	75	246	225	268	44.0	97
TX160-475	4	13.1	75	246	300	358	72.1	159
TX160-375	3	9.8	75	246	225	268	54.0	119

7. Special Considerations

MAKE REPAIRS

- ▶ If Tensor® Geogrids become damaged during or after installation, repair them by patching the area with the following measures:
 1. Remove fill from the surface of the damaged geogrid and clear a 3 ft area around the damage.
 2. The geogrid patch should cover the damaged area and extend 3 ft beyond it in all directions.

SURFACE RUTTING

- ▶ If deep rutting occurs beneath truck wheels, do not grade out the ruts. Rutting is normally indicative of fill that is too thin, too wet or inadequately compacted. Grading out the rut will reduce aggregate fill thickness between the wheel paths and may lead to geogrid exposure.
- ▶ Fill in the ruts with additional specified aggregate fill and compact. This places extra fill where it's needed and may prevent further rutting under channelized traffic.
- ▶ Crown the fill during the grading process to ensure rainfall runoff and to prevent fill saturation.

COLD WEATHER

- ▶ At sub-freezing temperatures, Tensor Geogrid is less impact resistant and can be fractured with dynamic force (i.e., striking with a hammer). Other aspects of dynamic loading associated with very cold temperatures should be avoided. For example, direct trafficking by rubber-tired equipment atop geogrid is permissible when the subgrade is competent. However, it's not advisable at very cold temperatures.

AGGREGATE FILL CONSIDERATIONS

- ▶ The preferred gradation for paved base reinforcement applications is well-graded crushed aggregate fill with a maximum particle size of 1½ in. and less than 10% fines (passing #200 sieve). The gradations listed in Table 2 (below) provide good stability and low moisture susceptibility. **For unpaved subgrade improvement applications, any clean granular fill may be acceptable.**
- ▶ Tensor Geogrids will structurally enhance coarser or finer fill gradations, as long as the aggregate fill is compacted and placed at, or just below, optimum moisture content. For coarser fill, a graded filter analysis is recommended to



Preferred Fill Gradation	
Size	% Passing
1½ in.	100
¾ in.	50-100
#4	25-50
#40	10-20
#100	5-15
#200	less than 10

TABLE 2



IMAGE 13: A backhoe excavation through Tensar Geogrid.

Excavating Through Tensar® Geogrid

When confined beneath and within compacted fill, the geogrid should pose no significant threat to post-construction activities like utility trenching or driving/auguring supports for rails, signs or standards. Conventional excavation equipment will shear directly through the geogrid leaving a clean cut as represented in Image 13.

guard against potential contamination from the underlying subgrade (see Table 1 on pg. 4). If the aggregate fill does not meet the requirement(s) of a graded filter over soft and saturated clays and silts it is recommended that a sand filter layer be placed at a minimum depth of 6 in. on top of the geogrid layer. This sand fill may need to be increased in the event the design fill thickness requires a thicker initial lift. It is not recommended that a non-woven geotextile be used when constructing over saturated silts. However, non-woven geotextiles are recommended in conjunction with Tensar® TriAx® Geogrids when:

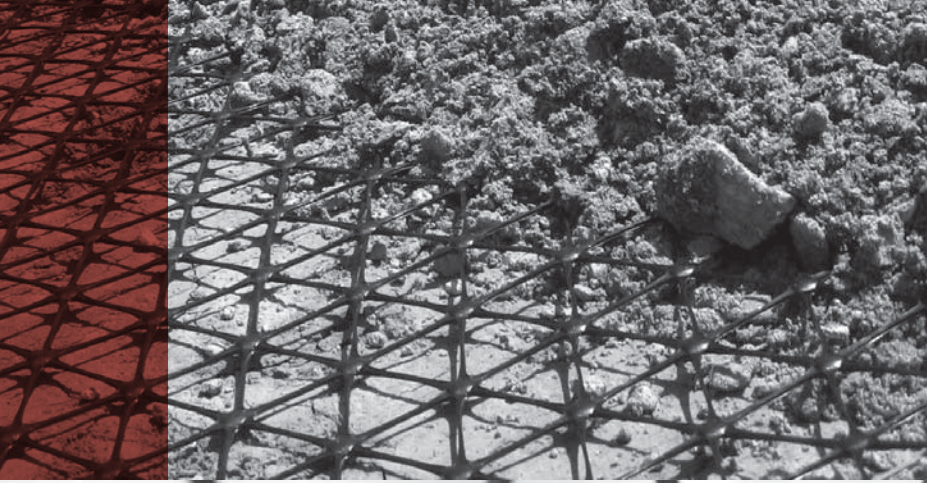
1. The filter criteria of the fill when compared to the subgrade soil does not pass the piping ratio requirement, and
 2. Significant clay content is present that will limit the mobilization of fine particles with excessive stress and moisture.
- ▶ Do not use uniformly sized coarse fill as it does not compact well and will rut under wheel loading, despite the improved stability brought about by Tensar Geogrids.
 - ▶ The moisture content of the fill should not exceed optimum. Wet fill is not easy to compact and will rut under wheel loading.

PREFERRED EQUIPMENT

- ▶ **Soft Ground** – the preferred equipment imposes low contact pressure on the ground surface. This may be done with smaller machinery, wide tires and/or LGP tracks. Equipment that concentrates heavy loads over relatively small contacts, such as front-end loaders, are not recommended. In all soft ground cases, fill must be sufficiently thick to avoid overstressing the underlying soils and Tensar Geogrid.
- ▶ **Competent Ground** – the preferred equipment maximizes productivity for specific construction requirements. Over competent ground, geogrids can be trafficked directly by rubber-tired equipment, making hauling equipment (i.e., dump trucks) and spreading equipment (i.e., motor graders) ideal (Image 12). Spreader boxes are not recommended – wrinkling in the geogrid between the screed and wheels of the box and dump trucks can cause slack to become trapped, raising the geogrid up into the aggregate layer.



IMAGE 12: Geogrid can be trafficked directly by rubber-tired equipment.

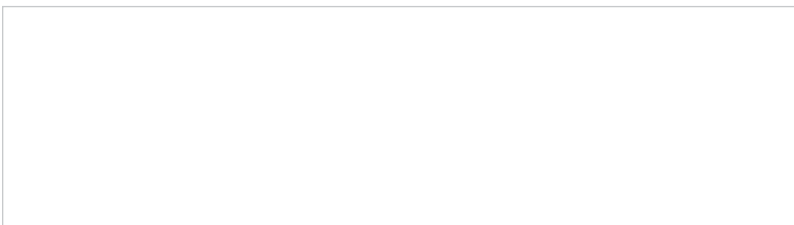


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SECTION 02050
DEMOLITION

PART 1 GENERAL

1.01 SCOPE:

- A. Summary of Work: The CONTRACTOR shall include the removal of existing construction to limits indicated on drawings where earthwork or other construction operations are to be performed as specified herein. The ENGINEER shall not be responsible for the condition of any items to be removed or salvaged.

1.02 APPLICABLE PUBLICATIONS: (Not Used)

1.03 DEFINITIONS: (Not Used)

1.04 SUBMITTALS:

A. Schedule of Demolition:

- 1. Submit proposed methods and operations of demolition to the ENGINEER for approval prior to the start of work.

B. Permits:

- 1. The CONTRACTOR shall be responsible for acquiring appropriate necessary permits for the work. Copies of the permits shall be submitted to the ENGINEER.

1.05 QUALIFICATIONS: (Not Used)

1.06 RESPONSIBILITIES:

- A. The CONTRACTOR shall not commence demolition prior to written permission of the City of Miami.

B. Condition of structures to be demolished:

- 1. The ENGINEER assumes no responsibility for actual condition of structures to be demolished.
- 2. Conditions existing at time of inspection for bidding purposes will be maintained by ENGINEER insofar as practicable.

C. The CONTRACTOR shall remove all foundations to one foot below the proposed sub-grades.

- D. Explosives: The use of explosives will not be permitted. The CONTRACTOR may use a non-explosive, expanding agent in drilled holes for the demolition of concrete, and shall conform to all manufacturers' recommendations, including safety precautions for mixing and placing the agent.

- E. The CONTRACTOR shall ensure the safe passage of persons around the area of demolition and clearing. The CONTRACTOR shall conduct operations to prevent injury to adjacent structures, other facilities, and persons.

- 1. The CONTRACTOR shall protect existing finish work that is to remain in place from damage due to demolition operations.

F. Traffic:

- 1. The CONTRACTOR shall conduct operations and the removal of debris to ensure minimum interference with existing access roads and other adjacent occupied or used facilities.
- 2. Do not close, block or otherwise obstruct access roads or other occupied or used facilities without permission from the ENGINEER.

- G. The CONTRACTOR shall promptly repair damages caused to adjacent facilities by demolition operations at no cost to the OWNER.

1.07 CERTIFICATIONS AND TESTING: (Not Used)

1.08 INSPECTION COORDINATION: The CONTRACTOR shall provide access to the WORK for the ENGINEER as requested for inspection. The Contractor shall provide 48 hours notice of its intention to begin new WORK activities.

1.09 WARRANTY: (Not Used)

PART 2 PRODUCTS

1.10 SALVAGE MATERIALS:

- A. The CONTRACTOR shall salvage and store the following:
 - 1. Material and equipments as directed by the OWNER.
 - 2. The CONTRACTOR shall use extreme care not to damage the equipment and material during their removal and replacement.
 - 3. Salvage material shall be transferred to OWNER'S Facilities as directed by the OWNER.

PART 3 EXECUTION

1.11 DEMOLITION:

- A. The CONTRACTOR shall provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
- B. If hazardous materials are found, the contractor shall notify the ENGINEER immediately.
- C. The CONTRACTOR shall completely backfill below-grade areas and voids resulting from demolition work. The CONTRACTOR shall provide fill consisting of approved soil, gravel or sand (free of trash and debris) and compact fill to approximate density of surrounding native soil.

1.12 DISPOSAL OF DEMOLISHED MATERIALS:

- A. The CONTRACTOR shall remove debris, rubbish, and other materials resulting from demolition operations.
- B. If hazardous materials are encountered during demolition operations, the CONTRACTOR shall comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
- C. The CONTRACTOR shall transport materials removed during demolition activities and properly dispose of them at an approved site according to the State, Federal, and local regulations.

1.13 CONNECTIONS TO EXISTING CONSTRUCTION:

- A. The CONTRACTOR shall cut and remove portions of existing construction as required to allow proper installation of new construction.
- B. The CONTRACTOR shall shore, brace and maintain existing structure(s) in a safe condition until permanent supports are completed.
- C. The CONTRACTOR shall repair all damage as a result of installation of shoring and bracing.

1.14 CLEANUP AND REPAIR:

- A. Upon completion of demolition work, the CONTRACTOR shall remove tools, equipment and demolished materials from site.
- B. The CONTRACTOR shall repair demolition performed in excess of that required and return structures and surfaces to conditions existing prior to commencement of demolition work. The CONTRACTOR shall repair adjacent construction or surfaces soiled or damaged by demolition work.
- C. The CONTRACTOR shall remove or modify as indicated all existing construction within the construction limits to the extent necessary to permit construction of the work. The CONTRACTOR shall properly dispose of the material at an approved site according to the State, Federal, and local regulations.

END OF SECTION 02050

SECTION 02072
VEGETATIVE REMOVAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Removal work as required on drawings and as specified in this section and repair of damage to existing facilities to remain.

- B. Related Sections:
 - 1. 02200 - Earthwork.
 - 2. 02931 - Tree Protection.

1.02 SUBMITTALS

- B. Removal Procedure for Site Work: If requested by A/E, submit proposed procedure of removal work.
 - 1. Procedure shall provide:
 - a. Means for safe conduct of work, careful removal, and disposition of materials specified to be salvaged for the Owner.
 - b. Protection of property to remain undisturbed.
 - c. Timely disconnection of utility services.
 - 2. Procedure shall include a detailed description of methods and equipment to be used for each operation, and sequence of each operation.

1.03 PROJECT/SITE CONDITIONS

- A. Existing sidewalks, curbs, paving, landscaping, or other existing work not specified for removal that is temporarily removed, damaged, exposed, or disturbed or altered by removal work shall be repaired, patched, or replaced at no cost to the Owner.

- B. Existing Trees:
 - 1. Do not damage trees within project site specified to be left in place.
 - 2. Protect trees indicated to remain as required with acceptable barricades or temporary fencing during construction.

- C. Environmental Protection:
 - 1. Dust Control:
 - a. Control dust resulting from demolition to prevent spread of dust to occupied portions of buildings and to avoid creation of a nuisance in surrounding areas.
 - b. Do not use water to control dust when it will result in flooding or pollution or other hazardous or objectionable conditions.
 - 2. Fire: Do not dispose of demolished materials or trees, etc., by burning.
 - 3. Explosives: The use of explosives is not allowed.

- D. Site Inspection: Inspect entire project area to determine extent of removal, salvage, and patching work.

1.04 SCHEDULING

- A. Activities in areas next to removal areas cannot be interrupted or disturbed during normal facility hours.
 - 1. Consult with the Owner and A/E to schedule work. See Section 01310 - Construction Schedule.
- B. Utility Companies:
 - 1. Coordinate with applicable utility companies and the Owner for utility line removal, if any, and related capping and utility shutdowns required by such removal work.
- C. Removals:
 - 2. Assign removals to appropriate trades under respective sections, best suited for this type of work to avoid unnecessary damage due to the efforts of unskilled workers.

PART 2 PRODUCTS

2.01 DISPOSITION OF MATERIALS NOT INDICATED OR SPECIFIED TO BE SALVAGED

- A. Title to Materials:
 - 1. Title to materials and equipment to be removed, except salvageable equipment to be retained by the Owner, is vested in the Contractor upon receipt of Notice to Proceed.
 - a. The Owner will not be responsible for condition, loss of, or damage to such materials and equipment after receipt by Contractor of Notice to Proceed.
- B. Remove excess materials and equipment not specified to be salvaged from site and premises upon completion of removal operations.

PART 3 EXECUTION

3.01 REMOVAL WORK

- A. Perform removal work indicated on drawings or as specified in an orderly manner according to accepted construction schedule.
 - 1. Protect work specified to remain.
 - 2. Protect adjacent areas from damage or undue dirt and dust.
 - 3. Wet down debris or rubbish, if necessary, to minimize flying dust.

3.02 EXISTING UTILITIES

- A. Utility work shall be performed according to these specifications for the particular type of utility service involved.

3.03 EXISTING WORK

- A. Existing work may be cut, altered, removed, or temporarily removed and replaced as necessary for the performance of work required.
 - 1. Exception: Unless otherwise indicated on drawings, do not cut or alter structural members without authorization by the A/E.
- B. Filling: Holes and other hazardous openings created by removal work shall be filled following procedures specified in Section 02200 - Earthwork.
- C. Restore damaged or defaced areas or items, remaining in place, of work performed under this Contract to comparable conditions existing before the work.

END OF SECTION 02072

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section Includes: Earthwork for buildings, and grassed or landscaped areas as indicated on Drawings and specified in this section.
- B. Related Sections:
 - 1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
 - 2. 02280 - Soil Treatment.
 - 3. 02931 - Tree Protection.
 - 4. 02935 - Sodding.

1.02 REFERENCES:

- A. American Society of Testing Materials, (ASTM):
 - 1. C136-96a Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. D422-63 Test Method for Particle-Size Analysis of Soils.
 - 3. D698-91 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - 4. D1556-90 Test Method for Density of Soil in Place by the Sand-Cone Method.
 - 5. D1557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
 - 6. D2487-93 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 7. D2922-91 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 8. D2974 Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Materials.
 - 9. D 4972 Test Method for pH of Soils.
- B. Florida Department of Transportation (FDOT)
 - 1. "Standard Specifications for Road and Bridge Construction," latest edition, (FDOT).
- C. Miscellaneous Project Data:
 - 1. Subsurface soil data logs are provided for the CONTRACTOR's reference.

1.03 DEFINITIONS:

- A. Select Fill: Select Backfill shall be clean material free from organic material, clods, and stones greater than 3 inches. Select backfill shall be used for all backfilling operations, unless otherwise indicated on the Drawings (See 2.01 C.1).
- B. Random Fill: Random Backfill shall be clean material free from organic material, clods, and stones greater than 4 inches. Random backfill shall be used for all backfilling operations unless otherwise indicated on the Drawings (See 2.01 C.2).
- C. Unclassified Fill: Unclassified Fill shall be material used to bring areas to grade where there is no potential for slope erosion and the fill will not support a structure of critical function. Unclassified backfill shall be placed as shown on the Drawings (See 2.01 C.3).

1.04 SUBMITTALS: The Contractor shall submit cross-sections for record purposes.

1.05 QUALIFICATIONS: (Not Used)

1.06 RESPONSIBILITIES: (Not Used)

1.07 CERTIFICATIONS AND TESTINGS: Field density tests in accordance with ASTM Standards, for each type of material used in backfilling shall be required. Failure to meet the specified density will require the CONTRACTOR to recompact and retest, at his own expense, those areas directed by the ENGINEER

1.08 INSPECTION COORDINATION: The CONTRACTOR shall provide access to the WORK for the ENGINEER as requested for inspection. The Contractor shall provide 48 hours notice of its intention to begin new WORK activities.

1.09 WARRANTY: (Not Used)

PART 2 - PRODUCTS

2.01 MATERIALS ENCOUNTERED:

- A. The CONTRACTOR may consider all materials encountered in excavations, excluding peat unless the quantities are less than 25 percent of the total volume, as suitable for use as unclassified random fill.
- B. The CONTRACTOR shall use only material that is free of debris, roots, and organic matter in all fill areas. Peat materials are not suitable for use in select fill.
 - 1. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands generally exclusive of clayey and silty material - materials which are free-draining and for which impact compaction will not produce a well-defined moisture-density relationship curve and for which the maximum density by impact methods will generally be less than by vibratory methods.
 - 2. Cohesive materials include silts and clays generally exclusive of sands and gravel - materials for which impact compaction will produce a well-defined moisture-density relationship curve.
- C. The CONTRACTOR shall furnish materials for each type of fill indicated.
 - 1. Select backfill: Select Backfill shall be material that is well graded, free of debris, roots, < 5% organic matter and peat. Select backfill shall be material excavated for the WORK (native) or may be imported. The CONTRACTOR may blend native materials to achieve a material that meets the requirements for Select Backfill. Select backfill shall be free from seeds of nuisance or exotic species. Select Backfill shall meet the following Unified Soil Classification System (ASTM D2487) designations:
 - a. Select Backfill: CL, ML, SC, SW, SP, SM
 - 2. Random Backfill: Random backfill shall be material that is well graded, free of debris, roots, organic matter and peat. Random backfill shall be material excavated for the WORK (native) or may be imported. The CONTRACTOR may blend native materials to achieve a material that meets the requirements for Random Backfill. Random backfill shall be free from seeds of nuisance or exotic species. Random Backfill shall meet the following Unified Soil Classification System (ASTM D2487) designations in addition to the classifications identified for Select Backfill: CH.
 - 3. Unclassified Backfill: Material excavated for the WORK of imported that can be compacted to the required density. Unclassified backfill shall be free for seeds of nuisance or exotic species.

- D. The CONTRACTOR shall consider all materials encountered, regardless of type, character, composition and condition thereof unclassified other than as indicated above. The CONTRACTOR shall estimate the quantity of various materials included prior to submitting Bid Form. Rock encountered shall be handled at no additional cost to OWNER.

PART 3 - EXECUTION:

3.01 SITE_PREPARATION:

- A. Clearing and Demolition: The CONTRACTOR shall perform clearing and demolition as specified in SECTION 02050 Demolition and SECTION 02100 Site Preparation.

3.02 EXCAVATION_AND_TRENCHING:

- A. Trenching for Pipes: The CONTRACTOR shall perform trenching for pipes as shown, required and specified in accordance with SECTION 02221.
- B. Sheeting and Bracing: The CONTRACTOR shall provide sheeting and bracing as required or shown in accordance with the following provisions.
 - 1. Use when required by the specifications or drawings and where resulting slopes from excavation or trenching might endanger in-place or proposed structures.
 - 2. Provide materials on site prior to start of excavation. Adjust spacing and arrangement as required by conditions encountered.
 - 3. Remove sheeting and bracing as backfill progresses. Fill voids left after withdrawal with sand or other approved material.
 - 4. Comply with all applicable sections of OSHA.
 - 5. Comply with all requirements of the Florida Trench Safety Law as specified in the GENERAL CONDITIONS.
- C. Blasting is not allowed under this contract.
- D. Excavation for Structures: The CONTRACTOR shall perform excavation for structures as shown, required and specified below:
 - 1. Excavate area adequate to permit efficient erection and removal of forms.
 - 2. Trim to neat lines where details call for concrete to be deposited against earth.
 - 3. Excavate by hand in areas where space and access will not permit use of machines.
 - 4. Notify the ENGINEER immediately when excavation has reached the depth indicated.
 - 5. Restore bottom of excavation to proper elevation with flowable fill or low resistance concrete in areas over excavated.
 - 6. Conform to the requirements of SECTION 02221

3.03 BACKFILLING:

- A. Pipe Embedment and Backfill: The CONTRACTOR shall perform pipe embedment and backfill as required, shown and specified in accordance with SECTION 02221.
- B. Structures: The CONTRACTOR shall perform backfilling for structures in accordance with the following:
- C. Structure backfill shall be constructed using material suitable for use in select fill, except that stones or rocks greater than two inches in any dimension shall not be placed within 12 inches of the structure. Lifts shall not exceed 12 inches.
 - 1. Structure backfill shall be compacted to 98 percent maximum dry density per AASHTO T-180
 - 2. Backfill only after concrete has attained 70 percent design strength.

3. Backfill adjacent to structures only after a sufficient portion of the structure has been built to resist the imposed load.
 4. Remove all debris from excavation prior to placement of material.
 5. Place backfill in level layers of thickness within compacting ability of equipment used but not to exceed 12".
 6. Perform backfilling simultaneously on all sides of structures.
- D. Unclassified Backfill shall be placed in 12-inch lifts to the lines and grades shown on the drawings or as approved by the ENGINEER. The CONTRACTOR shall compact unclassified backfill to a density approximating the density of surrounding native material and in a manner that will not allow settlement of the completed area.

3.04 MAINTENANCE:

- A. The CONTRACTOR shall protect newly graded areas from actions of the elements.
- B. The CONTRACTOR shall fill, repair and re-establish grades to the required elevations and slopes for any area that shows settling or erosion occurring prior to seeding .

END OF SECTION 02200

SECTION 02221

EXCAVATING, BACKFILLING, AND COMPACTION FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02720 - Storm Drainage System.
3. 15047 - Identification.
4. Division 15 - Mechanical Work.
5. Division 16 - Electrical Work..

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D1556-90 Test Method for Density of Soil in Place by the Sand-Cone Method.
2. D1557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
3. D2487-93 Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. Occupational Safety and Health Administration (OSHA): Trench Safety Act.

1.03 DEFINITIONS

- ###### A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW, and SP properly worked by Contractor to obtain optimum moisture and compaction. Maximum size of rock limited to 6 inches. Use 2 inch maximum size for the top 2 feet below the finish indicated grade.

1.04 SUBMITTALS

- ###### A. Submit copies of tests and records performed as specified to A/E for review before starting work.

1.05 QUALITY ASSURANCE

- ###### A. Regulatory Requirements: Comply with OSHA, Trench Safety Act, Standard 29 C.F.R.s., Chapter XVII, Subpart P (para. 1926.650 thru 1926.653).

1.06 PROJECT CONDITIONS

- ###### A. Excavation, filling, and backfilling for utilities complete for underground utility lines and structures as specified and as shown on the drawings.

B. Existing Utilities:

1. Protect existing utilities from movement, settlement, or other damages.

- C. Trench Safety Act: Provide trench safety systems at all trench excavations where workers may be exposed to moving ground or cave-ins regardless of depth of trench. All trenches more than 5 feet in depth shall comply with OSHA "Trench Safety Act".

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Trench Backfill Materials: Either satisfactory excavated material or fill materials as specified.
- B. Pipe Bedding Material: Bedding material shall be selected or satisfactory backfill material and free of any rocks or stones larger than 2 inches in diameter for cast iron and PVC pipe. Limerock screenings or sand shall be used for copper tubing. (Underground copper lines are 3 inch diameter or less.)

PART 3 - EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 EXCAVATION:

- A. General:
 1. Perform excavating of every description and of whatever substance encountered to depths indicated or specified.
 2. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins.
 3. Keep surface drainage of adjoining areas unobstructed.
 4. Remove excavated materials not required nor suitable for backfill from site.
 5. Remove water by pumping or other acceptable method and discharge at a safe distance from excavation. Continue dewatering until deemed proper or desirable for the installation of utility lines.
 6. Comply with the applicable standards and regulations of Miami-Dade County and the city where building is located.
 7. Sheet piling and shoring shall be done as is necessary for protection of work and for safety of personnel. Excavating shall be by open cut.

- B. Trench Excavations:

1. Make trench of necessary width and depth for proper laying of pipe, with bank as vertical as practical.
2. Coordinate trench excavation to avoid open trenches for prolonged periods.
3. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along their entire length, except portions of pipe sections where it is necessary to excavate for couplings and for proper making of pipe joints or where unsatisfactory materials incapable of properly supporting pipe and utility structures are encountered at bottom of trench.
4. Dig holes and depressions for joints after trench bottom has been graded of length, depth, and width required for properly making the particular type of joint.
5. When unsatisfactory soil, incapable of properly supporting pipe, is encountered at the bottom of the trench, remove such soil to a minimum depth of 12 inches, or 1/4 of the pipe diameter, whichever is greater, below the bottom of pipe and backfill material specified.
6. Over-depths in unstable soil excavation and unauthorized over-depths shall be at the expense of Contractor.

C. Special requirements relating to specific utilities are as follows:

1. Storm Drains:
 - a. Where shown on drawings, make width of trench at and below top of pipe adequate to allow space for workers to place and properly joint pipe.
 - b. Clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe.
 - c. Width of the trench above the level may be as wide as necessary for sheeting and bracing and proper performance of the work.
 - d. For plastic pipe, where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of 2-1/2" or less pipe and a minimum of 36 inches of cover over the top of 3 inch or larger pipe from finished grade unless otherwise indicated or required by local utility. Install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.
 - e. Round the bottom of the trench so at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil or select bedding for as nearly the full length of the barrel as proper joining operations will allow.
 - f. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.
 - g. Perform this part of the excavation manually a few feet ahead of the pipe laying operation by workers skilled in this type of work.
2. Electrical Conduit or Cables:
 - a. Trenches for plastic conduits shall be a depth providing not less than 24 inches of cover from finished grade or 12 inches or greater of cover from underside of slabs to accommodate bending radii, unless otherwise indicated. Install warning tape 8 inches below finish grade or underside of slab. See Section 15047 -Identification.

- b. Trenches for plastic conduit and cables shall be cut to an over-depth of not less than 3 inches and a cushion of rock free soil or coarse sand used for not less than 3 inches bedding and 3 inches backfill over the plastic conduit and cable.
3. Excavating for Appurtenances:
- a. Excavations for structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or shoring used.
 - b. Whenever unstable soil is incapable of properly supporting the structure is encountered in the bottom of the excavation, such soil shall be removed and excavation backfilled as specified herein in paragraph "Trench Excavation".
 - c. Unauthorized over-depths or under-depths in wet or otherwise unstable soil shall be filled with selected backfill material or concrete, as directed, at the expense of the Contractor.

3.03 EXCAVATION OF UNCLASSIFIED MATERIAL

- A. Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, or other similar materials.
- 1. No adjustment will be made in the Contract Price because of the presence (or absence) of rock, concrete, masonry, or other similar materials.

3.04 PROTECTION OR REMOVAL OF UTILITY LINES

- A. Protection:
- 1. Protect existing utility lines indicated on drawings (or the locations of which are made known to Contractor before excavating and trenching) specified to remain, including utility lines constructed during trenching operations, from damage during trenching, backfilling, and compacting operations.
 - a. If such new or existing utility lines are damaged during trenching, backfilling, and compacting operations, repair or replace at no cost to A/E.
 - 2. When utility lines specified to be removed or replaced are encountered within the area of operations, issue notices in ample time for measures to be taken to coordinate necessary interruption of services.
- B. Repair of Damage to Unknown Existing Utility Lines:
- 1 Existing utility lines not shown on drawings (or the location of which is not known to Contractor in time to avoid damage) damaged during trenching operations shall be repaired by Contractor and an adjustment to the Contract Price will be made.

3.05 BACKFILLING

A. General:

1. Coordinate backfilling with testing of utilities. Leave sheeting in place where damage is likely to result from withdrawal.
2. Carefully backfill trenches with satisfactory specified materials.
3. Bring backfill up evenly in 9 inch maximum layers, loose depth, and thoroughly and carefully compact with mechanical or hand tampers until pipe has a minimum cover of one foot. Take care not to damage the pipe.
4. Deposit remainder on the satisfactory backfill material in the trench in one foot layers and compact by mechanical means to percentages as specified.
 - a. Trenches and excavation pits improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, refilled and compacted, with the surface restored to the specified grade and compaction.
5. Keep excavations free of ground and surface water until backfilling operation is complete.

B. Appurtenances:

1. At structures, remove forms and trash before backfilling.
 - a. Place satisfactory backfill materials symmetrically on all sides in 9 inch maximum loose depth layers.
 - b. Moisten each layer, if necessary, and compact with mechanical or hand tamper, taking care not to injure the structure by excessive tamping.
2. Materials and density shall be as previously specified for trenches depending upon location of the structure.

C. Compaction:

1. Material may be compacted by a hand tamper, a powered hand tamper, a vibrating tamper, or mechanized power tamper provided such compaction percentages meet the required density as specified below.
2. Backfilling and compacting by means of hydraulic methods will not be allowed except as may be approved by A/E.
 - a. Compact each layer to not less than the percentage of maximum density specified below, determined according to ASTM D1557, Method D:

FILLS AND BACKFILL

Under slabs and pavement
Under walk areas, top 12 inches
Under walk areas, below top 12 inches
Under landscape areas
Under other areas noted on Site Plan

COHESIONLESS SOIL

95%
95%
90%
85%
85%

3.06 TESTING

- A. Testing Laboratory to perform specified tests at the Contractor's expense.
- B. Tests of Materials shall be as follows:
 - 1. Laboratory Tests for Moisture Content and Density:
 - a. According to ASTM D1557, one test for each material encountered or proposed to be used.
 - 2. Field Tests for Moisture Content and density:
 - a. According to ASTM D1556, one test per layer per 100 linear feet of ditch.

END OF SECTION

SECTION 02470

SITE FURNISHINGS & AMENITIES

PART I - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the Site Furnishings work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".
- B. Including but not necessarily limited to the following:
 - 1. Tables & Chairs with Umbrellas
 - 2. Benches
 - 3. Shade Canopies
 - 4. Trash Receptacles

1.03 RELATED WORK

- A. Section 03310 - Cast-in-Place Concrete for Site.

1.04 SUBMITTALS

- A. Manufacturer's Data: Descriptive data of installation, methods, procedures and maintenance.
 - 1. Guarantees and warranties of products.
- B. Complete shop drawings for all items of work under this section indicating all details of fabrication and installation, including sizes, shapes, finishes, colors, thicknesses, material quality and all other related work applicable to the items of this section.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials with manufacturer's original containers or packaging, with identifying tags and labels intact and legible.
- B. Upon delivery, inspect shipments to assure compliance with requirements

of Contract Documents and approved submittals, and that all materials are properly protected and undamaged.

C. Store and handle all materials so as to prevent soiling, damage, or deterioration. Make periodic inspections of all stored materials to assure that they remain free from damage and deterioration. Damaged products shall be rejected.

PART II – PRODUCTS

TABLES & CHAIRS WITH UMBRELLAS

- A. Product: Large Table: 42” round Catena Table by Landscape Forms or City approved equal. White powder coated. Color shall be submitted for final approval to the City. Finish to be powder coated.
- B. Product: Plaza Table: 30” round Catena Table by Landscape Forms or City approved equal. White powder coated. Color shall be submitted for final approval to the City. Finish to be powder coated.
- C. Product: Chair: Catena Chair by Landscape Forms or City approved equal. White powder coated. Color shall be submitted for final approval to the City. Finish to be powder coated.
- D. Product: Large Umbrella: Equinox by Landscape Forms or City approved equal. Size: 97”x96”. Color: Buttercup Yellow. Color shall be submitted for final approval to the City.
- E. Product: Plaza Umbrella: Equinox by Landscape Forms or City approved equal. Size: 97”x96”. Color: Buttercup Yellow. Color shall be submitted for final approval to the City.
- F. Location:
 - 1. Locations and quantities as indicated on Landscape Plan and/or as field located by the City.
 - 2. Each Plaza Table to be equipped with one Plaza Umbrella.
 - 3. Each Large Table to be equipped with one Large Umbrella.
 - 4. Each 30” Table to have (2) chairs.
 - 5. Each 42” Table to have (4) chairs.
 - 6. Quantity for Plaza Tables is 10.
 - 7. Quantity for Large Tables is 3.

BENCHES

- A. Product: Court Benches: 10’ Cabana Bench by Shady Court or City approved equal. Wood Bench. Material & Finish shall be submitted for final approval to the City. Backless Bench with no arms.
- B. Product: Stand-Alone/Plaza Benches: Persidio Bench by Landscape Forms or City approved equal. White Powder coat. Color & Finish shall be submitted for final approval to the City. Backless Bench with no arms.

- C. Location:
1. (6) to be located between courts – Center benches under Shelter/Canopy structures in between courts, as indicated on Landscape Plan. Mount on Shelter posts per Manufacturer's details and specification.
 2. (2) Stand-alone Benches to be located east of the Tennis Center Building on the edge of the plaza. Surface mount on a 4" concrete slab.

SHADE CANOPIES / SHELTERS

- A. Product: 10'x6' Cabana Tennis Court Canopy/Awning by Shady Court or City approved equal. Color: Forest Green/White Striped Canvas Canopy. Canopy specifications shall be submitted to the City for final approval on materials and color. Embedded. Size: 88"x113". Provide two-sided flat backless bench between posts. Surface Mount.
- B. Location: (6) Between courts as indicated on Landscape Plan.

TRASH RECEPTACLES

- A. Product: Site Receptacle: Lakeside by Landscape Forms or City approved equal. Top opening. 36-gal liner. Color: White powder coated. Color shall be submitted for final approval to the City. Finish to be powder coated. Side Pattern: 'Grass'.
- B. Location: (3) Locations and quantities as indicated on Landscape Plan or as field located by the City.

PART III - EXECUTION

3.01 WORKMANSHIP AND INSTALLATION

- A. Provide Amenities and Furnishings as indicated and detailed on the drawings, and as per manufacturer's standard printed specifications, instructions and recommendations.
- B. Provide complete manufactured cut sheets on all manufactured items, include installation hardware and methods.

END OF SECTION 02470

SECTION 02529

CONCRETE SIDEWALKS

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

- 1 02200 - Earthwork.
- 2 03300 - Cast-In-Place Concrete.

1.02 REFERENCE STANDARDS

- A. Miami-Dade County Public Works Manual (M-DCPW), latest edition.

1.03 SUBMITTALS

- A. Submit properly identified manufacturer's literature and installation instructions before starting work.
- B. Concrete Tests: Submit for review.

1.04 QUALITY ASSURANCE

- A. Perform tests according to the specified standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete:

- 1 Provide concrete for sidewalks as specified in Section 03300.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Concrete Sidewalks: Provide as indicated on drawings and specified in Section 145 of M-DCPW.

3.03 TESTING

- A. Provide tests as specified in Section 03300, Sections 145 of M-DCPW and Section 520 of FDOT.

END OF SECTION 02529

SECTION 02720

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

- 1 02221 -Excavating, Backfilling, and Compaction for Utilities.
- 2 03300 -Cast-in-place Concrete.

1.02 REFERENCES

A. The American Society for testing and Materials (ASTM):

- 1 A53-96 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- 2 A74-96 Specification for Cast Iron Soil Pipe and Fittings.
- 3 C131-96 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- 4 C443-94 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
- 5 C564-95a Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- 6 D3034-96 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

B. The American Association of the State Highway Transportation Officials (AASHTO).

C. Florida Department of Transportation (FDOT), latest edition, Standard Specifications for Road and Bridge Construction.

- 1 Delete the basis of payment and other pay measurement requirements from FDOT specifications.
- 2 Payment for work specified in this section will be included as part of lump sum bid for entire project according to Construction Documents.

D. Miami-Dade County Public Works Manual - Standard Specifications (DCPW).

E. Cast Iron Soil Pipe Institute.

1.03 SUBMITTALS

- ###### A. Submit properly identified shop drawings and manufacturer's catalog cuts, technical data, and certificates on the following for review before starting work.

- 1 Precast concrete structures.
- 2 Frames and grates.
- 3 Pipe.
- 4 Test reports.
- 5 Plastic filter fabric.

B. Include manufacturer's certificates of compliance or certified analysis according to applicable standards with each shipment of material.

1.04 QUALITY ASSURANCE

A. Work shall be performed according to plans and specifications in a neat and accurate manner.

1.05 STORAGE

A. Keep materials, structures, equipment, and appurtenances stored on the site clean and free of foreign materials.

B. Replace damaged items at no cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. High Density Polyethylene Storm Drainage Pipe:

- 1 Advance Drainage Systems, Inc.
- 2 Hancor, Inc.

B. Corrugated Metal Pipes:

- 1 Helically corrugated aluminum alloy round pipe shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.
- 2 Helical corrugated aluminum-alloy pipe perforated shall comply with AASHTO M196. 16 gage thickness unless otherwise indicated on the drawings.
 - a. Perforated pipe shall have perforations of 1/4" to 3/8" diameter holes at + 2-3/4" o.c., with a minimum of 114 holes per linear foot.
- 3 Helically corrugated steel pipe shall comply with AASHTO M36. Pipe shall be fully bituminous coated according to the requirements of AASHTO M190, for Type A. Thickness: 16 gage unless otherwise indicated on the drawings.
- 4 Joint: Locking bands with a rubber or neoprene gasket for a flexible watertight joint. Locking band shall comply with AASHTO M36 and gasket shall comply with ASTM C443.

C. PVC Sewer Pipe and Fittings: ASTM D3034 for SDR 35.

- 1 Joints: Bell spigot type, elastomeric gasket joints.

- D. Cast Iron Soil Pipe: Comply with ASTM A74 for Cast Iron Soil Pipe and Fittings.
 - 1 Joints: Provide with roll-on joints complying with ASTM C564 and Cast Iron Soil Pipe Institute recommendations for compression joints.
- E. Black Steel Pipe: Comply with ASTM A53 for schedule 40 Pipe and Fittings.
- F. Catch Basins and Storm Manholes: Cast-in-place concrete or precast concrete, with cast iron frames and hinged grates as indicated on drawings and specified in Section 425 of FDOT Specification.
- G. Ballast Rock: Ballast rock shall be obtained from fresh water local sources. When subjected to ASTM C131 tests, the loss shall not exceed 40 percent. Ballast rock designated as 2 inches shall fall within the 3/4" to 2-1/2" range.
- H. Plastic Filter Fabric: Plastic filter fabric shall comply with Section 985 of the FDOT "Plastic Filter Fabric" for the piping trench.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Excavation and Backfilling for Trenches and Manholes: As specified in Section 02221-Excavating, Backfilling, and Compaction for Utilities.
- B. Placing Pipe:
 - 1 Carefully examine each pipe before laying. Do not use defective or damaged pipe.
 - 2 Lay pipelines to grades and alignment indicated.
 - 3 Provide proper facilities for lowering sections of pipe into trenches.
 - 4 Inspect pipe in place before backfilling and remove and replace those damaged during placement at no cost to the Owner.
 - 5 Storm Sewer Pipe:
 - a. Shape bottom of trench by hand to give uniform circumferential support to lower one fourth of each pipe.
 - b. Where applicable, lay pipe upgrade with tongue or spigot ends pointing in direction of flow.
 - c. Lay each pipe true to line and grade indicated on drawings and in such a manner to form a close concentric joint with adjoining pipe and to prevent sudden offsets of flow line.
 - d. Keep interior of storm sewer free of dirt and superfluous materials as work progresses.

- e. Keep a suitable swab or drag in pipe where cleaning after laying is difficult due to small pipe size and pull forward past each joint immediately after each jointing has been completed.
- f. If maximum width of trench at top of pipe as specified is exceeded, install either concrete cradling, pipe encasement or other bedding as may be required to support added load of backfill.
- g. Keep trenches for sections of sewer free from water until pipe-jointing material has set and trench backfilled.
- h. Do not lay pipe when condition of trench or weather is unsuitable for such work.
- i. Keep open ends of pipes and fittings securely closed at times when work is not in progress.
- j. If pipe cannot be adequately supported on undisturbed earth or tamped backfill, encase pipe in concrete or support it on a concrete cradle.

C. Concrete Structure:

- 1 Concrete structures shall be constructed according to plans and as specified on Concrete Work - Division 03300, excavation and backfill as specified in Section 02221 - Excavating, Backfilling, and Compaction for Utilities, DCPW, and as indicated on the drawings.
- 2 Leveling courses at structures for manholes and catch basins shall be 3 to 12 inches and according to DCPW SD4.5.

D. Catch Basins and Manholes: Frames and Inlet Grates or Solid Covers: Set the cast iron frames and grates in a bed or mortar and carefully adjust to elevations shown on the drawings.

3.03 CLEAN UP

- A. If drainage well has been used for disposal of water from dewatering operation, upon completion of dewatering clean out the detention tank and perform capacity tests as specified to insure that the disposal well is capable of disposing of storm water as indicated on drawings and specified in this Section.

END OF SECTION 02720

SECTION 02810
IRRIGATION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

- 1 02200 - Earthwork.
- 2 02221 - Excavating, Backfilling, and Compaction for Utilities.
- 3 02900 -Landscaping.
- 4 02935 -Sodding.
- 5 Division 16 - Electrical.

1.02 WORK INCLUDED

A. Provide labor, materials, necessary equipment, and services to complete the underground sprinkler systems work, as indicated on the drawings and as specified, except for items indicated as not-in-contract (NIC).

B. The completed and proper construction of the landscape irrigation system shall include, but not be limited to:

- 1 A complete and operable system for the irrigation of areas to be landscaped on the project site.
 - a. Size the pump for the number of circuits/zones for proper irrigation during a maximum 5 hour per day irrigation cycle to achieve 1.5 inches per week.
 - b. Maintain operation of the remaining existing system where needed, while construction of the new system is under way.
 - c. Plans and specifications are intended to include items obviously necessary and requisite for the proper irrigation of the project.
 - d. Provide any additional labor, materials, and equipment required for a proper system.
- 2 For existing sites, locate, interface, and connect, where indicated, the existing system to the proposed.
- 3 Repair any of the existing irrigation system damaged during construction.
- 4 OWNER will supply as-built-plans of the existing system.

C. On-Site Conditions.

- 1 Protection of Property:

- a. Preserve and protect site conditions to remain from damage due to this work. In the event damage does occur, damage shall be completely repaired to its original condition at no additional cost to the Owner.

2 Trenching:

- a. Trenching or other work under the leaf canopy of trees shall be done by hand or by other methods so that no branches are damaged in any way.
- b. Trenching around existing plant material shall be done by hand to minimize root disturbance.
- c. Buildings, walks, walls, and other property shall be protected from damage. Open ditches left exposed shall be flagged and barricaded by approved means.
- d. Restore disturbed areas to their original condition.

3 Protection and Repair of Underground Utilities:

- a. Request the proper utility company to stake the exact location of any underground lines including but not limited to electric, gas, telephone service, water, and cable.
- b. Take whatever precautions necessary to protect underground lines from damage. In the event damage does occur, damage shall be completely repaired to its original condition, at no additional cost to the Owner.

4 Protection of Existing Plants and Site Conditions:

- c. Take necessary precautions to protect site conditions to remain. Should damages be incurred, repair the damage to its original condition at no additional cost to the Owner.
- d. Any disruption or disturbance of any existing plant, tree, shrub, or turf, or any structure shall be completely restored to the satisfaction of the Owner at no additional cost to the Owner.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

- 1 A53-96 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- 2 D1785-96a Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 3 D2564-96a Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- 4 D2855-96 Practice for Making Solvent-Cemented Joints With Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

1.04 SUBMITTALS

- A. Submit properly identified manufacturer's literature before starting Work.

B. Submit Shop Drawings on the following:

- 1 Pipe and Fittings.
- 2 Sprinkler Heads.
- 3 Swing joints.
- 4 Gate Valve.
- 5 Electric Control Valve.
- 6 Pressure Gage.
- 7 Controller.
- 8 Foot Valve.
- 9 Compound Gage.
- 10 Pressure Switch.
- 11 Backflow Preventors.
- 12 Valve Boxes.
- 13 Pressure Relief Valve.

C. Record Drawings:

- 1 After completion of installation, furnish completed as-built reproducibles showing locations of sprinkler heads, valves, drains, and piping to scale, with dimensions where required or necessary.
 - a. Show vertical and horizontal deviations from the bid documents made during construction affecting, but not limited to, the mainline pipe, controller locations, remote control valves, quick-coupling valves, and sprinkler heads.
 - b. The drawing shall also indicate and show approved substitutions of size, materials, manufacturers' names, and catalog numbers.
 - c. Piping shall be dimensioned and drawn to scale.
 - d. Remote control valves and isolation valves shall have 2 measurements from fixed objects.
- 2 The A/E will supply one complete set of sepia mylar prints to be used for Record Document submittal. Transfer record documents information outlined above to these reproducible prints.
- 3 At contract close out, deliver the completed set of sepia mylar prints fully updated and containing the information outlined above to the A/E for the Owner.
- 4 Furnish two blueline copies of "as-built" drawings. These drawings shall be delivered to the Landscape Architect before his review for Substantial Completion of the work.

D. Operation and Maintenance Manuals:

- 1 Prepare and deliver to the Landscape Architect within ten calendar days before completion of construction a minimum of three hard cover binders with three rings containing the following information:
 - a. Index sheet stating the contractor address and business telephone number, list of equipment with names and addresses of local manufacturers' representatives.
 - b. Catalog and parts sheet on every material and equipment installed under this contract.
 - c. Complete operating and maintenance instructions on major equipment components.
 - d. Provide the Owner's maintenance personnel with instructions for major equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.
 - e. Furnish a reduced color-coded copy of the as-built drawings laminated in plastic, and mounted inside the controller cover. Note the valve number on drawings and include same number on tag attached to valve, or engrave on outside cover of valve box.

1.05 WARRANTY

- A. Fully warrant the landscape irrigation system for a period of one year after the written confirmation from the Landscape Architect that the warranty period is in effect.
- B. During the warranty period, enforce manufacturer and supplier warranties. Any malfunctions, deficiencies, breaks, damage, disrepair, or installation by the contractor and his suppliers shall be immediately and properly corrected to the proper order as directed by the Owner or Landscape Architect.
- C. Make full and immediate restoration for any damages caused by system malfunction at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe and Fittings:

- 1 All materials throughout the system shall be new and in working condition.
- 2 Underground Piping:
 - a. Main lines (Irrigation lines on the supply side of the system up to the zone control valves).
 - (i) Pipe 4" Diameter and Less: Schedule 40 PVC plastic pipe 1120 or 1220, NSF approved, and complying with ASTM D1785.
 - (ii) Pipe Larger than 4" Diameter: PVC plastic pipe, SDR 21, 1120, or 1220, complying with to ASTM D2241 with a minimum pressure rating of 200 psi.

(iii) Fittings: PVC molded fittings manufactured of the same material as the pipe and suitable for solvent weld. Slip joint ringtie seal (SCH 40) complying with ASTM D 2466 or threaded connections (SCH 80) complying with ASTM D2464.

b. Lateral lines (Irrigation lines on the sprinkler head side of the system from the control valves to the sprinkler heads.)

(i) Schedule 40 PVC plastic pipe 1120 or 1220, NSF approved, and complying with ASTM D1785.

c. Swing Joints:

Triple elbow swing joints for all rotors and quick coupling valves. 2) Nipples: PVC complying with ASTM D1785, Type 1, Grade 1, Schedule 80. 3) Poly-pipe swing joints are not allowed. 4) Fittings schedule 40 PVC ells and street ells.

3 Above Ground Piping:

a. Spray nozzle riser pipe: UV radiation resistant SCH 80 PVC nipple.

4 Pipe Sleeves: Schedule 40 galvanized steel pipe providing minimum 1/2" clearance between sleeve and PVC sprinkler pipe.

B. Solvent Cement: Heavy body grey, according to ASTM D2564.

C. Thrust Blocks:

1 Main line piping shall have thrust blocks sized and placed according to pipe manufacturer's recommendations and as shown on drawings.

2 Thrust blocks shall be standard concrete mix according to ASTM C150, ASTM C33, and ASTM C94 with a 28 day compressive strength of 3,000 PSI.

3 Thrust blocks shall be installed at tees, elbows, 45's crosses, reducers, plugs, caps, and valves.

4 Ensure stability of thrust blocks.

D. Sprinkler Heads:

1 Provide sprinkler heads as scheduled on Drawings.

Paint above grade risers for stationary head with 2 coats of exterior flat black paint unless already black painted by manufacturer.

E. Gate Valve: Nibco Model T-111, all bronze body, Class A, Type II, or accepted equivalent.

F. Control Valve Box: Precast polymer concrete box and green lockable cover with the words "Irrigation Valve".

G. Irrigation Control Wire:

1 Electrical control and ground wire shall be irrigation control cable. Wiring used for connecting the automatic remote control valves to the automatic independent station

controllers shall be Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.

- 2 Insulation shall be 4/64" thick minimum covering of an approved thermoplastic compound for positive waterproof protection of the following sizes:
 - a. Control wire from independent station controllers to electric valves shall be AWG Size 14/1.
 - b. Any major controller wire splices (10-12wires) need to be in junction box.
- 3 Verification of wire types and installation procedures shall be checked to conform to local codes.

H. Quick Coupler Valves:

- 1 Quick coupling valves shall be 3/4" Rainbird #3RC Series single piece valve.
- 2 Valve shall be mounted on tripe swing joint as shown on drawings.
- 3 Provide Rainbird #33K Series quick coupler keys and two 3/4" swivel hose ells to the Owner for each quick coupling valve installed.
- 4 Quick couplers shall be located and installed as specified.

I. Electric Zone Control Valve:

- 1 Rainbird PGA plastic valves.
- 2 Non-corrosive piston and cylinder assembly, 24 volts AC solenoid.

J. Controller:

- 1 Electromechanical, 14 day, 24 hour, 110 volts, 60 Hz AC with 24 volts output, ESP Series by Rainbird.
- 2 Provide number of stations as shown in Drawings.
- 3 Provide complete with internal transformer.
- 4 Provide pump switch control circuit.

K. Pressure Relief Valve:

- 1 Watts No.53L, or accepted equivalent.
- 2 Sized as indicated on Drawings.

L. Pressure Gage:

- 1 4-1/2" diameter drawn steel case, 0-100 psi range, Marshalltown No.23, or accepted equivalent.

- 2 Provide gage cock.
- M. Foot Valve:
 - 1 Flomatic Model 60-S, bronze body, or accepted equivalent.
 - 2 Valve shall be 4 inch size.
- N. Compound Gage:
 - 1 4-1/2" steel case, Marshalltown Model 45, or accepted equivalent.
 - 2 Provide gage cock.
- O. Pressure Switch: Mercoid Series "D", with visible calibrated dial or accepted equivalent.
- P. Backflow Preventor: Reduced pressure type. Comply with local authority requirements and as indicated on Drawings.
- Q. Solvent Cemented Joints in PVC Pipe and Fittings: According to ASTM D2855.
- R. Rain Sensor/Rain Switch: As indicated on drawings.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Excavation, Placing Piping, and Backfilling:
 - 1 Excavate trenches for underground piping to provide:
 - a. A minimum of 24 inches cover under pavement without pipe sleeve.
 - b. A minimum of 12 inches cover with pipe sleeve:
 - c. A minimum of 12 inches cover in landscaped areas for lateral lines 4" and under.
 - d. A minimum of 18 inches cover in landscaped areas for main lines.
 - e. A minimum of 24 inches cover in landscaped areas for main lines larger than 4".
 - f. The pipe and fittings shall be carefully inspected before installation of trench.
 - g. Rocks over 2 inches in diameter and unsuitable bearing material shall be removed from trench according to manufacturer's recommendations.
 - 2 Backfill shall be carefully placed to avoid pipe dislocation.
 - a. Backfill material shall be free of rocks, stumps, roots and other unsuitable material.

- b. Backfill shall be placed in six inch lifts and shall be thoroughly compacted, except in planting area where planting soil is used.
 - c. In planting areas, the top six inches shall be suitable planting soil.
 - d. Backfill under pavement or sidewalks shall be compacted to 98 percent of maximum A.A.S.H.O. T-180 density.
 - e. The surface of backfilled trenches shall be even with the surrounding ground surface.
- 3 Plant, structures and utility locations shall take precedence over sprinkler and pipe locations. The contractor shall coordinate the routing of lines and final head locations with the placement of specimen trees, shrubs and utilities.
- 4 After pipe has been installed and tested, cover with 3 inches of rock-free soil and backfill trenches to grade.
 - a. Backfill shall be tamped in place.
 - b. Remove from the site, materials not suitable or required for backfill.
- 5 Coordinate underground piping location with new tree locations and portable building locations to avoid interference.
- B. Swing Joints: Install sprinkler heads on the swing joints as indicated on Drawings.
- C. Threaded Joints in PVC Pipe and Fittings:
 - 1 Use Teflon thread tape or liquid Teflon thread lubricant.
 - 2 Do not use pipe wrenches or pump pliers on PVC pipe or fittings.
- D. Sprinkler Heads:
 - 1 Install flush with the finished grade, or as called for in Drawings.
 - 2 Sprinkler heads located along curbs and edges of paving shall be installed 6 inches from back of curb or paving. Along roadways without curbs, sprinkler heads shall be located 18 inches from edge of pavement.
- E. Controllers:
 - 1 Equip with lightning protection and grounded to a standard 5/8" copper clad steel ground rod driven a minimum of 8 feet into the ground and clamped.
 - 2 Surge protection of 10 OHMS or less is required. If grounding rods will not give the 10 OHMS or less, 150 feet of bare #6 wire shall be installed 8 inches to 12 inches deep into an irrigated area.
 - 3 This wire shall be connected to the ground rod by a brass, single piece clamp.

- 4 Wire used to connect equipment to grounding rod shall be one size larger than largest wire used on the irrigation system at same location, and connected with a brass, single piece clamp.

F. Control Wire Installation:

- 1 Install control wires at least 18 inches below finish grade and lay to the side of the main line. Provide a minimum of 24 inches of looped wire slack at valves and snake wires in trench to allow for contraction of wires. The color-coded wires in bundles at 10 foot intervals. The wire shall be laid in the trench before the installation of the pipe. The wire shall be beneath and 6 inches to the side of the main line pipe.
- 2 Underground splices shall be made at electric valves in valve boxes. Solder splices and coat with elastomeric waterproof cement. Wrap with electrical tape and coat again with elastomeric waterproof cement.
- 3 Wire passing under existing or future paving or construction shall be encased in Schedule 40 PVC conduit extending at least 12 inches beyond edges of paving and stabilized for construction. Any wire in plant beds shall be placed in 3/4" Class 160 PVC with 18 inch minimum burial. Installation procedures shall comply with local codes.
- 4 Electrical connections to electrical control devices shall be made with Rainbird Pen-Tite connector or accepted equivalent.

G. VALVE AND VALVE BOX INSTALLATION

- 1 Gate Valves: Install as located and detailed on the drawings. Position boxes in straight line layouts.
- 2 Quick Coupling Valves:
 - a. Install on main line pipe in areas shown on the drawings.
 - b. The connection between the main line and quick coupler valve shall be with a threaded Schedule 40 PVC pipe and triple swing joint.
- 3 Electric Control Valves:
 - a. Install in specified valve boxes.
 - b. The valve shall have 6 inches of 3/4" pea gravel installed below the bottom of the valve.
 - c. The valve shall be connected to the main line as shown in the details.
 - d. If the valve box does not extend to the base of the valve, a valve box extension shall be installed.
 - e. Electric control valves shall be installed where shown and grouped together where practical. Place no closer than 36 inches to walk edges, building, and walls. Placement shall neatly reflect the adjacent site geometry.

f. Adjust the valve to provide flow rate or rated operating pressure required for each sprinkler circuit.

H. PAINT

- 1 Exterior alkyd enamel, forest green, or as accepted by the Owner, shall be used on aboveground PVC risers and other designated irrigation equipment.
- 2 Provide paint sample before starting painting.

3.03 CLEANING, TESTING, AND BALANCING

- A. Before testing, thoroughly flush piping system until clean.
- B. Do not cover piping system with backfill until tests are satisfactorily performed.
- C. Hydrostatically test the piping system at 100 psi for 1 hour with no loss in pressure.
 - 1 Test the piping system with plugs at swing joint and branch the locations.
 - 2 Install swing joints after hydrostatic testing is satisfactorily performed.
- D. Notify A/E 24 hours before any test and obtain acceptance of tests from A/E before covering piping.
- E. Provide pattern, throw, and delivery as shown on Drawings.
- F. Adjust and balance the components of the piping system to provide complete coverage with a minimum of overthrow.
- G. Provide an 8" x 10" reduced laminated photocopy, inside controller box door, of the irrigation plan with color coded circuits noted in sequence equal to automatic operation.

END OF SECTION 02810

SECTION 02830

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Coordinate chain link fence & gate work with work before and after.

1.2 REFERENCES

- B. American Society for Testing and Materials (ASTM): Specifications for
 - 1 A123A-08 Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 - 2 A641-09 Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3 A824-05 Metal-Coated Steel Marcellled Tension Wire for Chain Link Fence.
 - 4 C94-07 Ready-Mix Concrete.
 - 5 F567-07 Standard Practice for Installation of Chain Link Fence.
 - 6 F626-08 Fence Fittings.
 - 7 F1043-08 Strength & Protective Coatings on Steel Chain Link Fence Framework.
 - 8 F1083-08 Pipe, Steel, Hot Dip Zinc-Coated, Welded, for Fence Structures.
- C. American Society of Mechanical Engineers (ASME) / American National Standards Institute (ANSI) joint standard:
 - 1 B36.10 Welded and Seamless Wrought Steel Pipe

1.3 SUBMITTALS

- A. Product Data.
 - 1 Chain link fence and components, including producer's installation instructions.
 - 2 Submit shop drawings for schedule of treatment, primer and enamel for painting bollards.
 - 3 Draft of Special Warranty from chain link fence & gates producer to Owner.
- B. Shop Drawings.
 - 1 Layout and details of corner, end post, gate, gate post, and baffle construction, including types and sizes of members, fabric, fastenings and fittings.
 - 2 Show gate leaf sizes and bracing, gate swings, which items of hardware are welded to gate leaves in shop, and the location of keepers and stops at end of swing.

- 3 Show closer spacing of posts where narrower bays are needed to keep sloping bottom rails close to sloping grades.
- 4 Identify any bays where tension wire has been approved by A/E.

C. Samples.

- 1 Colored chain link plastic slats, in colors selected by A/E.
- 2 Windscreen
- 3 Post and Pole finishes

1.4 SECURITY

A. Maintain the worksite in secure condition as follows:

- 1 At the beginning of each work day, remove temporary fence, barricades, and other security items from that portion of the worksite perimeter where the new permanent chain link fence work will be done that day.
- 2 Before the end of each work day, protect the entire facility using temporary chain link fence or plastic mesh barricades that surround safety hazards and create a continuous worksite fence perimeter at least 6 ft high.
- 3 When a continuous temporary perimeter fence cannot be provided during installation of new fence, provide the services of a licensed security guard until the security of a full perimeter fence is restored.

1.5 SPECIAL WARRANTIES

A. Chain Link Fence Assembly – Material Only

- 1 Scope of Special Warranty: Replace defective galvanized steel items within the chain link fence and gates assembly, such as posts, rails, braces, fittings, fabric, fasteners, hardware, and accessories.
 - a. "Defective": Galvanized steel items in the assembly that develop red rust over more than 5% of its surface during warranty period.
 - b. The chain link fence manufacturer shall be named as the entity issuing the limited warranty in the interest of the Owner.
 - c. In satisfying the warranty the manufacturer shall provide material replacing rusted components, without paying for delivery, tax, or the labor of removing/replacing.
- 2 Special Warranty period / duration: From date of Substantial Completion of the Work until 12 years after that date
- 3 Exceptions.
 - a. Damage from improper design or use; accidents, acts of God, and abuse.

- b. Only galvanized steel components supplied by the chain link fence and gates manufacturer are covered under this warranty.

PART 2 PRODUCTS

A. CHAIN LINK FENCE AND GATES

B. Description.

- 1 Fence and baffles. Steel chain link fabric on galvanized steel pipe posts, with other steel pipe framing, such as rails and bracing, with wires and fastenings and steel or iron fittings, all items galvanized.
- 2 Gates. Steel chain link fabric on welded steel pipe frames and bracing, with fastenings and steel hardware, all items galvanized. Any fence mat used must be made with Knuckled Selvage only. No twisted selvage will be accepted.

- 2.1 Chain link fence and gate work also includes, only when and to the extent shown in the Construction Documents, such items as colored slats.

2.3 TEMPORARY FENCING

- A. Posts and Bracing: At least NPS 1-1/2 line and NPS 2-1/2 end / corner / pull / gate posts, non-corroding, driven in compacted soil sufficient to hold fence in place against fabric-stretching and wind forces, with rails and bracing.

- 1 Provide the posts and their bracing in quantity and spacing as needed to secure the site against unauthorized entry during construction.
- 2 Where soil does not keep posts vertical under forced entry, rain softening, or wind loads on fence, set posts in concrete footings.

- B. Gates: Provide 6 ft. high, lockable, non-sagging gates in quantity and width as needed to give access to the site by authorized users.

2.4 FENCE POSTS, CAPS, AND FOOTING DIMENSIONS

- A. Description. Zinc galvanized round steel pipe and post caps.

- 1 Steel pipe: ASTM F1043, Group IC, $f_y = 50,000$ lb/in².
- 2 Do not use: Channel-formed steel, square steel pipe, or aluminum posts.
- 3 Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.
 - a. Do not use: SS40 zinc coating.
- 4 Post loop caps. Provide on line posts and where needed to let top rail pass.
- 5 Post dome caps: Provide on corner, end, pull, and gate posts.
- 6 Pipe size convention: Nominal pipe size (NPS); ASME/ANSI B36.10.

- B. Standards:

- 1 Post galvanizing: ASTM A123, Table 2, Coating Grade 85.
- 2 Post dimensions: ASTM F1083, Table 1, Standard Weight, Schedule 40.
- 3 Fence post sizes: ASTM F1043, from Table 3 or larger as specified.
- 4 Gate post sizes: ASTM F567, from Table 2 or larger as specified.

C. Line Post Size Schedule.

<u>Height above grade</u>	<u>6 & 8 ft</u>	<u>4 ft</u>
NPS (Nominal Pipe Size)	2	1-1/2
Pipe OD (outside diameter), in.	2.375	1.900
Pipe wall thickness, in.	0.154	0.145
Post spacing, ft oc	10	10
Minimum footing depth, in.	30	24
Minimum footing diameter, in.	10	8

D. Corner, End, and Pull Post Schedule.

<u>Height above grade</u>	<u>6 & 8 ft</u>	<u>4 ft</u>
NPS	3-1/2	2
Pipe OD, in.	4.000	2.375
Pipe wall thickness, in.	0.226	0.154
Minimum footing depth, in.	36	30
Minimum footing diameter, in.	16	10

E. Gate Post Schedule for Gates up to 6 ft High.

<u>Gate leaf width</u>	<u>4-1 to 8 ft</u>	<u>up to 4 ft</u>
NPS	2-1/2	2
Pipe OD, in.	2.875	2.375
Pipe wall thickness, in.	0.203	0.154
Minimum footing depth, in.	36	30
Minimum footing diameter-in.	12	10

F. Producer.

- 1 Allied Fence / Tyco.

- 2 Master Halco.
- 3 Merchants Metals.
- 4 Sonco Worldwide.
- 5 Equal product in quality and performance approved by A/E.

2.5 BRACES AND RAILS

A. Description. Zinc galvanized steel pipe.

- 1 Accessories, such as truss rods, turnbuckles, rail sleeves, bolts, washers, and nuts: Hot dip galvanized steel.
- 2 Size: NPS 1-1/4 in., OD 1.660 in., 0.140 in. wall thickness.
- 3 Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.

B. Standards:

- 1 Pipe galvanizing: ASTM A123, Table 2, Coating Grade 85.
- 2 Pipe dimensions: ASTM F1083, Table 1, Standard Weight, Schedule 40.

C. Producer.

- 1 Allied Fence / Tyco.
- 2 Master Halco.
- 3 Merchants Metals.
- 4 Sonco Worldwide.
- 5 Equal product in quality and performance approved by A/E.

2.6 FASTENINGS AND ACCESSORIES

A. Description. Zinc galvanized steel (or malleable iron) fastenings and accessories with rounded edges, galvanized after fabrication. Do not use aluminum.

- 1 Zinc coat: At least 1.8 oz / ft² hot dip galvanizing after forming; ASTM A123.

B. Rail and Brace Ends, Line Caps, Rail Sleeves, Tension and Brace Bands: Sized to fit posts and rails; ASTM F626.

C. Stretcher Bars, Tension Bars: At least 3/16 x 3/4 in. galvanized steel, 2 in. shorter than full height of fabric, 1 bar at gate or end posts, 2 bars corner or pull posts.

D. Fastenings. Hot dip galvanized steel; ASTM F626. (For spacing, see PART 3)

- 1 Tie Wire: 9 ga, for attaching fabric to posts.
- 2 Clips: 9 ga.

- 3 Bands 12 ga, at end, corner, pull, and gate posts
 - 4 Brace rods: Galvanized steel, with welded-on turnbuckles for adjustment.
- E. Tension Wire: Marcellled 7 ga (0.177 in.) galvanized steel wire; ASTM A824, Type II.
- 1 Zinc coating: 2.00 oz/ft²; ASTM A817, Type II, Class 5.
 - 2 Breaking strength of 7 ga wire: Not less than 1880 lb; ASTM A817.
- F. Zinc Repair Compound, for use at missing or damaged zinc galvanizing. High adhesion, zinc-rich, UV-resistant compound, such as ZRC.
- G. Concrete: f'c = 2500, 5 in. maximum slump; ASTM C94.

2.7 GATE FABRICATION AND HARDWARE

- A. Framing Assembly: Galvanized steel pipe, together with fabric, bracing, hinges and latches, shop assembled and welded.
- 1 Gate heights: Match adjacent fence height, unless shown otherwise.
 - 2 Gate framing and fixed bracing: At least NPS 2, galvanized, as specified above.
 - 3 Brace gates against sagging using brace rods and adjustable turnbuckles in place of fixed bracing if more practical than fixed braces.
 - 4 For gate leafs over 73 in. high, add one hinge to the number specified.
 - 5 Coat welds and bare spots with specified zinc repair compound.
- B. Gate Hardware: Steel or malleable iron, zinc coated with at least 1.8 oz / ft² hot dip galvanizing, for all items. Typical examples follow:
- 1 Hinges: Heavy duty, industrial grade, offset type, of ball and socket design, allowing gates to swing back parallel to the fence line, such as:
 - a. 1746 / 1747 / 1748, by Semmerling Fence & Supply.
 - b. 422405 / 422406 / 422407, by Southeastern Wire.
- Equal product in quality and performance approved by A/E.
- 2 Latches, all heights: Easily lockable with padlock(s).
 - 3 Latches for single leaf gates: Single gate latch assembly, with keeper.
 - 4 Latches for twin leaf gates: Heavy duty gate stops with steel pipe sleeves anchored in concrete so as to engage plunger of latch at the center of each opening. Latch and plunger shall not be removable without special tools.
 - 5 Keepers: To automatically engage the gate leaf and hold it in the open position until manually released.

- 6 Stops: Set in a concrete base, located so as not to present a tripping hazard.
- 7 Rods with turnbuckles:: Cut rods to length that gives maximum future adjustability and weld turnbuckles to rods and rods to gate frame.
- 8 Items for handicapped accessibility: Heavy-duty lever-type gate hardware or weatherproof push bar in place of latches.

C. Gate Hinge Schedule.

<u>Gate leaf width</u>	<u>4-1 to 8 ft</u>	<u>4 ft or less</u>
Number of hinges, leafs up to 6 ft high	3	2

COLORED SLATS

D. Colored Plastic Slats. UV-resistant color HDPE olefin plastic, in color as selected by A/E.

- 1 Product / Producer. Colored Fence Slats, by Filona, or equal product in quality, appearance and performance approved by A/E.

PART 3 EXECUTION

3.1 PREPARATION

- A. Underground Clearances: Before starting chain link fence and gate work, obtain underground locations, depths and clearances of underground utilities, pipes, cables and structures from utility companies and the Construction Documents. Probe before drilling for footings in questionable locations.
- B. Remove Existing Fences: Remove existing chain link fences not shown to remain. Also remove other types of fence shown in Construction Documents to be replaced by chain link.
 - 1 Perform unearthing, disassembling, collecting, and disposing of all existing fence posts, fabric, hardware, footers, keepers, stops, and debris accumulated along the fence line.
 - 2 Fill holes and surface irregularities created by fence removal to reduce trip hazard.

3.2 TEMPORARY FENCING

- A. Temporary Fencing. Provide NPS 2 or larger driven posts and 6 ft. high with 11 ga or heavier fabric tied with 11 ga steel ties. Provide gates as specified for permanent construction, adjustable against sagging but without mid-rails.

Coordinate so as to maintain security requirements specified in PART 1.

- B. Removal of Temporary Fencing. Remove temporary fencing when A/E states that levels of other security are sufficient to do so. Remove fencing and post foundations. Fill, tamp and level post foundation holes to ensure no trip hazard.
 - 1 Remove trash, vegetation (except grass that matches adjacent new sod) and ground level irregularities within 1 ft of entire length of the former temporary fence line.

3.3 INSTALLATION

- A. Overall Chain Link Fence and Gate Assembly:

- 1 Follow ASTM F567 and chain link fence producer's published instructions except as more stringently specified herein.
 - 2 Install components of the assembly plumb and level, except as needed to closely follow vertical contours of the site.
 - 3 Rails. Provide a top rail and a bottom rail at all intervals between posts (and a mid-rail where specified).
 - 4 Adjust post spacing to accommodate bottom rails. Where the ground level slopes, decrease the normal 10 ft spacing between posts to as little as 3 ft in order to be able to install bottom rails that will hug the contour of the paving or soil.
 - a. Definition of "hug": Keep average bottom-of-fence dimension within 1 in. of grade as measured in any 1 ft of run but never more than 2 in.
 - 5 Tension wire. Do not replace a bottom rail with a tension wire unless severe grade changes make this more practical. Obtain written approval of A/E before installing any tension wire.
 - 6 Alignment. Align new fencing with existing fencing. Where obstructions are encountered, obtain instructions from A/E.
- B. Bracing Installation. Brace end, corner and pull posts sufficiently to stretch fabric and to provide stability against wind and forced entry forces.
- 1 Install bracing in both directions from each corner, end and pull post, inclined no more than 50° from ground, with concrete footings at bracing ends to resist pulling thrust.
 - 2 In addition, provide pull-post bracing, at a post sized for pulling forces, every 200 ft in straight fence runs.
 - 3 Attach brace halfway up end, corner and pull posts.
 - 4 Fasten horizontal bracing members with truss rods from end, corner and pull posts to the adjacent line post.
- C. Gate Installation.
- 1 Gates in the vicinity to a building shall open in the direction of building egress.
 - 2 No gate shall reduce or restrict a building egress dimension in its open position.
 - 3 Make gates level and plumb in their closed position.
 - 4 Make gates so they can be secured in both their open and closed positions.
 - 5 Install gates complete with welded-on hinges, latches, keepers, and stops. Weld on hasps for locking.
 - 6 Do not swing a gate outward onto a public sidewalk; instead, notify A/E that for safety the gate must either swing inward or a sliding gat

3.4 CLEANING AND ADJUSTING

- A. At completion of each day's work, remove all fencing debris, cuttings and removed fencing from the worksite, roads, walks, and adjoining properties.
- B. Adjust gates and hardware for friction-free, noise-free alignment between gates and posts. Lubricate, and demonstrate to be in smooth, quiet working order.

END OF SECTION 02830

SECTION 02840

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Related Sections:
 - 1. 02511 - Asphaltic Concrete Paving.

1.02 REFERENCES

- A. Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration.
- B. Florida Department of Transportation (FDOT) Specifications for Road and Bridge Construction.
- C. Miami-Dade County Public Works Manual (M-DCPW).
- D. Florida Building Code (FBC) for accessibility requirements.

1.03 SUBMITTALS

- A. Submit properly identified manufacturer's literature and technical data before starting work.
 - 1. Shop Drawings: Submit shop drawings for review, indicating construction details, sizes, elevations, installation requirements, gauges, thickness of materials, colors, and other information necessary to show compliance with the requirements of this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sign Panels:
 - 1. Galvanized steel according to the applicable requirements of FDOT Section 700 "Highway Signing or Standard Road Details of the MDCPW
 - 2. Size, shape, and color as indicated on the drawings or as specified.
- B. Sign Support Posts:
 - 1. Galvanized steel according to the applicable requirements of FDOT Section 700 "Highway Signing" or M-DCPW.
 - 2. Size, shape, and color of posts and mountings as indicated on drawings.
- C. Aluminum components are not allowed.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Sign Panels and Supports:
 - 1. Install according to applicable requirements of the following:
 - a. FDOT Section 700 "Highway Signing".
 - b. Standard Road Details of M-DCPW.
 - c. Manual on Uniform Traffic Control Devices.
 - d. Accepted shop drawings and as indicated on drawings.

END OF SECTION 02840

SECTION 02921
PLANTING SOIL MIX

PART 1 GENERAL

1.01. SUMMARY

- A Includes - but is not limited to - furnishing and installing sod as described in Contract Documents.
- B Related Sections include:
 - 1. Section 02212 - Finish grading
 - 2. Section 02935 – Sodding
 - 3. Section 02950 - Planting

1.02. SUBMITTALS

- A Samples
 - 1. Sample of the prepared Soil Mix for agricultural laboratory analysis and approval prior to delivery to site.
- B Quality Control Submittals
 - 1. Delivery slips indicating amount of Soil delivered to Project site.
 - 2. Identify source of Soil production.

1.03. QUALITY ASSURANCE

- A Pre-Installation Meeting
 - 1. See Section 01 245.
 - 2. Schedule site meeting after placement of Soil and completion of finish grading, but prior to beginning of sod installation and installation of trees and shrubs.

PART 2 PRODUCTS

2.01 MATERIAL

- A Planting Soil Mix
 - 1. Shall have a pH within the range of 6.0 to 6.5.
 - 2. Shall be a thoroughly batched blend by volume of the following:
 - a. 20% Everglades Muck;
 - b. 60% coarse, sharp edged sand;
 - c. 10% Canadian Peat Moss; and
 - d. 10% decomposed Pine bark or wood chips.
 - 3. Planting Soil Mix shall be batched thoroughly by mechanical means which provides adequate, calibrated monitoring of required product volumes (examples: Atlas Peat + Soil / 561-734-7300; Amerigrow / 561-499-8148). Indicate source of Soil when submitting bid.

PART 3 EXECUTION

3.01 PREPARATION

A. Protection

1. Take care in performing work of this Section to avoid conditions that will create hazards. Post signs and barriers as necessary to insure worker and public safety.
2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.

3.02 APPLICATION

A. Site Tolerances

1. Finish grade of sodded areas prior to planting shall be approximately 2" below proposed final, finished grade of sodded areas.
2. Install sod per Section 02935.
3. Install plants per Section 02950. Holes for plants shall be 2x rootball diameter. Backfill holes with the prepared planting soil mix.

END OF SECTION

SECTION 02931
TREE PROTECTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Protection of existing trees from damage because of Contractor's operations including, but not limited to:
 - 1. Vegetation protective signage.
 - 2. Tree protection fencing.
 - 3. Boxing of tree trunks.
 - 4. Root pruning, construction pruning, and root protection.
- B. Related Sections:
 - 1. 02200 - Earthwork

1.02 SUBMITTALS

- A. Proposed methods and schedule for tree and plant protection.
- B. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization.

1.03 QUALITY ASSURANCE

- A. A. Comply with the most stringent applicable requirements of the following standards.
 - 1. American National Standards Institute (ANSI) Z133.1 – Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.
 - 2. International Society of Arboriculture (ISA) - Guide for Establishing Values of Trees and Other Plants.
 - 3. National Arborist Association (NAA) - Ref.1, Pruning Standards for Shade Trees.
 - 4. International Society of Arboriculture (ISA) - Construction Management Guidelines.
- B. Damaged Trees/palms:
 - 1. 1. Trees scheduled to remain and are damaged during construction shall be replaced per canopy equivalency at no expense to the Owner.

PART 2 PRODUCTS

2.01 COMPONENTS

- A. Tree Protection Fencing:
 - 1. Tree protection fencing shall be 4 feet high galvanized chain link fencing.

2. Stakes for fencing shall be 8 feet galvanized steel posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 10 feet o.c. maximum.
- B. Boxing (Fencing):
1. Boxing shall be 4 inch x 4 inch posts spaced 8 feet o.c., with 2 inch x 4 inch rails between bays approximately 24 feet x 24 feet centered on the tree trunk, to a height of approximately 5 feet.
- C. Root Pruning:
1. Liquid fertilizer applied to root pruned and construction pruned trees shall be Peters M77 Sequestered-Cleated Soluble Fertilizer by W.R. Grace and Co., Cambridge, MA, or accepted equivalent.
 2. Dormant oil spray shall be a dormant miscible spray, Volck Oil, by Ortho or accepted equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Fencing:
1. Before start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed at all trees designated to be protected. Fencing shall be installed a minimum of 15 feet beyond the drip line of trees to be protected, unless otherwise accepted by the A/E.
- B. Boxing:
1. Box trees to remain and not within designated tree protection areas.
- C. Root Pruning:
1. Where construction will occur close to existing trees designated to remain, roots shall be pruned. Proximity shall be as determined in the field by the A/E.
 2. Root pruning is the physical cutting of tree roots to minimize root damage and promote healing. Suitable means for root pruning include trenching, vibrating plow, or stump grinder. Any method capable of tearing roots or disturbing the soil beyond the grading limit is not allowed.
 3. Root prune trees as noted to a depth of 24 inches by trencher, backhoe, or other approved means.
 4. Backfill root pruning trench with existing soil mixed with peat moss or well-rotted sawdust to a mixture of approximately 75 percent soil and 25 percent humus. Tamp lightly to set soil.
 5. Apply mulch to a depth of 4 to 6 inches at minimum dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk.
- D. Construction Pruning and Root Protection:
1. To compensate for root zone damage by cut or fill work, prune top of tree to approximate percent of damaged root zone area.

2. Construction pruning shall consist of pruning the tree crown to compensate for root zone damage due to construction operations. Construction pruning shall include a fertilization/insecticide program.
 3. Construction pruning shall comply with NAA Ref.1 for Class IV – Crown Reduction Pruning and ANSI ZI33.1.
 4. For those trees remaining within construction zone to be protected, apply mulch to a depth of 6 inches within dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk. Remove protection mulch after completion of work as specified.
- E. Fertilization and Insect Spraying:
1. Treat root pruned and construction pruned trees with liquid fertilizer, dormant oil spray, and insecticide.
 - a. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref.2.
 - b. Apply dormant oil spray, at a rate recommended by the manufacturer, in early spring before buds begin to swell.
 - c. Apply insecticide spray twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.
- F. Removal of Protection:
1. Except as otherwise indicated or requested by A/E, temporary protection devices and facilities installed during course of the work shall be removed only after all work that may injure or damage trees and plants is completed.

END OF SECTION

SECTION 02935

SODDING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02221 - Excavating, Backfilling, and Compaction for Utilities.
3. 02900 - Landscaping

1.02 SUBMITTALS

A. Soil Testing and Amendment:

1. Obtain and test, one representative mixed sample, each, of planting soil and top soil materials intended for use on this project. These samples shall be blended mixes composed uniformly of materials taken from the stockpile of the two respective soil types.
2. Test soils for horticultural purposes and submit the test results to the Landscape Architect accompanied by a recommendation from the testing agency regarding the suitability of the samples and appropriate soil amendments required to correct any detrimental or deficient soil conditions.
3. Testing shall include, but not be limited to:
 - a. Tests required to determine soil pH and the identification and quantity of soluble salts or other common pollutants that may be in the samples. Soil pH range for sodded areas shall be 6.0-6.5.
 - b. After application of topsoil and amendments, a representative soil sample shall be obtained by collecting 15 to 20 samples from the top 4 inches of soil from various areas.
 - c. Samples shall be combined and mixed thoroughly.
 - d. Submit samples to an independent testing firm for analysis.
 - e. Analysis shall provide pH and fertility levels of soil along with recommended actions for appropriate soil amendments to adjust pH levels and fertility levels.
 - f. Contractor shall amend soil according to analysis recommendations by roto-tilling the amendments thoroughly into the top 4 inches of soil.
 - g. A second soil sample shall be submitted for analysis after soil amendments have been incorporated into the soil.
 - h. Final soil testing analysis results shall be submitted to the Landscape Architect before any planting of sod.

B. Certificates:

1. Submit certificates from supplier stating the delivered topsoil mix, sod, and other landscaping materials comply with requirements specified.
2. Deliver certificates upon final completion of the installation.

1.03 QUALITY ASSURANCE

- A. A. Sod shall comply with Florida Department of Agriculture quarantine requirements.
- B. B. The sod supplier shall certify on the invoice that the sod product is Floratam St.
- C. C. Augustine grass.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect solid sod before, during, and after installation from over-heating, drying out, and physical damage.
- B. Replace damaged or rejected solid sod at no cost to the Owner.

1.05 WARRANTY

- A. Contractor is to replace, at no additional cost to the Owner, grass areas in unsightly or damaged condition, for 90 days after final completion. Replace dead grass at no additional cost to the Owner for one year.
 - 1. Irrigate the newly planted grass until final completion. Irrigation shall occur in sufficient quantity to insure the orderly establishment of the grass.
 - 2. Contractor shall not be responsible for the replacement of lost materials due to "Acts of Providence", theft, vandalism, or for reasons out of the control of the Contractor.
- B. Warrant sod for 90 days after final completion and the satisfactory conclusion of the maintenance period. Any grass that fails or dies within that period shall be replaced and replanted immediately without expense to the Owner, The Contractor shall not be held responsible for losses beyond his control arising from "Acts of Providence", acts of vandalism, or loss arising from documented neglect by the Owner to properly care for planting after final completion.

1.06 MAINTENANCE

- A. Maintain sod, starting at the time of planting and continuing for 90 calendar days after final completion.
- B. Maintain and protect sodding until end of maintenance period.
- C. Sodding Maintenance:
 - 1. Provide a complete maintenance cultural program until final completion.
 - 2. Cultural program shall consist of watering, fertilizing, mowing, insect and disease control, and weed control.
 - a. Begin mowing program as soon as sod is firmly rooted.
 - 1) Mow Floratam St. Augustine sod with a rotary type mower at least three times per month at a 3 inch mowing height.
 - 2) Mowing program shall include weed-eating and edging of beds,

and along walks, curbs, and buildings.

3. Final completion is contingent upon full coverage of the sodded area resulting in healthy, vigorous turf, free of insects, disease, and weeds.

D. General Maintenance:

1. Maintenance shall include watering, weeding, fertilizing, cultivating, spraying, adjustment of guying, staking, and pruning necessary to keep plant materials in a healthy vigorous growing condition and to keep planted areas neat and attractive.
2. Provide equipment and means for proper application of water to those planted areas not provided with an irrigation system.

E. Replacements:

1. At the end of maintenance period, plant material shall be in a healthy growing condition.
2. During maintenance period immediately replace any plants showing weakness and probability of failure with a new healthy plant of the same type and size, without additional cost to the Owner.

F. Extension of Maintenance Period: Continue maintenance period, at no additional cost to the Owner, for additional 30 days after previously noted deficiencies have been corrected. Warranty extension period shall start upon acceptance of planting and at the end of the maintenance period.

G. The Contractor shall conclude maintenance (exclusive of replacement within warranty period) upon written acceptance of the LANDSCAPE ARCHITECT at the end of the maintenance period or, as provided for above, at the end of the extended maintenance period.

H. Protection:

1. Irrigate the newly planted grass until final completion.
2. Planting area shall be kept weed free with a herbicide program until final completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid Sod:

1. St. Augustine Floratam: At all areas in "Construction Staging Area" and any other sod damaged by Contractor during construction.
2. Mow sod to a height not to exceed 1-1/2" before lifting.
3. Sod shall be strongly rooted and free of pernicious weeds, 1-1/2" minimum root structure, freshly dug, brought to the site and placed immediately.
4. Sod showing discoloration or wilting will be rejected.
5. Sod containing nutgrass, lippia, water sedge, and dollar weed is not acceptable.

- B. Commercial Fertilizers:
1. Commercial grade fertilizer, uniform in composition, dry, free flowing, and delivered to site in fully labeled, unopened containers, bearing name, trade name or trademark and warranty of producer.
 2. Fertilizers shall comply with applicable State and Federal law.
 3. At least 50 percent of the nitrogen content shall be derived from natural organic sources and potash derived from sulphate of potash.
 4. Each container of fertilizer shall bear manufacturer's statement of analysis or a manufacturer's certificate of compliance shall be submitted to the LANDSCAPE ARCHITECT upon delivery to the site.
 5. The following minimum percentages of available plant food by weight are required.

PART 3 EXECUTION

3.01 INSPECTION

- A. A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.
- B. B. Inspect work of other trades and verify work is complete to the point landscape work may start. Verify planting may be completed according to Construction Documents.
- C. C. Discrepancies:
1. In event of discrepancy, immediately notify LANDSCAPE ARCHITECT.
 2. Do not proceed with installation of materials or plants in areas of discrepancy until such discrepancies have been fully resolved to the satisfaction of the LANDSCAPE ARCHITECT.
- D. It shall be the Contractor's responsibility to thoroughly test the irrigation system before planting and report any malfunctions to the Owner. No planting shall be done until the irrigation system is operating properly.

3.02 PREPARATION OF ROUGH GRADING AND SUBGRADE

- A. Rough grading and subgrade shall be correct and suitable materials and proper drainage shall exist before placing sod. Soil or drainage conditions detrimental to growth of plant material shall be corrected.
- B. Existing subgrade shall be scarified to a minimum depth of 3 inches before spreading of topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 2 inches, sticks, and other extraneous materials.
- C. Soil in compacted areas shall be tilled to a depth of 12 inches to produce a loose friable soil.
- D. D. Sodding shall not begin if any areas exhibit ponded conditions.

3.03 SPREADING OF TOPSOIL

- A. Subgrade shall be damp when topsoil is spread.
- B. Areas where sod is to be planted shall have a subgrade 6 inches lower than the finish grade. A 4 inch layer of topsoil shall be added before the placing of sod.
- C. Topsoil in areas to receive sod shall be fine graded with drag or rake. Remove sticks, stones, and extraneous matter. Grading shall round out breaks in grade, smooth down lumps and ridges, and fill in holes and crevices. Grade shall be maintained until placement of sod.
- D. Topsoil shall be partially incorporated into the subsoil to avoid potential layering effect of different soil layers. Apply 1/3 topsoil depth. Roto-till, plow, or disk into subsoil, then apply remainder.

3.04 INSTALLATION OF SODDING

- A. Install sod as soon as practical following placement and grading of topsoil mixture.
- B. Sod shall be free of mesh before installation.
- C. Fertilizer: Spread 30 pounds of commercial fertilizer per 1,000 square feet of finished topsoil, lightly rake in and level.
- D. Sod Placement:
 - 1. Lift sod from trucks or storage piles and place by hand with closed joints and no overlapping.
 - 2. Ground shall be leveled with the back of a rake and sod laid with joints closely butted so no voids are visible, keeping surface of sod flush with the adjoining pavements.
 - 3. All sprinkler heads shall be flagged by the playing field contractor before laying of the sod. The sod supplier/installer shall cut sod away from all sprinkler heads.
 - 4. After laying, sprinkle sod thoroughly, and tamp sufficiently to incorporate sod with topsoil blanket and to insure tight joints between sections or strips.
 - 5. After laying, cover sod with sufficient sand top dressing to fill voids remaining and then thoroughly water to wash top dressing into sodded surface.
 - 6. Completed sod surface shall be true to finish grade indicated on plans, even and firm at all points and shall, after settlement, be flush with top of abutting walks, paving, concrete borders, catch basins and the like.
 - 7. Keep new sod properly watered until final completion.
 - 8. Protect sodded areas against trespassing and damage of any kind for the duration of maintenance period.

3.05 ADJUSTMENT AND CLEANING

A. Site Clean-Up:

1. Upon completion of any landscape project, thoroughly clean up the project site.
2. Remove equipment, unused materials, deleterious material, and surplus excavated material.
3. Fine grade disturbed areas and the areas adjacent to the new plantings to provide a neat and uniform site.
4. Damaged or altered existing structures, because of the landscape work, shall be corrected.

END OF SECTION

SECTION 02950

PLANTING

PART 1 GENERAL

1.01 SUMMARY

1. Includes but not limited to furnishing and installing all landscape materials as described in Contract Documents.
2. Related sections include Section 02921, Planting Mix; Section 02922, Sodding Mix, and Section 02910, Irrigation.

1.02 SUBMITTALS

A. Samples

1. Sample of mulch for approval prior to delivery to site.
2. Sample of Planting Mix for approval prior to delivery to site.
3. Sample of Sodding Mix for approval prior to delivery to site.
4. Confirm purchase of specified Lagerstroemia from Apopka Tree.

1.03 QUALITY ASSURANCE

A. Pre-Installation Meeting

1. Meet with Landscape Architect on-site prior to commencing operations related to delivery, preparation, and installation of all plant materials.
2. Participate in installation meetings as required.

1.04 SEQUENCING

1. Do not install trees, palms, shrubs, and ground cover until major construction operations are completed.
2. Install trees and palms prior to planting shrubs, ground covers, and vines.
3. Plant shrubs and vines before planting ground covers.

1.05 WARRANTY

A. Guarantee from date of Final Written Acceptance

1. Trees and palms for one year (12 consecutive months)
2. Shrubs, ground covers, and vines for six months
3. Plant materials shall be robust, healthy, vigorous, and in continuous growing condition, and shall be the height, spread, and caliper indicated.

NOTE:

Containerized plant materials shall have been growing in the specified container size for at least two months prior to delivery to the site of the work. Plant materials that appear to the Landscape Architect to have been "moved up" to a larger container size and which do not exhibit vigorous root growth, will be rejected.

1.6 OWNER'S INSTRUCTIONS

- ###### A. Provide written instructions on maintenance requirements, from completion of guarantee period, from conclusion of Contractor's required maintenance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Plants

1. Conform to requirements of plant list/key on Construction Drawings and to "Horticultural Standards" of American Association of Nurserymen as to species, variety, character, and other pertinent factors including size and caliper.

2. Nomenclature -
 - a. Plant names used shall conform to "Standardized Plant Names" by American Joint Committee on Horticultural Nomenclature except in cases not covered.
 - b. In cases not covered, follow custom of south Florida nursery trade.
 - c. Plants shall bear a tag showing the genus, species, and variety of at least 10% of each species delivered to site.
3. Quality -
 - a. Plants shall be sound, healthy, vigorous, and robust, free from plant disease, insect pests or their eggs, fungi, noxious weeds, and shall have healthy, normal root systems.
 - b. Container stock shall be well established and free of root-bound conditions.
 - c. Do not prune plants or top trees prior to delivery.
 - d. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character. Rejected materials shall be immediately removed from site.
 - e. Bare root trees, palms, and shrubs are not acceptable, and collected specimen material shall require prior inspection and written authorization of Landscape Architect.
 - f. Provide plant materials from a licensed nursery.
3. Measurements –
 - a. Measure height and spread of plant materials with branches in their normal position.
 - b. Measure in two directions perpendicular to one another, through the center of the plant, half way between the top and bottom of the foliage of the plant.
 - c. Measurement of plant pread should be average of plant, not greatest diameter. For example, plant measuring 15 inches in widest direction and 9 inches in narrowest would be classified as plant having a 12 inch spread.
 - d. Measurement of height shall be the maximum average height less the immediate growth.
 - (1) For trees, "immediate growth" shall mean the uppermost 12" of foliage.
 - (2) Palms shall be measured from top of root ball to center height of unopened spike.
 - (3) For shrubs, "immediate growth" shall mean the uppermost 4" of foliage
 - (4) Measure caliper of trees DBH, at 48" above crown of root ball.
 - (5) Where caliper or other dimensions of plant materials are omitted from Construction Drawings, plant materials shall be normal stock for type listed.

NOTE: Root ball of specimen Ligustrum lucidum (Glossy Privet) shall not exceed 36" diameter and 30" depth from top of root ball to bottom of root ball.
 - e. Plant materials larger than those specified may be supplied with approval of Landscape Architect, contingent upon
 - 1) Complying in all other respects with this specification.
 - 2) Provided at no additional cost to Owner.
 - 3) Proportional increase in size of root ball(s).
5. Shape and Form -
 - a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Construction Drawings.

B. Planting Mix - See Section 02921

C. Planting Tablets - 21 gram Agriform (20-10-5).

- D. Tree Guys -
 1. Of suitable woven horticultural strapping, minimum 2 ½" in width, and manufactured and intended for use in guying trees.

- E. Pre-Emergent Herbicide
 1. Approved Materials -
 - a. Princep Cal 90
Treflan
 - b. Surflan
 - c. Ronstar G
 - d. Prometon 5PS
 2. Comply with all local, state, and federal laws related to purchase, storage, application, and disposal of pre-emergent herbicides.
 3. Contractor shall insure that only a properly licensed individual executes all herbicide application.

- G. Mulch-
 1. "Florimulch".
 2. Submit sample for Landscape Architect approval prior to delivery.
 3. Cypress mulch products SHALL NOT BE USED.

PART 3 EXECUTION

3.01 VERIFICATION

- A. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to the Landscape Architect before proceeding with work of this Section.
- B. Plant totals are for convenience of Contractor only and are not guaranteed. Verify quantities as shown on Construction Drawings.

3.02 PREPARATION

- A. Protection -
 1. Take care and preparation in work to avoid conditions which will create hazards. Post signs or barriers as required.
 2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
- B. Layout
 1. Identify and clearly mark individual tree and palm locations, and areas for multiple plantings of shrubs and ground cover. Stake locations and outline areas.
 2. Secure Landscape Architect's approval before planting.
 3. Make minor adjustments as may be necessary or requested.

3.03 INSTALLATION

- A. Planting Pit Excavation
 1. If underground construction work or obstructions are encountered in excavation of planting pits, Landscape Architect will select alternate locations.
 2. Excavation Size -
 - a. Install plants delivered in 1 gallon cans in planting pits at least 14 inches in diameter.
 - b. Install plants delivered in 3 gallon cans in planting pits at least 24 inches in diameter.
 - c. Install plants delivered in 7 and 10 gallon cans in planting pits at least 30" in diameter.
 - d. Plant trees and palms in holes at least two times greater in diameter than their root ball.

- d. Depth -
 - (1) Holes for shrubs shall be deep enough to allow 6 inches minimum of planting mix beneath root ball.
 - (2) Holes for trees and palms shall be 1-1/2 times as deep as vertical dimension of root ball but never less than 12 inches deeper than vertical dimension of root ball.
 3. Roughen sides and bottoms of excavations.
 4. After each planting pit is excavated to proper depth, fill with planting mix and tamp sufficient to bring plant to desired elevation.
- B. Planting
1. Plant immediately after removing plant from container. Remove shrubs, vines, and ground cover plants from containers without damaging roots.
 2. After placing balled and burlapped ("B&B") trees and palms in planting pits, lay back top 1/3 of burlap from around root ball, pushing downward into planting hole.
 3. Place trees, palms, and shrubs centered in planting pits so that, after watering and settling, plant shall be approximately flush and level with immediately adjacent existing grade
 4. Properly cut off broken or frayed roots.
 5. Center plant in hole and backfill with specified planting mix making saucer of mounded excavated soil around hole's perimeter to form watering basin.
 6. During backfilling and planting operations, add Agriform planting tablets evenly spaced around and half-way between the top and bottom of the root ball, as follows:
 - a. One gallon shrub - 1 tablet
 - b. Three gallon shrub - 3 tablets
 - c. Seven gallon and 10 gallon shrubs - 4 tablets
 - d. Trees and palms - 6 Tablets
 7. Settle by firming and watering to bring root ball to proper level.
 8. Do not use muddy soil for backfilling.
 9. Make adjustments in positions of plants as directed by Landscape Architect.
 10. Thoroughly water trees, palms, shrubs, vines, and ground cover immediately after planting.
 11. At base of each tree planted in open areas (not within paved Lower Terrace) , leave 24 inch diameter circle free of any grass, and mulch to loose measure depth of 3".
- C. Guying for Trees and Palms
1. In planting, include placement of adequate support for trees and palms 2 1/2" or greater in caliper.
 2. Support shall consist of:
 - a. For trees and palms up to 16'0" in height, use three horticultural strapping guys evenly spaced.
 - b. For trees and palms exceeding 16'0" in height, use four horticultural strapping guys evenly spaced.
 - c. Anchor each horticultural strap to one, capped #4 rod, 18" long, driven at a 45 degree angle to the trunk of the tree.
- D. Vines
1. Remove from stakes and trellises, untie, and securely fasten to wall or fence next to which they are planted.
- E. Ground Cover
1. Container-grown unless otherwise specified on Construction Drawings. Space evenly to produce a uniform effect.
 2. Stagger in rows and intervals, creating an equilateral triangle among any three plants in two adjacent rows or columns.
 - 3.
- F. Post Planting Weed Control

1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas after completion of planting. DO NOT SPRAY PLAN FOLIAGE.
 2. Planting areas shall be free of existing weed growth prior to application of herbicide.
 3. Apply herbicide in accordance with Manufacturer's recommendations.
- G. Mulching
1. After application of herbicide, mulch shrub and ground cover planting areas with loose measure 2 inch deep layer of approved mulch.
 2. Place mulch to uniform depth and rake to neat finished appearance.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 03100 - Concrete Formwork.
2. 03200 - Concrete Reinforcement
3. 03312 - Concrete Testing.
4. 07270 - Firestopping and Fire and Smoke Barrier Caulking.
5. 07190 - Vapor/Radon Barrier.
6. 07900 - Joint Sealers.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A615/A-04 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
2. C78-94 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
3. C150-04 Specification for Portland Cement.
4. C260-95 Specification for Air-Entraining Admixtures for Concrete.
5. C309-97 Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
6. C494-92 Specification for Chemical Admixtures for Concrete.
7. D1751-83 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
8. D1752-84 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

A. Submit shop drawings for reinforcement and accessories

1. Detail beams and reinforcing in elevation and not in schedules.
2. Show slab reinforcing in plan view, similar to the structural drawings, not scheduled, and drawn to a minimum scale of 1/8" = 1'-0". Show reinforcing on the plan view along with size, quantity, marks, and spacing.
3. Detail walls and reinforcing in elevation and not in schedules.
4. Other items may be detailed as needed.
5. A/E will not review drawing submitted not complying with these requirements. Contractor shall verify detailing proceeds as specified to avoid untimely reinforcing arrival.

B. B. Materials and methods of curing.

C. C. Concrete materials and mix designs.

- D. D. Certifications required for admixtures (chloride and solids).
- E. E. Chlorides in concrete.
- F. F. Test reports.
- G. G. Waterstops and premolded joint fillers.
- H. H. Curing compounds.

1.04 STANDARDS

- A. Concrete work shall comply with requirements of ACI 301- Specifications for Structural Concrete for Buildings, except as specified.
- B. The Contractor shall familiarize himself with the requirements of ACI 301 and this specification.
- C. The requirements that follow are listed in the sequence of chapter numbers of ACI 301 for ready reference purposes.
- D. Florida Building Code (FBC).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Comply with Chapter 1 of ACI 301.

2.02 MATERIALS FOR CONCRETE

- B. Comply with Chapter 2 of ACI 301 and the following:
 - 1. Cement: Type I or III complying with ASTM C150.
 - 2. Admixtures:
 - a. Water Reducing Admixture: The admixture shall comply with ASTM C494, Type A, and not contain more chloride ions that are present in municipal drinking water.
 - 1) Eucon WR-75 by Euclid Chemical Co.
 - 2) Pozzolith 200N by Master Builders.
 - 3) Plastocrete 160 by Sika Chemical Corp.
 - b. Water Reducing, Retarding Admixture: The admixture shall comply with ASTM C494, Type D, and not contain more chloride ions that are present in municipal drinking water.
 - 1) Eucon Retarder-75 by Euclid Chemical Co.
 - 2) Pozzolith 100XR by Master Builders.
 - 3) Plastiment by Sika Chemical Corp.
 - c. High Range Reducing Admixture (Superplasticizer): The admixture shall comply with ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - 1) Eucon 37 by Euclid Chemical Co.
 - 2) Sikament by Sika Chemical Corp.

- d. Non-Chloride Accelerator: The admixture shall comply with ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.
 - 1) Accelguard 80 by Euclid Chemical Co.
 - 2) Darex Set Accelerator by W.R. Grace.
- 3. Air Entraining Admixture: Complying with ASTM C260.
- 4. Calcium Chloride: Calcium chloride or admixture containing more than 0.1 percent chloride ions are not allowed.
- C. Certification: Written compliance to above-mentioned requirements and the chloride ion content will be required from the admixture manufacturer (include
- D. admixtures) before mix design review by the A/E.

2.03 PROPORTIONING

- A. Comply with Chapter 3 of ACI 301 and the following:
 - 1. Strength: Normal weight concrete - see drawings.
 - a. Concrete slabs, designated as "Concrete Pavement": 28-day compressive strength not less than 4,000 psi and a flexural strength (modulus of rupture) of not less than 650 psi when tested according to "Method of Test for Flexural Strength of concrete (using simple beam with third point loading)", ASTM C78. Include curb or curb and gutters.
 - 2. Durability:
 - a. Pumped Concrete:
 - 1) Testing shall be completed at the final discharge location after pumping.
 - 2) Testing shall be completed at the truck before pumping.
 - 3) Samples shall include samples for both slump and strength tests.
 - 4) Adding of water to transit mixers/agitators.
 - a) Contractor shall maintain a maximum time limit of 90 minutes on the introduction of water into the cement.
 - b) Only 1 addition of water on the site to bring the mix to the producer's mix slump criteria is allowed.
 - b. Design Mixes:
 - 1) Design mixes for concrete intended to be placed as-is from the truck shall be designed as such.
 - 2) Design mixes for concrete intended to be pumped shall be made on one of the following bases:
 - a) The mix shall be designed as a truly plastic mix by proper proportioning. See ACI 304.2R – Placing Concrete By Pumping Methods for guidelines for a pumpable plastic workable mix. Trial batches shall be made, and without a device to test pumping ability, results of field trials shall be used.
 - b) Water shall not be added at the pump. One addition of water at the truck to meet the design slump (at the truck) is allowed.
 - c) A super plasticizer may be used.

- c. Concrete slabs placed at temperatures below 40 degrees F. shall contain the "Non-Chloride Accelerator".
 - d. Concrete required to be air entraining shall contain the "Air Entraining Admixture", and air content shall comply with table 3.4.1 of ACI 301.
 - e. Pumped concrete and concrete with a water/cement ratio less than 0.50 shall contain the "High Range Water Reducing Admixture".
 - f. The "Water Reducing", Type A, or "Water Reducing and Retarding", Type D admixtures complying with ASTM C494 may be used at the option of the Contractor.
 - g. Concrete containing the "High Range Water Reducing Admixture" (superplasticizer) shall have a maximum slump of 8 inches unless otherwise directed by the A/E. The concrete shall be proportioned for a slump of 2 to 3 inches, be verified, then the high range water reducing admixture added to increase the slump to the approved level.
 - h. All other concrete shall be proportioned to have a maximum slump of 4 inches.
- 3. Normal weight concrete shall be air-entrained. Amount of air-entraining shall be according to Table 3.4.1.
 - 4. Requirements for Other Concrete: The requirements of Paragraph 2.03 D(1).

2.04 FORM WORK

- A. A. Comply with Chapter 4 of ACI 301 and the following:
 - 1. Earth cuts shall not be used as forms for vertical surfaces. Natural rock formations maintaining a stable vertical cut may be used as side forms. Comply with OSHA's "Trench Safety Act".
 - 2. Design and Installation of Formwork: Form ties that leave through holes in the concrete are not allowed.
 - 3. Removal Strength:
 - a. Wall forms and column forms may be removed 12 hours after pouring.
 - b. Slabs supported by precast joists may have forms removed as follows:
 - 1) Joist spacing 4'-6" or less, 24 hrs.
 - 2) Joist spacing between 4'-6" and 6'-8", 48 hrs.
 - 3) Joist spacing between 6'-8" and 8'-8", 72 hrs.
 - c. Beams and other slabs shall not have forms removed until the concrete has achieved 75 percent of its design strength. Beams shall be reshored immediately upon removal of forms.
 - d. In addition to the above, flat slab forms and stair slab forms shall not be removed for 5 days. Upon removal of forms, reshores shall be placed and remain in place until concrete is 14 days old.

2.05 REINFORCEMENT

- A. Comply with Chapter 5 of ACI 301 and Section 03200 – Concrete Reinforcement.

2.06 FIBER REINFORCEMENT

- A. Comply for use in plain concrete as defined in ACI 318.1. and Section 03200 - Concrete Reinforcement.

2.07 JOINTS AND EMBEDDED ITEMS

- A. Comply with Chapter 6 of ACI 301 and the following:
 - 1. Expansion Joints:
 - a. Premolded joint fillers shall be preformed bituminous type, ASTM D1751 for joints without sealant.
 - b. Premolded expansion joint fillers for pavements, for joints with sealant and where indicated shall be non-extruding and resilient type of ASTM D1752, compatible with urethane joint sealant compounds.
 - 2. Waterstops:
 - a. Waterstops and fittings shall be manufactured from PVC. The waterstops shall be as manufactured by Greenstreak or accepted equivalent.
 - b. For construction joints, 4 inch serrated typed with Centerbulb, RS 316-4 or RB316-4 shall be used.
 - c. For expansion joints, 6 inch serrated type with Centerbulb, RB38T6 or RSB386 shall be used.
 - d. Make splices using splicing unions according to manufacturer's instructions. Make waterstop intersections using factory molded fittings.
 - e. Provide #14 tie wire at 2'-0" center to center embedded in base pour for waterstop support.

2.08 PRODUCTION OF CONCRETE

- A. Comply with Chapter 7 of ACI 301 and following:
 - 1. Ready-Mixed Concrete:
 - a. Provide copies of each delivery ticket to the A/E. Include mix designation on delivery ticket.
 - b. Do not place concrete over 90 minutes old from the time it was batched.
 - 2. Weather Conditions:
 - a. Where the relative humidity is less than the corresponding concrete temperature as placed, or intended to be placed, as indicated in the following Table, the Contractor shall follow the recommendations of ACI 305R, "Hot Weather Concreting".

Concrete Temperature (F) Minimum Relative Humidity

100	80
95	70
90	60
85	50
80	40
75	30

- b. The above Table is based upon a wind speed of 10 mph. For ambient wind speeds more than 10 mph, the Contractor shall follow the recommendations of Fig.2.1.5 of ACI 305R if the relationships of air temperature, wind velocity, relative humidity, and concrete temperature indicate a rate of evaporation more than 0.2 pounds per sq.ft. per hour.
- c. Concrete having a temperature more than 100 degrees F. shall not be placed.
- d. The requirements of Paragraph 7.6.1.2 of ACI 301 (cooling of concrete ingredients are not waived).

2.09 PLACING

A. Comply with Chapter 8 of ACI 301 and the following:

- 1. Protection: When the temperature of the concrete exceeds the minimum relative humidity relationship specified in Paragraph "Production of Concrete", the requirements of Paragraph "Production of Concrete" shall control.

2.10 REPAIR OF SURFACE DEFECTS

A. Comply with Chapter 9 of ACI 301 and the following:

- 1. 1. With prior approval of the A/E, as to method and procedure, repair
- 2. defective areas according to ACI 301, Chapter 9, except that the bonding
- 3. compound Euco Weld by the Euclid Chemical Company or Weldcrete by
- 4. the Larsen Company must be used.
- 5. 2. Defects designated as "structural" by the A/E shall be repaired with prior
- 6. approval of the A/E, as to method and procedure, using the epoxy
- 7. adhesive epoxy mortar as furnished by the Euclid Chemical Company or
- 8. Sika Chemical Corp.

2.11 FINISHING OF FORMED SURFACES

A. Comply with Chapter 10 of ACI 301 and the following:

- 1. 1. Finishes:
 - a. All concrete shall be "rough form finish" according to Paragraph 10.2 of ACI 301, except concrete that will be exposed to view shall be "smooth form finish".

2.12 SLABS

A. Comply with Chapter 11 of ACI 301 and the following:

- 1. 1. Finishes: Finishes shall be according to Paragraph 11.8 of ACI 301
- 2. except as specified.
- 3. 2. Maximum allowable tolerances for floor slabs not receiving ceramic or
- 4. quarry tile shall be 1/8" in a 10 foot radius.
- 5. 3. Exterior slabs receiving tile, pavers, or similar covering shall be troweled
- 6. finish.

2.13 CURING AND PROTECTION

- A. Comply with Chapter 12 of ACI 301 and the following:
1. Preservation of moisture according to Paragraph 12.2 of ACI 301.
 2. Curing and Sealing Compound: Super Floor Coat or Super Pliocure by the Euclid Chemical Company or Masterseal 66 by Master Builders. The compound shall comply with ASTM C309, Type 1 or Type 1D, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 grams per sq.cm. when applied at a coverage rate of 300 sq.ft. per gallon. Manufacturers certification required.
 3. Curing and Hardening Compound: "Eucosil" by the Euclid Chemical Company or "Curetox" by Toch Brothers. The compound shall be sodium silicate type.
 4. Apply compounds according to manufacturer's directions.
 5. Slabs receiving carpet or are of exposed concrete in the finished structure shall receive the "Curing and Sealing Compound". Exclude exterior walks and pavements.
 6. Slabs receiving resilient tile or cementitious or other toppings are to receive the "Curing and Hardening Compound".
 7. Verify the compatibility of the compound with the applied coverings or toppings.
 8. Submit manufacturer's data.
 9. Application of Curing and Sealing and Curing and Hardening Compound: Apply compound to concrete floors and slabs according to manufacturer's directions and as follows:
 - a. After fresh placed concrete surface has been finished and will not be marred by application, uniformly apply undiluted compound by spray, brush or squeegee without allowing compound to collect in low spots.
 - b. Keep traffic off surface for 24 hours or until surface is completely dry.
 - c. Within 1 week of a date set by the A/E, thoroughly clean and wash exposed concrete interior floors, then apply a second uniformly applied coat of the specified Curing and Sealing Compound without allowing compound to collect in low spots. Keep traffic off surface for 24-hours following the second coat, or until surface is completely dry. Exclude walks, pavements, and exterior slabs.
- B. Temperature, Wind, and Humidity: The requirements of "Production of Concrete" shall decide the conditions and precautions for hot weather concreting.

2.14 TESTING

- A. Comply with Chapter 16 of ACI 301, Section 03312 - Concrete Testing, and the following:
1. Testing Agencies: The cost of testing services unless specified otherwise, will be as follows:
 2. Services described in Paragraphs 16.3.1, 16.3.2, and 16.3.3 of ACI 301 (review or check test Contractor's materials and mix design, secure and test production samples at plants or stock piles) will be paid by the Contractor, as required by the A/E.
 3. Services described in Paragraphs 16.3.4, 16.3.5, and 16.3.6 of ACI 301 (strength, slump, and temperature tests of concrete) will be paid by the Contractor.

4. If air entrained concrete is specified, tests according to Paragraphs 16.3.5 and 16.3.6 of ACI 301 (air content will be paid by Contractor).
5. Services described in Paragraph 16.5 of ACI 301, additional testing and inspection because of changes proposed by Contractor, additional testing because of failure to meet specifications shall be paid by Contractor.

B. Testing Services:

1. For strength test of concrete, mold, cure, and test 5 specimens. Test 1 at 3 days, 1 at 7 days, and 3 at 28 days.
2. Make 1 strength test for each 50 cubic yards or fraction thereof placed in any 1 day.

2.15 EVALUATION AND ACCEPTANCE OF CONCRETE

- A. Comply with Chapter 17 of ACI 301.

2.16 ACCEPTANCE OF STRUCTURE

- A. Comply with Chapter 18 of ACI 301.

PART 3 - NOT USED.

END OF SECTION 03300

SECTION 16023

CODES AND STANDARDS

PART 1 GENERAL

1.01 REFERENCES

A. Comply with the following:

1. Florida Building Code (FBC).
2. Florida Building Code (FBC) - Mechanical.
3. Florida Building Code (FBC) - Plumbing.
4. National Electrical Code - (NEC), (NFPA 70).
5. National Fire Protection Association (NFPA).
6. NFPA 101 and other NFPA codes as applicable.
7. American National Standards Institute (ANSI) A117.1.
8. American Society of Civil Engineers (ASCE).

1.02 QUALITY ASSURANCE

- A. Where materials and equipment are available under the continuing inspection and listing service of Underwriters Laboratories (UL), furnish materials and equipment so listed.
- B. Comply with latest FPL Commercial/Industrial Energy Conservation Program Standards, if FPL is the available utility company.
- C. A maximum of 3 helpers to 1 journeyman are allowed according to Metropolitan Dade County.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 SUMMARY

A. Coordination With Other Trades:

1. Examine drawings and specifications. Visit site to determine work to be performed by Electrical, Mechanical, HVAC, and other trades.
2. Provide required electrical materials and equipment to put work into operation, completely wired, tested, and ready for use including raceways, conductors, disconnects, starters/contactors, or other devices for proper operation and sequences of electrical, mechanical, or other systems or equipment.
3. Unless otherwise noted, conduit, wire for controls, and devices, both line and low voltage, shall be provided and installed as described in this or other parts of the Construction Documents.
 - a. Install boxes or housings necessary for conduit and wire to controls, excluding items to be installed in piping, ducts.
 - b. These items are specified for installation in other sections. Connecting wiring is specified in this Division.
4. Seal penetrations through fire walls with fire resistant compound as specified in Section 07270.
5. Connect electrical equipment and devices as parts of the equipment or furniture furnished under other sections.
6. Comply with provisions of Instructions to Bidders and General Conditions and Section 01340.

B. Tradesperson Qualifications:

1. Contractor shall provide or cause to be provided by the appropriate subcontractors in the electrical trade for all work required by this Division 16, a ratio of one licensed master or journeyman for every three trainees at all times as those terms are defined by Chapter 10 of the Miami-Dade County Code. No other workers shall be allowed.
2. Where the work of these trades is subcontracted:
 - a. The contractor shall include this requirement in those subcontracts.
 - b. The subcontractor shall show capacity to bond the subcontracted work. The decision to require such bond to be issued remains with the general contractor.

1.02 1.02 SUBMITTALS

A. Manufacturer's Data:

1. Complete list of materials to be furnished under this section.
2. Manufacturers' specifications and other data required to assure specification compliance.
3. Catalog cuts, clearly marked for identification of items to be provided, including disconnects, breakers, fuses, starters, lighting fixtures, transformers, or other materials not requiring specially prepared Shop Drawings.

B. Shop Drawings for nonstandard items, including but not limited to panelboards, switchboards, control centers, anchoring layouts and details, lighting fixtures, or similar products.

C. Contract Closeout Submittals:

1. Record Drawings.
2. Warranties.
3. Operating Instructions, maintenance manuals, and parts lists.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Deliver materials to jobsite in their original unopened containers with labels and certifications intact and clearly legible at time of use.
2. Store materials according to manufacturers' recommendations and as approved by A/E.

B. Replacement: In case of damage, pilferage, or other loss, make immediate repair or replacement of materials necessary to obtain approvals of A/E, without cost to the Owner.

C. Protection: Use necessary means to protect materials of this section before, during, and after installation, including protection of installed work and materials of other trades.

PART 2 NOT USED

PART 3 NOT USED

END OF SECTION

SECTION 16112
RACEWAYS AND CONDUIT

PART 1 GENERAL

1.01 SUMMARY.

A. Related Sections:

1. 02221 - Excavating, Backfilling, and Compaction for Utilities.
2. 07270 - Firestopping and Fire and Smoke Barrier Caulking.
3. 07900 - Joint Sealers.
4. 09901 - Painting.
5. 10400 - Identifying Devices.
6. 16120 - Wire and Cable.
7. 16131 - Outlet, Pull, and Junction Boxes.
8. 16450 - Grounding.

1.02 DEFINITIONS

- A. Refer to NEMA Standard VE 1 for definitions of cable tray terminology used in this section.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Materials shall bear Underwriters Laboratories (UL) labels.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's literature including printed installation instructions and recommendations before starting work. Submit samples if requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fibrated Emulsion Conduit Coatings:

1. Karnak Chemical Corp., 220 Fibrated Emulsion.
2. Monsey Products Co., Monsey Asphalt Emulsion Roof Coating Fiber.
3. Sonneborn Building Products, Hydrocide 700B.

2.02 EQUIPMENT

- A. Conduit shall be sized according to NEC, unless otherwise noted. Feeders and home runs shall not be less than 3/4" diameter.

B. Rigid Conduit:

1. Galvanized Rigid Steel Conduit (GRS): Hot dip galvanized or electrogalvanized, with corrosion resistant coating on the inside, threaded, standard weight steel conduit complying with ANSI C80.1-1990, and Article 346 of the NEC.
2. Intermediate Metal Conduit (IMC): Hot dip galvanized or electrogalvanized, threaded, steel conduit complying with ANSI C80.6-1986 and Article 345 of the NEC.

3. Rigid Non-Metallic: Schedule 40, PVC plastic 90 degrees C. complying with ANSI/UL 651-1989, and Article 347 of the NEC.
- C. Electrical Metallic Tubing (EMT):
1. Galvanized steel tubing with smooth interior coat of lacquer enamel or zinc coat.
 2. Comply with ANSI C80.3-1983, and UL 797, and Article 348 of the NEC.
- D. Flexible Metal Conduit:
1. Steel: Flexible galvanized steel conduit (Greenfield) complying with UL 1 and Article 350 of the NEC.
 2. Liquid Tight: Flexible galvanized steel conduit with oil and water-resistant overall plastic sheath, complying with UL 1, and Article 351 of the NEC.
 3. Minimum size for flexible metal conduit 1/2" except 3/8" where allowed by Section 349 of the NEC for connections to lighting fixtures.
- E. Conduit Fittings:
1. Rigid Steel Conduit and Intermediate Metal Conduit: Zinc or cadmium plated steel or galvanized malleable iron complying with ANSI C80.1 and C80.3. Fittings shall be threaded type. Die cast zinc alloy fittings are not allowed.
 2. Rigid PVC conduit: 90 degrees C., PVC fittings UL listed. Fittings shall match conduit and complying with ANSI/UL 651-1989.
 3. EMT fittings: Zinc or cadmium plated steel or malleable iron of the compression type or stainless steel multiple point locking (set screw) type. Connectors shall have insulated throats. Fittings shall comply with ANSI C80.3-1983. Die cast zinc alloy fittings are not allowed.
 4. Flexible metal conduit fittings: Steel or malleable iron only with insulated throat, complying with Fed. Spec.W-F-406B. Die cast zinc alloy fittings are not allowed.
 5. Bushings and connectors shall incorporate an insulating insert of at least 150 degrees C. rated plastic or 105 degrees C. rated nylon. Conduit bushings made entirely of nonmetallic material are not allowed. Grounding and bonding bushings shall have clamp type terminal for copper conductor.
 6. Expansion Fittings and Sealing Fittings: UL listed with ground continuity means.
- F. Conduit Supports:
1. Straps: Formed zinc coated steel or malleable iron one-hole pipe straps or conduit clamps sized for conduits or tubing.
 2. Fastenings: Zinc coated or cadmium plated steel screws, bolts, toggles, and expansion anchors as required.
 3. Electrical steel channels shall be equivalent to Unistrut P-3000 Series. Provide trapeze, clamps, supports, concrete inserts, galvanized steel or plated steel with galvanized conduit clamps, and threaded 1/4" diameter minimum suspension rods.
 4. For individual branch circuit EMT or flexible metal conduit concealed above accessible hung ceilings only, "caddy clips" spring steel conduit clamps.
- G. Conduit Coatings: Steel conduit buried directly in the earth shall receive a factory applied PVC coating or 2 coats of fibrated emulsion conduit coating. Comply with manufacturer's application recommendations.
- H. Surface Raceways: Only where specifically indicated. UL listed and comply with Fed.Spec.W-C-582, and Articles 352 and 353 of the NEC.
1. Manufacturers:
 - a. Walker, Division of Butler Manufacturing Co.

- b. Wiremold.
- 2. Pull Wires: Galvanized steel or nylon rope of sufficient strength to pull in the maximum size conductors through trade size conduit. Minimum strength shall be 200 lbs.
- I. Wireways and Auxiliary Gutters:
 - 1. Hot dip galvanized code gage sheet steel, complete with knockouts, enclosures, and removable covers unless indicated as hinged.
 - a. Manufacturers:
 - 1) Hoffman.
 - 2) Lee Products.
 - 3) Keystone.
 - 4) Square D.
 - 2. Exterior locations shall have weathertight gasketed covers, joints, and drip-proof rain shields. Paint after installation with exterior enamel paint.
 - 3. Wireways and gutters shall comply with Articles 362 and 374 of the NEC.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not proceed with the work of this Section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Provide where indicated and where required, ducts, conduits, tubing, wireways, and gutters to form a complete and integrally grounded raceway system. The system shall be installed according to NEC and local code requirements. Components of the system shall be of sufficient size, strength, and capacity to allow for placements, pulling-in, or other installation of conductors, wires, cables, splices, taps, and terminations whether included in this Contract or for future use without strain or injury to those items being installed.
- B. Provide pull wires in empty raceways where no conductors are installed in this Contract. Allow 10 inches minimum slack at each end of pull wire and securely caulk in place. Provide marking tags showing opposite destination noting building and closet number at each end.
- C. The minimum size of rigid conduit, EMT, and flexible metallic conduit shall be according to NEC except as follows:
 - 1. Unless otherwise specified under "Products" or shown on the Drawings.
 - 2. Unless otherwise shown on the Drawings, telephone conduits shall be not less than 1 inch trade size.
 - 3. Feeders and homeruns shall not be less than 3/4" diameter.
- D. Check sizes of raceways to determine the green equipment ground conductor specified, shown, or required can be installed in the same raceway with phase and neutral conductors according to the percentage of fill requirements of NEC. If necessary, increase the duct, conduit, tubing, or raceway sizes shown or specified to accommodate conductors without additional cost to the Owner.

E. Raceway and Conduit Locations: Unless indicated otherwise, conduit types specified shall be used in the following locations. Any deviation from this schedule shall be submitted for approval with corresponding price adjustments before installation. Any conduit installed and not of the specified type shall be removed and replaced with the specified type at no additional cost to the Owner.

1. Exterior Raceways:
 - a. Below Grade:
 - 1) Below Grade Direct Buried:
 - a) Galvanized rigid steel (GRS), painted or PVC jacketed.
 - b) PVC Schedule 40, as noted on plans.
 - b. Exterior Exposed:
 - 1) GRS conduit.
 - 2) IMC conduit.
 - 3) PVC flexible conduit, PVC jacketed with liquid tight fittings.
 - 4) Gutters, wireways, and troughs of the gasketed, raintight type.
2. Interior Raceways:
 - a. Under Slabs on Grade:
 - 1) GRS (painted or PVC coated).
 - 2) PVC Schedule 40, with 12 inches clear to bottom of slab.
 - b. Embedded in Concrete Walls or Floor On or Below Grade: PVC or GRS with threaded or concrete tight steel fittings.
 - c. Embedded in Concrete Walls or Floors Above Grade:
 - 1) PVC Schedule 40.
 - 2) GRS or IMC with threaded or concrete tight steel fittings.
 - 3) EMT with concrete tight steel fittings.
 - d. Concealed in Masonry Walls:
 - 1) GRS or IMC with steel fittings.
 - 2) EMT with concrete tight fittings.
 - e. Concealed in dry wall construction, or in suspended ceilings: EMT or flexible metal conduit with steel fittings.
 - f. Interior Exposed:
 - 1) GRS or IMC at 8 feet or less above finish floor.
 - 2) EMT with steel fittings more than 8 feet above finish floor.
 - 3) Option: EMT installed below 8 feet from floor in electrical, mechanical, and telephone rooms.
3. Sealing fittings shall be installed at the following points and as otherwise indicated:
 - a. Where conduits enter or leave hazardous areas and enclosures for explosion-proof lighting fixtures, switches, receptacles, etc., use sealing compounds according to NEC to be of a type approved for the conduits.
 - b. Where conduits pass from warm locations to cold locations, such as refrigerated spaces and air conditioned spaces, use to prevent passage of water vapor.
 - c. Where required by the NEC.
4. PVC conduit shall not be used indoors either exposed or concealed, except embedded in concrete or under slabs on grade.
 - a. The depth of conduits under interior slabs shall be based on the minimum allowable bending radii of stub-ups.
 - b. Stub-ups on exterior and exterior walls shall be GRS, with transitions from PVC to GRS occurring below grade. Curves to stub-ups shall be GRS.

F. Raceway and Conduit Installation:

1. Conduit Routing:
 - a. Route feeders, homeruns, and conduits as indicated, except for minor deviations as accepted.

- b. Maintain a minimum separation of 12 inches between conduits containing emergency feeders and conduits containing normal feeders.
 - c. The routing of conduit, as shown on the plans, is general.
 - d. Before installing any work, examine the working layouts of all other trades to determine exact locations and clearances.
 - e. Where equipment is installed by other trades requiring connection as specified in this section, determine exact conduit entry locations from the approved shop drawings.
 - f. Modifications to conduit runs shown on the electrical drawings, based on this section, shall be made without additional cost to the Owner, and shall be subject to A/E approval.
 - g. In determining clearances, conduit shall not be run within 6 inches of any heated pipe or duct, or if unavoidable, the conduit must be kept at least 1 inch from the outer covering.
2. Conduits In Finished Spaces:
- a. Conduits, fittings, outlet boxes, and pull boxes shall be concealed in ceilings, floor slabs, walls, or partitions of the buildings.
 - b. Provide sufficient space at concealed conduits over conduit and coupling for the applications of finished floor, walls, and ceilings.
 - c. Examine the Drawings, and if necessary, confer with the A/E to determine the type of construction containing the concealed conduits and the space available for such conduits.
 - d. Unless otherwise shown on the Drawings, conduit may be run exposed on unfinished walls, on attics, and roof spaces.
3. Roof Conduit:
- a. Avoid running conduit on the roof wherever possible.
 - b. If absolutely necessary, roof mounted conduit shall be GRS or IMC, a minimum of 16 inches above roof on galvanized steel struts, securely supported, horizontally and vertically with pitch pans as required, on supports and conduit penetrations.
4. Conduits Penetrating Waterproof Membranes Under Floor Slabs on Grade:
- a. Coordinate installation of conduits before installation of waterproof membrane.
 - b. Membrane to be sealed waterproof to conduits as specified in Section 07120 before pouring of slab over membrane.
 - c. Provide Schedule 40 galvanized steel pipe sleeves for conduits penetrating floor slabs as specified in Section 01043.
5. Conduits Penetrating Waterproof Membranes on Walls: Provide properly coordinated Schedule 40 galvanized steel pipe sleeves for conduits in concrete forms as specified in Section 05500. Membrane to be sealed waterproof to conduits as specified in Section 01043.
6. Conduit Embedded in Concrete:
- a. Conduit embedded in poured concrete shall be of the specified type, unless otherwise indicated.
 - b. EMT shall not be installed underground, in slabs on grade, in wet locations, in hazardous areas, or for circuits operating at more than 600 volts.
 - c. Metallic conduit buried in the ground shall be of the specified type.
 - d. The outside diameter of any conduit buried in concrete shall not exceed one-third of the thickness of the structural slab, wall or beam in which it is placed. The conduit shall be located entirely within the middle third of the member whenever possible.
 - e. Lateral spacing of conduits buried in concrete slabs shall be not less than three diameters except where drawings indicate the concrete slab has been specially designed to accommodate a closer spacing of conduits entering panelboards, etc., or the arrangement is accepted by the A/E.
 - f. In general, conduits shall not be run through beams, except where clearly indicated on Drawings, specified, or where allowed by the A/E.

- g. No vertical conduit passing through horizontal concrete beams shall interfere with reinforcing. Where accepted by the A/E, horizontal conduit may pass through beams, provided they are not closer than 6 inches clear and are confined to upper half of beam section.
 - h. Properly support conduit to be embedded to maintain correct location and spacing during concreting operations. If necessary, provide suitable metal supports for this purpose.
 - i. Where a concrete embedded conduit passes through an expansion or contraction joint in the structure, install the conduit at right angles to the joint, and provide an approved conduit expansion fitting at the joint installed according to the manufacturer's instructions. Paint the conduit with an approved bituminous compound for 1 foot on either side of the expansion joint.
 - j. Conduits concealed in slabs on grade shall be installed over vapor barrier. Underground rigid conduit not encased in concrete shall receive the specified conduit coating.
 - k. Factory applied plastic resin or epoxy coated metal conduit and fittings may be used, provided that coating holidays and abrasions to coating are repaired with compatible mastic.
 - l. At any 1 point, not more than 2 lines of conduits shall intersect in any portion of slab.
 - 1) In all such cases, any additional conduit shall be rerouted through other areas, or run under the slab and stubbed through the slab at the required locations.
 - 2) Conduits and pipes shall have a minimum cover of 1 inch of concrete.
 - 3) Do not install conduit in slabs 3 inches thick or less.
 - 4) Under no conditions shall aluminum conduit be buried in concrete slabs.
 - 5) Slab installed conduit shall be stubbed within webbing of block and shall be extended vertically concurrently with laying of block.
 - 6) Determine centerline of block partitions measured from column centerlines.
7. Conduit Bending, Cutting, and Placement:
- a. Conduit bends and offsets shall be avoided where possible.
 - b. Required bends shall be made with standard benders designed for the purpose and with a minimum radius of 6 times the internal conduit diameter.
 - c. Make conduit bends according to the NEC unless otherwise shown on the contract Drawings. Use of a pipe tee or vise for bending conduit is not allowed.
 - d. Conduit crushed or deformed shall not be installed.
 - e. Bends shall be free from dents or flattening. Bends more than 360 degrees are not allowed in conduit between any 2 terminations of pull boxes.
 - f. Make no bend in surface raceways. Use factory formed fittings for surface raceways.
 - g. Raceways shall not contain more than two 90 degree bends or equivalent. Provide additional junction or pull boxes to meet this requirement.
 - h. The ends of conduit shall be carefully reamed out free from burrs before installation and after threading.
 - 1) Cuts shall be made square.
 - 2) Coupling of conduit by means of running threads is not allowed.
 - 3) Where it is impossible to run the conduit and coupling sections together, an Erickson coupling or other accepted combination coupling shall be used.
 - 4) Joints shall be made up tight.
 - 5) Joints in conduits concealed in slab, floor fill, earth, etc., shall be made using approved silicone paint on threads.
 - i. Prevent lodgement of plaster, dirt, or trash in raceways, boxes, fittings, and equipment during course of construction. Clogged raceways shall be entirely freed of obstructions or replaced.
 - j. During installation of conduit, unfinished runs and terminations in pull boxes, cabinets, etc., shall be capped until conductors are installed.

- k. Plastic caps designed for this specific purpose shall be used to cover and align conduits before concrete pours and shall remain on conduit stub-ups until conduit is extended. Caps shall have selfaligning, interlocking male or female wings molded on each side. Duct or electrical tape and wire are unacceptable.
8. Conduit Connections:
- a. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Unless otherwise specified, each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a bushing on the inside or by means of a liquidtight, threaded, self-locking, cold-weld type wedge adapter. Where nominal circuit voltage exceeds 250 volts:
 - 1) In rigid conduit, an additional locknut shall be provided, 1 inside locknut and 1 outside locknut.
 - 2) In EMT or flexible metal conduit, the 1 locknut shall be made wrench-tight.
 - 3) Locknuts shall be the bonding type with sharp edges for digging into the metal wall of an enclosure and shall be installed to provide a locking installation.
 - 4) Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections.
 - 5) Protect vertical runs of conduit or EMT terminating in the bottoms of wall boxes or cabinets, etc., from the entrance of foreign material before the installation of conductors.
 - b. Plastic conduit joints shall be made by brushing a plastic solvent cement on the inside of the plastic coupling fitting and on the outside of the conduit ends. Slip together the conduit and fitting, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly. Remove excess cement built-up on the surface of the conduit.
 - c. The end of each conduit one inch and smaller shall be provided where it enters a junction box, outlet box, cabinet, etc., with the locknut and bushing. For conduits 1-1/4" and larger, use insulated bushings with ground stud. If insulated bushings are of the fully insulated type, use additional locknuts inside the junction box or cabinet before installing the bushing. Provide conduit entering main distribution switchboard feeder pull boxes with insulated bushing with ground stud regardless of size.
 - d. Install the conduit system complete before any conductors are drawn in. Each run of conduit shall be blown through and swabbed after plaster is finished and dry, and before conductors are
 - e. installed.
 - f. Install conduit to drain any moisture, collecting in the conduit, to the nearest outlet or pull box, where possible.
 - g. Where metallic conduit is exposed to different temperatures, seal the conduit to prevent condensation and passage of air from one area to the other.
 - h. Light and power conduit shall run from a permanent and continuous ground return back to the service ground connection point. Conduits used on systems entirely isolated from the light and power distribution system shall be electrically continuous and grounded in an approved manner.
9. Conduit Penetrations and Supports:
- a. Sleeves, conduits, or other pipes passing through floor slabs, beams, or walls shall be located to not impair the strength of the structure.
 - b. Conduits penetrating the walls or smoke partitions shall be fire stopped (sealed). Filling materials for openings in floors shall be fire-resistive, and finished to prevent passage of water, smoke and fumes. Filling material for openings in walls shall be fire-resistive where it occurs in fire walls, and shall be installed to prevent the passage of air, smoke or fumes. Where conduit and wiring pass through fire walls or floor slabs, the Contractor shall fill the opening with fireproof sealant, as specified in Section 07270.

- c. Roof penetrations shall be made using approved flashings and counterflashings. Do not penetrate cant strips or expansion joint covers with conduits. Do not run conduits up through roof nearer than 12 inches from toe of cant strip. Where conduits penetrate exterior walls near flashings, penetration shall be at least 3 inches above the flashing reglet.
- e. Where conduits passing through the openings are exposed in finished rooms, the finishes of the filling materials shall match and be flush with the adjoining floor, ceiling, or wall finishes.
- f. Where unused sleeves or slots are provided for future installation of conduit, etc., they shall be suitably identified if not readily recognizable.
- g. EMT and conduits not embedded in concrete or masonry shall be securely and independently supported so that no strain will be transmitted to outlet box and pull box supports, etc. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.
- h. Run conduits exposed in unfinished spaces, mechanical equipment spaces, where specifically indicated on the Drawings, or with the expressed permission of the A/E.
 - 1) Feeder conduits shall be run exposed or in hung ceilings, except as noted.
 - 2) Where exposed conduits are installed, they shall be run parallel to the building walls or partitions, using approved conduit fittings.
 - 3) Exposed conduits shall be securely supported with malleable iron pipe straps, angle iron pipe straps, angle iron or steel channel racks or other approved means as required for clearance of other piping or ductwork.
 - 4) Wood hangers and perforated sheet metal hanger straps are not allowed.
 - 5) Spacing of conduit supports shall not exceed 7 feet.
 - 6) Horizontal feeder conduit banks shall have their hangers fastened to the building structure by approved means.
 - 7) Hangers for banks consisting of 1 or 2 conduits may be fastened from inserts in the slab.
 - 8) Auxiliary steel for fastening shall be furnished and installed under this section.
- i. Support individual conduits not larger than 1-1/2" diameter by means of one-hole pipe straps or individual pipe hangers. Support individual horizontal conduits larger than 1-1/2" diameter by individual pipe hangers.
- j. Conduit located in hung ceilings shall be supported in approved manner similar to exposed conduits.
- k. Branch circuit conduits above suspended ceilings may be supported from the floor construction above or from the main ceiling support members, however, the finished installation shall not interfere with the removability of ceiling panels. Individual branch conduits above suspended ceilings with removable panels may be supported from the ceiling suspension wires provided the load imposed on any individual wire is not greater than 64 pounds, including the ceiling weight.
- l. Space conduits installed against concrete or masonry surfaces away from the surface by clamp backs or other approved means.
- m. In dry locations, spring steel fasteners, clips, or clamps specifically designed for supporting exposed single conduits may be used instead of pipe straps or pipe hangers.
 - 1) Hanger rods used with spring steel fasteners shall be not less than 1/4" diameter steel with corrosion resistant finish.
 - 2) Spring steel fasteners shall be specifically designed for supporting single conduits or EMT
 - 3) Type, size and spacing of spring steel fasteners with accessories shall be approved by the A/E and the Contractor.
 - 4) Submit applicable load and rating data for approval.
 - 5) Wire shall not be used for support.
 - 6) Nails are not allowed for the support of conduit.

- n. Where 2 or more horizontal conduits or EMT run parallel and at the same elevation, they shall be supported on multiple trapeze pipe hangers. Each conduit or EMT shall be secured to the horizontal hanger member by a U-bolt, one-hole strap, or other suitably designed and approved fastener.
 - o. U-bolts, clamps, attachments, and other hardware necessary for hanger assembly, and for securing hanger rods and conduits shall be provided. Each multiple hanger shall be designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger, plus 200 pounds. Hardware shall be hotdip galvanized after fabrication.
10. Fittings:
- a. Expansion Fittings: Each buried conduit in or rigidly secured to the building construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fittings shall be made of hot dip galvanized malleable iron and shall have a factory installed packing that will prevent the entrance of water, a pressure ring and a grounding ring.
 - b. In addition to the grounding ring, a separate external copper bonding jumper secured by grounding straps on each end of the fitting shall be provided.
 - c. Sealing Fittings: Sealing fittings for use with rigid steel conduits shall be of the threaded, zinc or cadmium coated, cast or malleable iron type. Fittings used to prevent passage of water vapor shall be of the continuous drain type.
 - d. Sealing fittings shall be installed and sealed according to the manufacturer's recommendations at suitable, approved, accessible locations. In concealed work, each fitting shall have an access door or panel to allow access to the fitting.
 - e. Compression fittings shall be made up tight according to manufacturer's recommendations. No screw type fittings are allowed.
11. Conduit Fastening: Fasten raceways as follows:
- a. To Wood: Wood screws, sheet metal screws, or screw type nails.
 - b. To Hollow Masonry: Toggle bolts or expansion bolts as required. Holes not used to be filled.
 - c. To Concrete or Solid Brick Masonry: By expansion bolts. Holes drilled to a depth of more than 1-1/2".
 - d. To Steel Work: Machine screws, welded threaded studs, or spring-tension clamps. Raceways or pipe straps shall not be welded to steel structures.
 - e. To Light Steel Construction Partitions: Sheet metal screws. Bar hangers may be attached with saddle ties of 16 gage double strand zinc-coated steel wire.
 - f. Nail-type nylon anchors with lock washers and nuts may be used instead of expansion bolts or machine screws.
 - g. Explosive charge setting devices are not allowed for any type of fastening on the project.
 - h. Conduits, tubing, or raceways shall be continuous from outlet to outlet, cabinet, junction box, or pull box.
 - i. Surface Wireways and Auxiliary Gutters: Fasten according to manufacturer's directions with fastenings appropriate for surface as specified.
12. Flexible Conduit:
- a. Flexible conduits shall be used for connections to motors and other electrical equipment when it is subject to movement, vibration, misalignment, cramped quarters, or where noise transmission is to be eliminated or reduced. Flexible conduit used to meet the above requirements shall be of the liquid-tight type when installed under any of the following conditions:
 - 1) Exterior locations.
 - 2) Moisture or humidity laden atmosphere where it is possible for condensation to accumulate.
 - 3) Corrosive atmospheres.
 - 4) Where water or spray due to wash-down operations is frequent or possible.

- 5) Wherever there is a possibility of seepage, dripping, etc., of oil, grease, or water.
 - b. Flexible conduit shall be used for short connections to control devices, recessed fixtures, and similar items with enough slack to avoid tension. Connection between structure and first point of attachment to vibrating equipment shall be flexible.
13. Surface Raceways:
- a. Surface metal raceways shall be used where noted on Drawings. Surface metal raceways shall be securely grounded to outlet boxes or to back-plates and fixtures by means of bolts, screws, or other approved means. Ends of raceways shall be provided with bushings at entrances to boxes or canopies. A separate green ground conductor shall be installed in the raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.
 - b. Fasten surface raceways to surface in manner similar to methods specified.
 - c. Each surface metal raceway outlet box with an attached lighting fixture shall be of sufficient diameter to provide a seat for the fixture canopy.
 - d. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy, with or without extension ring, the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.
 - e. A surface metal raceway outlet box shall be provided, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
 - f. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed, a backplate slightly smaller than the fixture canopy shall be provided and no additional surface mounted outlet box need be installed.
14. Empty Conduits: Where empty conduit or tubing is indicated for wiring to be installed in future by utility company or by separate contract, install conduit or tubing according to previous requirements for conduit and tubing with following additional requirements:
- a. No length of run shall exceed 75 feet for 3/4" size and 150 feet for 1 inch or larger sizes.
 - b. Raceways shall not contain more than two 90 degree bends or equivalent.
 - c. Install additional pull or junction boxes to comply with above limitations, whether or not indicated.
 - d. Inside radii of bends in conduits of 1 inch or larger shall be not less than 10 times nominal diameter.
 - e. Provide pull wire in empty raceways.
15. Painting: Paint exposed conduit to match the surrounding wall or ceiling it is mounted against according to Section 09901 Painting.

3.03 ADJUSTING AND CLEANING

- A. Upon completion of installation of cable trays, inspect trays, fittings, and accessories, remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 16120

WIRE AND CABLE

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 16112 - Raceways and Conduit.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Materials shall bear Underwriters Laboratories (UL) labels.

1.03 SUBMITTALS

A. Submit product data and descriptive literature before starting work.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Wire and Cable:

1. Wire and cable shall be soft annealed 98 percent conductivity copper with 600 volt A.C. thermoplastic insulation unless otherwise noted.
2. Wire and cable shall be new and manufactured not more than 12 months before installation.
3. Each coil or reel shall bear UL label and wire marked with AWG or circular mil wire size, voltage rating, insulation type, type stranding, and the manufacturer's name.
4. Unmarked wire found installed shall be replaced at no additional cost to the Owner.
5. Wiring shall comply with NEMA WC-5, NEMA WC-7, IPCEA S-61-402 and IPCEA S-66-524.

B. Light and Power Wiring Circuit Conductors:

1. Light and power wiring circuit conductors may be stranded in sizes No.10 AWG and smaller, and concentric strand Class B for conductors No.8 AWG and larger.
2. Stranded copper conductors may be used for final connections to individual recessed lighting fixtures, devices, and for control and signal circuit wiring only with crimp-on type terminations.
3. Do not use stranded wire for wiring to receptacles, unless insulated crimp-on connectors are installed on the wiring ends.

C. Wiring Insulation shall be as follows:

1. For Feeders and Equipment Power Circuits: Type THW-75 degrees C., XHHW-75 degrees C., or THWN-75 degrees C. in wet or dry locations, and THHN-90 degrees C. or XHHW-90 degrees C. only at dry locations.
2. For Branch Circuit Wiring for Lighting and Power Circuits: Type THW-75 degrees C., THWN-75 degrees C. in wet or dry locations, and THHN-90 degrees C. only at dry locations.
3. For Wiring Through Fluorescent Fixtures Where Fixture Is Used As Wireway: Type THHN-90 degrees C.

D. Color Coding:

1. Wire of Size No.8 and smaller shall be factory color coded 600 volt, THW, THWN, or THHN. Sizes larger than No.8 may be factory color coded or color coded with 3M tape or accepted equivalent. Should tape be used, it shall cover not less than 6 inches of cable within enclosure.
2. Colors to be used in coding shall be:

120/208 Volt System

Neutral - White
Phase A - Black
Phase B - Red
Phase C - Blue
Ground - Green

277/480 Volt System

Neutral - Gray
Phase A - Brown
Phase B - Orange
Phase C - Yellow
Ground - Green

Electrical grounding and static - bare wire, where allowed by NEC.

E. Minimum Wire Size: Use No.12 AWG for control over 200 feet, unless otherwise noted. Control wiring may be No.14 AWG if distance is less than 200 feet.

1. Fire alarm and intrusion systems shall have cable and wiring according to manufacturer's specifications.

F. Wire and Cable Connectors and Terminations:

1. For splices in branch circuit conductors solid or stranded size No.10 AWG and smaller, use UL listed soft plastic wire nut with sharp selfcutting interior threads, 3M Scotchlok, Ideal Supernut, or T&B Piggy of the size to match the wire.
2. For terminations of stranded or solid wire in size No.10 AWG and smaller at equipment terminals, use UL listed, tin-plated copper, 600 volt vinyl insulated compression type ring or fork type equivalent to T&B "Sta-Kon" or Burndy "Vinylug".
3. For No.8 AWG and Larger: T&B "Locktite" connectors, Burndy "Versitap" connectors, or OZ-Gedney solderless connectors, with insulating covers, tape or heat shrink insulation system.
 - a. Terminations and splices in feeders may be made with solderless pressure type connectors complete with composition insulating covers, field insulating tape, or heat shrink insulation system.
 - b. Connectors and lugs for 250 mcm cable and larger shall be of the 2-hole type and for compression type shall have at least 2 indents.
 - c. Compression lugs and connectors shall be tin plated wrought copper, of size to match the cable.
4. Splices in underground exterior wiring shall be made fully waterproof by potting or encapsulating.
5. Insulating tapes shall be of a type approved for the application and shall be flame retardant. Tapes shall be as manufactured by 3M or Bishop Electric.
6. Cable Ties: T&B "Ty-Rap" or Burndy "Unirap".
7. Cable Identification: Branch circuits wire markers 3M "Scotch Code" or accepted equivalent. For feeder sizes, non-ferrous metal stencil tags.
8. Thermal Fusion Connections: "Catalytic thermal weld" by Cadweld or accepted equivalent.

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

A. Wire and Cable Installation:

1. Wire and cable shall be suitably protected from weather or damage during storage and handling and shall be in first-class condition when installed.
2. Conductors shall not be pulled into conduit until raceway system is substantially complete. Wiring shall be continuous within conduit runs. Splices will be allowed only at outlet and junction boxes. Joints shall be mechanically and electrically secure.
3. Pulling lubricants, if used, shall comply with UL requirements for the type of conduit material and cable insulation being used.
4. Care shall be taken to prevent cutting and abrasion of cable insulation during the pulling of feeders.
 - a. Ropes used for pulling of feeders shall be made of polyethylene or other suitable nonmetallic material.
 - b. Pulling lines shall be attached to conductor cables by means of either woven basket grips or pulling eyes attached directly to the conductors.
 - c. Rope hitches shall not be used.
 - d. Cables to be installed in a single conduit shall be pulled in together.
 - e. Where polyethylene insulation is used and a pulling lubricant is required, the lubricant shall be certified by the manufacturer to be noninjurious to such insulation.
5. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impracticable and shorter radii are allowed by the NEC and NEMA Standards.
6. Neatly and securely bundle conductors located in branch circuit panelboards, cabinets, control boards, switchboards, and motor control centers. Use nylon bundling straps.
7. Provide suitable installation equipment to prevent cutting or distortion of conduits during the pulling of feeders. Use masking or other means to prevent obliteration of cable identification when solid color coating or colored tracers are used.
8. Control wiring color codes, shall be of type as required by its equipment manufacturer. Interconnections of control wiring shall be on numbered terminal strips.
9. Where 2 neutrals are installed in same conduit, their sets of wiring shall be grouped and clearly identified by permanent tags or other means.
10. At each outlet, a loop or end of wire not less than 9 inches long shall be left for connection to lead.
11. Leading end of each conductor pulled shall be carefully examined for damage to jacket. If damage is evident, cable shall be extended and further checked for damage, with good cable only to remain.
12. Cables in junction and pull boxes shall be properly trained and racked.
13. Branch circuit wiring in panelboard gutters shall be installed vertically in the gutter with a 90-degree bend at the supply circuit breaker, wire shall enter the circuit breaker lug horizontally.
14. Install cable supports and boxes at vertical feeders and according to the schedule in the NEC. Boxes shall be built of heavy steel plates not less than No.10 USS gage fastened to an angle iron frame with removable covers secured by brass machine screws. The cable support shall be of the split wedge type that clamps each conductor firmly and tightens due to the weight of the conductor.

B. Wire and Cable Splicing and Terminations:

1. Splices and terminations of conductors shall be made using specified materials and methods installed according to the manufacturer's recommendations.
2. Splices in branch circuit wiring shall be made by stripping conductor insulation, twisting conductors until mechanically secure, and installing a self-threading insulated type connector. Splices are not allowed within panelboards.
3. Conductors shall be squarely cut and fully inserted into the lug barrel or connector. Insulation shall be stripped without cutting the conductor or removing strands, exposing the conductor for the minimum distance required for connection. Splice connectors shall be of a type and be so
C. installed that the conductor is fully insulated by a skirt of such design, or taped so cold flow of the conductor insulation will not be induced when the conductor is positioned in its final operating position.
4. Do not combine conductors under the same lug. Provide individual lugs for individual conductors. Re-tighten bolt type connectors 24 to 48 hours after initial installation and before taping.
5. Connectors shall be insulated by approved type, integral or separate cover, or by means of taping with approved plastic or rubber and friction tapes to provide insulating value equal to that of the conductors being joined. The number and size and combinations of conductors allowed by UL as listed on manufacturers' packaging of connector shall be strictly complied with.
6. Terminations at equipment terminal blocks shall be made using compression type connectors suitable to match terminal type.
7. Continuity of neutral on multi-wire branch circuits shall not be made on any device at terminal blocks, but shall be spliced and a tap brought out, thereby assuring no openings of the neutral in the replacement of a device.
8. Feeders shall be identified by means of nonferrous tags or pressure-sensitive labels securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc. Tags or labels shall be stamped or printed to include the feeder number, source and equipment supplied. If suspended type tags are provided, they shall be attached by nylon cables ties or other nonconductive permanent means.
9. Branch circuit conductors shall be identified at supply circuit breakers, with the circuit number using pressure sensitive adhesive wire markers.
10. Branch circuit wiring for lighting and other single phase 277 volt or 120 volt applications shall be multi-wired utilizing common neutrals. Under no circumstances shall any switch break a neutral conductor. Branch circuit wiring extending more than 100 feet to the nearest outlet from a panel shall be No.10.
11. Circuiting work shall comply with the following:
 - a. Loads on panel busses shall be balanced on phases as evenly as possible.
 - b. No neutral conductor shall be common to more than 1 circuit conductor connected to the same phase leg of the supply system.
 - c. Circuiting of panelboards shall allow breakers to be grouped logically by functions.

END OF SECTION

SECTION 16131

OUTLET, PULL, AND JUNCTION BOXES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 09901 - Painting.
2. 16112 - Raceways and Conduits.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Materials shall bear Underwriters Laboratories (UL) labels.
2. Box size shall comply with NEC for number and size of conductors in boxes.
3. Box size shall comply with NEC for number and size of conduits entering and exiting each box.

1.03 SUBMITTALS

A. Submit manufacturer's literature and technical data before starting work.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Outlet Boxes:

1. Provide outlet boxes at required locations, where shown on the drawings, and as specified.
 - a. Fixture studs shall be securely fastened in an acceptable manner.
 - b. Plaster covers shall have depths suitable to the finish being applied to the walls.
 - c. Sheet steel boxes shall be properly drilled and tapped.
 - d. There shall be not more holes in any of the outlet boxes than are required for the entering conduits.
 - e. Depth of boxes shall allow for easy wire pulling and proper installation of wiring devices.
2. Outlet boxes shall be galvanized steel or rust resistant malleable iron alloy and comply with ANSI C33.65.
3. Outlet Boxes shall be as follows:
 - a. For Recessed Ceiling Fixtures:
 - 1) 4 inch square sheet steel box with blank cover and suitable hanger bar-box to be fastened to ceiling suspension members in an acceptable manner not more than 1 foot from fixture opening.
 - b. For Surface or Stem Mounted Ceiling Fixtures from Slab with Concealed Conduit:
 - 1) 4 inch sheet steel octagon concrete ring of a depth suitable to the construction and furnished with top cover having a 3/8" fixture stud.
 - c. For Ceiling and Wall Bracket Outlets on Exposed Conduit in Dry Locations:
 - 1) 4 inch octagon sheet steel box with 3/8" fixture stud.
 - d. For Surface Mounted Ceiling Fixture or Hung Ceilings:

- 1) 4 inch octagon sheet steel hung ceiling box with suitable hanger bars and 3/8" fixture stud. Box to be fastened to ceiling suspension in an acceptable manner.
- e. For Surface Mounted Wall Bracket Fixtures with Concealed Conduit:
 - 1) 4 inch square sheet box with round opening plaster cover and 3/8" fixture stud.
- f. For Ceiling and Wall Bracket Outlets on Exposed Conduit at Damp or Wet Locations:
 - 1) 4 inch cast iron.
- g. For Switches and Receptacles in Tile, Plastered, or Gypsum Board Walls:
 - 1) 4 inch square sheet steel box or multi-gang box with proper plaster covers as required. Two gangs may be provided by means of a 4 inch square box with two gang plaster cover.
- h. For Switches and Receptacles in Enameled or Face Brick walls, Unfinished Walls, and Woodwork:
 - 1) Single or multi-gang sheet steel utility boxes as required.
- i. For Switches and Receptacles on Exposed Exterior Conduit Work:
 - 1) Type FS or FD conduit.
- j. For Telephone or Computer Outlets:
 - 1) 4-11/16" square X 2-1/2" deep.
4. Boxes for fire alarm and other specialty equipment shall be by the manufacturer of the enclosed equipment.
5. Wet/Damp Locations:
 - a. Provide gasketed, weathertight, screw covers, code gage galvanized steel pull boxes with weatherproof conduit hubs equivalent to Myers Scru-Hub for pull boxes with multiple conduit entries.
 - b. Provide cast metal hub type, dipped in rust inhibitor and with gaskets for individual conduit runs.
6. Extension Rings: Do not use to increase the volume of boxes, except where necessary due to multiple conduit run conflicts.
 - a. Where such conflicts occur, an extension ring may be allowed for changes in direction of conduit to make necessary clearances.
 - 1) Not more than one extension ring may be used for each box where necessary.

B. Pull and Junction Boxes:

1. Where indicated in the plans and specifications or where necessary for compliance with code requirements for cable installation, install junction and pull boxes of the proper size for conduits over 1 inch trade size. Pull and junction boxes shall be of adequate size to accommodate installation of conductors without excessive bending of conductors that could damage insulation.
2. Pull and junction boxes shall comply with Fed.Spec.WJ-800 and be of all steel construction, spot or seam welded at joints, and hot dip galvanized after fabrication.
3. Boxes shall be drip proof with screw attached covers. Each box shall have a turned-in lip welded at joint to develop full strength. Lip shall be drilled and tapped for 1/8" or 3/16" round head screws, symmetrically placed. To provide adequate length of thread, nuts shall be tack welded on inside of lip, or lip shall be made double thickness.
4. Pull and junction boxes shall be sufficiently rigid to withstand moderate twisting strains. Steel boxes shall comply with the following:
 - a. 100 cubic inches or less shall be of No.14 gage steel.
 - b. Between 101 and 8500 cubic inches shall be No.12 gage steel.
 - c. Larger boxes shall be No.10 gage steel.
 - d. Barriers and reinforcing angles shall be supplied as required.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work or this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Locations of outlets on electrical drawings are approximate only.
 - 1. Do not scale drawings.
 - 2. Consult architectural plans, sections, elevations, and details for exact locations of outlets and equipment and rooms and spaces having furring or hung ceilings.
 - 3. Verify door swings on architectural drawings for properly locating light switches.
 - 4. Coordinate wall outlet locations with cabinets, and equipment.
- B. Determine the proper position of outlets and receptacles. Relocate any outlet or receptacle without additional cost to the Owner if improperly located.
- C. The A/E reserves the right to change the location of any outlet, apparatus, or equipment up to the time of roughing in without additional cost to the Owner, provided conduit runs are not substantially increased.
- D. Fasten and secure boxes to the building structure independent of the conduit. Provide acceptable plaster stops for boxes to be set in plastered walls and ceilings.
- E. Boxes and supports shall be fastened as follows:
 - 1. To concrete or brick: Bolts and expansion shields.
 - 2. To hollow masonry: Toggle bolts, or bolts and expansion shields.
 - 3. To steel work: Machine screws or welded studs.
 - 4. Explosive charge setting devices are not allowed.
- F. Recessed wall outlets shall be flush with the wall surface. Install box in wall with cover to allow block or wall surface to fit tight against lip of cover.
- G. Where shown together on the plans, switches shall be ganged in one outlet. Switches and receptacles shall be ganged together only where plans specifically indicate such combinations.
- H. Outlets for duplex receptacles shall be arranged for vertical mounting of the receptacles except as specifically indicated on plans.
- I. Barriers shall be provided as necessary to isolate voltage classes.
- J. Under no circumstances shall outlet boxes for adjoining spaces be placed back to back in partition walls.
- K. Circuit breakers and switches shall not be grouped or ganged in outlet boxes unless they can be arranged where the voltage between exposed live metal parts of adjacent switches does not exceed 300 volts. Provide barriers between 120 and 277 volt switches where ganged together.
- L. Align rows of outlet boxes for ceiling lights.

- M. Unless noted, specified, or directed otherwise, wall outlets shall be centered above finished floor as follows:
1. Convenience outlets: 18 inches to bottom of box.
 2. Utility outlets: 18 inches to bottom of box.
 3. Exit lights: 6 inches over doorway.
 4. Switch outlets: 46 inches to bottom of box.
 5. Special purpose outlets: as directed.
 6. Telephone outlets: 18 inches to bottom of box.
 7. Fire alarm visuals with or without horns: 78 inches to bottom of box.
 8. Fire alarm horns: 6" minimum below adjacent surface, but not less than 8'6" or greater than 10'0" above finish floor.
 9. Fire alarm pull station: 46 inches to bottom of box. Refer to Architectural drawings for additional mounting heights.
- N. Pull and junction boxes shall be provided at locations required to reduce length of cable pull or reduce number of elbows between outlets.
- O. Provide blank covers for outlet boxes when devices or wiring has been removed or not installed.
- P. Paint exposed boxes to match the color of the wall or ceiling to which they are mounted.
- Q. Where several feeders pass through a common pull box, tag each feeder to clearly indicate electrical characteristics, circuit number, and panel designation.

END OF SECTION

SECTION 16440
DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SUMMARY

- A. Related Sections:
 - 1. 09901 - Painting.
 - 2. 16475 - Overcurrent Protective Devices

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Materials shall bear Underwriters Laboratories (UL) labels. Label for "SERVICE ENTRANCE" where so applied.

1.03 SUBMITTALS

- A. Submit manufacturer's literature and technical data before starting work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Disconnect Switches:
 - 1. G.E.
 - 2. I.T.E.
 - 3. Hubbell.
 - 4. Siemens.
 - 5. Square D.
 - 6. Westinghouse.

2.02 EQUIPMENT

- A. Disconnect switches shall comply NEMA KSI-1975 for type HD and shall be of heavy duty type, enclosed, of quick-make, quick-break construction. Rating shall be as indicated on drawings. Switches shall be horsepower and I2t rated, UL labeled.
- B. Disconnect Switch Enclosure:
 - 1. NEMA 1 for indoor use.
 - 2. NEMA 3R for outdoor use.
- C. Disconnect switch operating handle shall be of insulated box mounted type that directly drives switch mechanism suitable for padlocking in "OFF" position.
- D. Defeatable, front accessible, "coin-proof" interlocks shall be provided to prevent opening of cover when switch is in "ON" position, and prevent turning switch ON when door is open. Securely fastened metallic nameplate shall include highly visible "ON-OFF" indication.
- E. Motor Disconnect Means: Provide each motor with an in-sight disconnect means, when required by NEC, and where shown on the drawings.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Install the disconnect switches vertically with top not more than 6 feet above the floor, and rigidly and securely attached to the building. Disconnect switches shall not depend upon conduit for support.
- B. Where used as service entrance main disconnects, switches shall be permanently labeled "MAIN SWITCH 1 of 4", "MAIN SWITCH 2 of 4", etc.
- C. Optional Mounting:
 - 1. Plywood Panel: Mount panelboards on backboard of 3/4" exterior grade plywood, finished one side, primed all surfaces, painted with one coat gray of fire retardant enamel (finished side) and secure to wall with approved shields or screws as directed by the A/E.
 - 2. Unistrut: Mount disconnect switches on Unistrut P-3000 mounting channels at top and bottom, secured similarly to wall.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 16120 - Wire and Cable.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Materials shall bear Underwriters Laboratories (UL) labels.

1.03 SUBMITTALS

A. Submit manufacturer's literature giving materials, finishes, accessories, and installations where required.

B. Ground resistance tests.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Grounding system installation shall comply with Article 250 NFPA 70 National Electrical Code - (NEC).

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Grounding System.

1. Grounding system shall comply with ANSI C33.8, IEEE-81.
2. The electrical system and equipment shall be grounded according to the requirements of the NEC and as specified.
3. The grounding conductor shall be an insulated copper wire of size indicated.
4. Where not indicated, the conductor shall be according to the requirements of the NEC except that minimum size shall be No.8 copper for system ground.
5. Inaccessible connections shall be made with the exothermic welding process using equipment manufactured by Burndy or Erico Products.
6. Accessible connections shall be made with multiple bolt silicon bronze connectors specifically designed and accepted for the connection to be made.
7. Connectors shall be as manufactured by Burndy or O.Z. Electric.
8. Grounding jumpers shall be provided across metal parts separated by non-conducting materials, or when joined, so there is a high resistance at the joints.
9. Grounding electrical conductors shall not be buried directly in concrete. Provide a conduit sleeve where each cable passes through concrete. If buried in earth, they shall be tinned.
10. Refer to electrical drawings for additional grounding.

B. Grounding Source:

1. Grounding electrical system shall comply with NEC 250.81. A ground ring or mat buried beneath the switchgear room, counterpoise and ground rods as shown on

- drawings, connection to the metal cold water main, metal frame of the building, and to a concrete encased electrode.
- C. All the grounding electrodes shall be bonded together if available on site.
 2. Maximum resistance to ground shall be limited to 5 ohms. Additional ground rods shall be driven if required to maintain this level.
 3. Maximum ground resistance to each of individual rods shall be 25 ohms.
 4. Submit test results for acceptance indicating that these values have been met, using the fall of potential method as directed in IEEE Standard 81-1983.
- D. System Grounds: Neutral bus and ground bus in switchgear shall be connected by means of an accepted bus link, and connected to the ground bus in the substation room.
- E. Ground Rods: Copper clad steel not less than 3/4" in diameter, 10 feet long, driven full length into the earth.
- F. Cold Water Pipe:
1. Ground loop shall be connected to the building steel and shall also be grounded to main cold water pipe at point of entrance of the metallic water service with copper conductor in conduit.
 2. Connection to cold water pipe shall be made by a suitable ground clamp.
 3. If flanged pipes are encountered, connections shall be made with the lug bolted to the street side of the flange connection.
- G. Parts to be Grounded: Switchgear frame, panelboard frames, fittings, fixtures and devices, cable sheaths, neutral of transformers, boxes and raceways, noncurrent carrying parts of appliances and devices, and all other parts and equipment as required by NEC. Neutral wire shall never be used as grounding means.
- H. Conductor: Grounding cable shall be green insulated copper stranded cable, soft drawn or annealed. Sized as indicated on drawings, from the main switchboard to each panel, power outlet, or load, except as specified for lighting branch circuits.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install grounding system as shown on drawings.
- B. Connections to equipment, bus, or conduit shall be made with approved type of solderless connector and shall be thoroughly cleaned and made bright before connection is made to insure metal contact.
- C. Connections inaccessible after completion of project shall be made by exothermic weld process.
- D. The grounding medium for lighting branch circuits shall be the conduit system.
 1. Ground the lighting fixture by means of a conductor between the outlet box and the fixture.
 2. Locknut connections to cabinets, pullboxes, junction boxes, etc., shall be drawn up sufficiently tight to assure a continuous metal-to-metal bond, where a separate ground conductor is not provided.
 3. Where GFCI type receptacles are indicated, provide a separate ground conductor from the panelboard.

- E. Bond conduits stubbing under switchboard, motor control center, and similar locations using bonding bushings. Run a separate ground conductor with the phase conductors from the motor control center ground bus or a grounding bushing in the starter enclosure to each motor frame.
- F. Do not use flexible conduit as a grounding medium. Provide a bonding wire in flexible conduits and connect to the boxes at each end in an approved manner.
- G. Unless otherwise indicated, provide in each feeder conduit an equipment grounding conductor. For parallel runs, provide a ground conductor in each conduit.
- H. Provide a ground rod driven through or near pole bases and weld a No.10 AWG wire or as indicated on drawings, to the top of the rod and extend the wire to a grounding lug in the base and bond the anchor bolts. Ground wire shall be connected to metallic feed conduit or circuit ground conductor if nonmetallic feed conduit is used.
- I. Bond all metal underground pull box covers.

END OF SECTION

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Related Sections:
1. 16440 - Disconnect Switches.
 2. 16470 - Panelboards.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements: Materials shall bear Underwriters Laboratories (UL) labels.

1.03 SUBMITTALS

- A. Submit properly identified manufacturer's literature and technical data before starting work.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Fuses shall comply with NEMA FUI and ANSI C33.42.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Circuit Breakers:
1. GE.
 2. Siemens.
 3. Square D.
 4. Westinghouse.
- B. Fuses:
1. Bussman.
 2. Cefco.
 3. Littelfuse, Inc.

2.02 EQUIPMENT

- A. Circuit Breakers:
1. Circuit breakers shall be a circuit interrupting device operating both manually for normal switching functions and automatically under overload and short circuit conditions, while providing circuit and self protection when applied in its ratings. Provide at voltage, phase, and amps indicated, with symmetrical amperes interrupting rating to be equal or larger than that shown on drawings. Control and signaling function may be incorporated by use of accessories.
 2. Operating mechanism shall be entirely trip-free so contacts cannot be held close against an abnormal over-current or short circuit condition.
 3. Operating handle of circuit breaker shall open and close all poles of a multi-pole breaker simultaneously. Circuit breakers shall meet applicable NEMA AB-1 and have

UL label. Each circuit breaker shall have a trip unit to provide overload and short circuit protection. Trip element shall operate a common trip bar that shall open all poles in case of an overload or short circuit through any 1 pole.

4. Ampere rating shall be clearly visible. Contacts shall be of non-welding silver alloy. Circuit breakers to be used in switchboards, lighting and power panelboards, distribution panelboards and individually enclosed shall be 1, 2, or 3 poles as indicated on drawings.

B. Molded Case:

1. Molded case circuit breakers shall be bolt-on type, mounted in lighting and power panelboards and individually enclosed units.
2. Molded case circuit breakers shall be quick-make, quick-break action.
3. Molded case circuit breakers for panelboards shall have the following minimum symmetrical ampere interrupting capacities (RMS):
 - a. 120 volts: 10,000 SAIC power panelboards.
 - b. 277 volts: 14,000 SAIC lighting panelboards.
 - c. 277/480 volts: Up to 50,000 SAIC distribution panelboards, or as shown on drawings.
4. Each molded case circuit breaker shall have a thermal magnetic trip device with trip ratings as shown on drawings.

C. Combination Molded Case and Current Limiting Fuse:

1. Bolt-on type mounted in switchboard.
2. Circuit breaker section shall be molded case and shall have the features previously mentioned for molded case breakers.
3. Fuse compartment located within molded case enclosure with accessibility for fuse replacing.
4. Unit circuit breaker shall trip as any of its fuses blows.
5. Unit shall be rated at 100,000 AIC RMS minimum.
6. Current limiting fuses provided as specified in this section.

D. Fuses:

1. Provide fuses for fusible equipment regardless of which trade has furnished such equipment.
2. The time-current characteristic and ratings shall assure positive selective coordination.
3. Fuses, 601 amperes and larger, shall comply with UL Class L standard and be Shawmut Form 480 "Amp-Trap" or Bussman "Hi Cap".
4. Fuses, 600 amperes and lower, where applied to general feeder and branch circuit protection, shall comply with UL Class RKL standards and be Shawmut dual element "Amp-Trap" or Bussman "Low Peak" Limitron.
5. Dual element fuses shall have low resistance and relatively low operating temperatures. Fuses shall be provided with thermal protection against damage from poor contact. Fuse shall open when temperature at thermal cutout reaches 280 degrees F., preventing damage to clips and switches before fuse opens. They shall combine high interrupting capacity (200,000 ampere RMS symmetrical) with time delay, holding 500 percent load for a minimum of 10 seconds.
6. Current limiting fuses shall be designed to provide high interrupting capacity (200,000 AIC SYM RMS) plus fast clearing time restricting let-thru current and energy to very low values. Clearing time on a severe short circuit shall be limited to less than 1/4 cycle.

7. Fuses, where required for circuit breaker backup protection shall comply with UL Class RKI standards and be Chase-Shawmut Class RK1 "Amp- Trap" or Bussman "Limitron".

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Install according to manufacturer's recommendations applicable codes and regulations and accepted submittals.
- B. Two and three pole breakers must be true two and three pole breakers.
 1. Do not combine single pole breakers with common handle connection to meet multiple pole breaker requirements.

END OF SECTION

SECTION 16530
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 16112 - Raceways and Conduits.
2. 16120 - Wire and Cable.

1.02 SYSTEM DESCRIPTION

- A. Material shall bear Underwriters Laboratories (UL) labels.

1.03 SUBMITTALS

- A. Properly identified manufacturer's literature and technical data before starting work.
- B. Photometric data for exterior lighting fixtures and a point by point illumination plan for entire site at same scale as Construction Documents

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Exterior Lighting Fixtures:

1. Exterior fixtures shall be vandal resistant.
2. Exterior lighting fixtures shall be furnished as indicated on drawings and fixture schedule. Fixtures shall be complete with necessary wiring, lamps, reflectors, glassware, and mounting accessories.
3. Components of the same type, size, rating, functional characteristic, and make of similar exterior lighting fixtures shall be interchangeable.
4. Fixture bases shall be metal and fastened to mounting locations with metal components.
5. Exterior fixtures shall be of aluminum or plastic construction.

B. Lamps:

1. Provide lamps for exterior lighting fixtures. Lamps shall be as indicated on the lighting fixture schedule.
2. High pressure sodium lamps shall comply with the following:
 - a. Wattage ratings as shown on fixture schedule.
 - b. Lamp base shall be mogul base.
 - c. Rated life shall be 24,000 hours.
3. Metal halide lamps shall comply with the following:
 - a. Wattage ratings as shown on fixture schedule.
 - b. Lamp base shall be mogul base.

- C. Ballasts: High power factor, individually fused, regulator type. Ballasts shall be UL approved. Voltage shall be as shown on fixture schedule.

PART 3 EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Exterior Lighting Fixtures: Exterior lighting fixtures shall be installed according to manufacturer's instructions and according to details as shown on electrical drawings.
- B. Exterior lighting shall be controlled using a combination of photocell control with the programmable timed lighting control system.

END OF SECTION



You are here: [Home](#) / [Products](#) / [Pavement Sealers](#) / [MasterSeal - Asphalt and Blacktop Sealcoating](#)

Products

Pavement Sealers	Traffic Paints	Tools & Accessories
Sealer Additives	Concrete Products	Sport Surfacing
Crack Fillers	Dust Suppressant	Parts
Preparation & Repair	Equipment	

SEALMASTER® MASTERSEAL - ASPHALT AND BLACKTOP SEALCOATING

MasterSeal™ is a mineral filled asphalt emulsion sealcoat designed to protect and beautify all asphalt pavement including parking lots, driveways, airports, shopping malls, roadways, and more.

Sizes Available

5 Gallon Pail, 55 gallon Drum, Bulk

Coverage

One gallon of MasterSeal™ Concentrate will cover approximately 100-120 square feet (11.1 to 13.3 square yards) per coat when properly mixed and applied.

NOTE: Coverage rate may vary due to pavement age, porosity, and method or application.

Colors Available

Black

* Colors may vary slightly from actual product.



For pricing on MasterSeal bulk tanker loads, totes,
drums and pails

CLICK HERE

Description

MasterSeal™ pavement sealcoating replenishes the binder that is lost through weathering and aging, and provides superior protection against environmental distress.

Features

- User Friendly – No Irritating Fumes
- Deep, Rich Black Color
- More Flexible – Won't Check Crack
- Ideal for all Asphalt Pavement Surfaces

Surface Preparation

New asphalt surfaces must cure a minimum of four weeks under ideal weather conditions before sealcoating is applied. Surface must be clean and free from all loose material, dirt, and dust. Cracks should be filled with SealMaster Hot Pour or Cold Applied crack fillers. Treat all grease, oil, and gasoline stains with SealMaster® Petro Seal or Prep Seal.

Mixing Procedures

For optimum results, mix MasterSeal™ in accordance with the following mix design (based on 100 gallons for ease of calculation):

MasterSeal™: 100 gallons

Water: 15-25 gallons

TopTuff Polymer Additive: 2 gallons

Sand: 300 – 500 lbs.

Mix materials to a uniform consistency.

NOTE: Zetac additive may also be used with MasterSeal™.

Application

For optimum performance two coats of mixed material are recommended. Apply by squeegee, brush, or spray. Allow a minimum of 2 to 4 hours drying time before applying second coat. Allow 24 hours before parking cars or allowing traffic to resume.

Important

Temperatures must be above 50°F both during application and for a period of at least 24 hours after application. Do not apply when rain is imminent or

PRODUCT DESCRIPTION

MASTERSEAL CONCENTRATE is a mineral filled asphalt emulsion pavement sealer designed to protect and beautify asphalt pavement. MasterSeal Concentrate is formulated to be job-mixed with water and aggregate.

RECOMMENDED USES

MasterSeal Concentrate is ideal for all types of pavement surfaces including parking lots, shopping malls, airports, driveways, roadways and more.

ESTIMATING MATERIAL REQUIREMENTS

One gallon of MasterSeal Concentrate will cover approximately 100-120 square feet (11.1 to 13.3 square yards) per coat when properly mixed and applied.

APPLICATION RATE OF MIXED MATERIALS

Apply properly mixed MasterSeal (MasterSeal, water, additive and sand) and at a rate of 70-82 square feet (7.77 to 9.11 square yards) per gallon. Application rates may vary due to pavement porosity and method of application.

PERFORMANCE CHARACTERISTICS

TABLE I - PHYSICAL PROPERTIES OF MASTERSEAL CONCENTRATE

ASTM	TEST DESCRIPTION	RESULT
D5	Penetration of Bituminous Materials-Base Asphalt	12-45 Pen
D6937	Density of Emulsified Asphalt	1,000 -1300 g/l
D6930	Settlement and Storage Stability of Emulsified Asphalts	20% max./24 hr.
D113	Ductility of Bituminous Materials-Base Asphalt	5-15 cm
E70	PH of Aqueous Solutions with Glass Electrodes	6-10 PH
D6378	Vapor Pressure (VPX), mm Hg @ 25° C (77° F)	22-26 mm Hg
D36	Softening Point of Emulsion Residue (Ring and Ball Apparatus)	> 200° F
D93	Flash Point of Liquid Emulsion	None detected
D562	Viscosity using a Stormer-Type Viscometer	90-140 KU
D4060	Abrasion Resistance- Taber Abraser Dry Method	< 1% Loss
D522	Mandrel Bend Test of Attached Coatings	No Cracking
D870	Water Resistance of Coatings using Water Immersion	No Delamination
D6904	Resistance to Wind-Driven Rain	No Delamination
D4585	Water Resistance of Coatings Using Controlled Condensation	No Delamination
D1735	Water Resistance of Coatings Using Water Fog Apparatus	No Delamination
D2247	Water Resistance of Coatings in 100% Relative Humidity	No Delamination
D4541	Adhesion Strength over Asphalt Pavement	> 200 PSI
D3910-6.4	Wet Track Abrasion Test	< 5 g/ft ² Loss
D2939-5	Uniformity of Emulsified Bituminous Coatings	PASS
D2939-7	Weight per Gallon	9-11 lbs./gal
D2939-8	Residue by Evaporation, %	48% min.
D2939-13	Drying Time- 50% humidity, 73.4 ± 3.6°F. Firm in 24 hrs.,	PASS
D2939-26	Resistance to Impact- No Chipping, Cracking or Delamination	PASS

TABLE I - CONT.

ASTM	TEST DESCRIPTION	RESULT
D2939-14	Resistance to Heat- No Blistering, sagging or slipping	PASS
D2939-15	Resistance to water- No softening, delamination or re-emulsification	PASS
D2939-16	Flexibility- No Cracking or Delamination	PASS
D2939-26	Resistance to Impact- No Chipping, Cracking or Delamination	PASS
D2939-27	Resistance to Impact After Accelerated Weathering	PASS
D2172	Asphalt Content by Weight, %	Min. 20%
D4799	QUV UV Aging- 1,000 Hours	No Color Fade
D3359	Measuring Adhesion by Tape- No More than a Trace of Peeling	PASS
SCAQMD Method 304	Determination of Volatile Organic Compounds (VOC) in various Coatings	< 50 g/l

SURFACE PREPARATIONS

Surface must be clean and free from loose material and dirt. Cracks should be filled with SealMaster Cold Pour or Hot-Applied Crack Filler. Oil stains should be cleaned and primed with SealMaster Oil Spot Primer.

APPLICATION EQUIPMENT

Properly mixed MasterSeal Concentrate shall be applied by mechanical squeegee/brush equipment or spray equipment capable of spraying coatings with sand. Equipment shall have continuous agitation or mixing capabilities to maintain homogenous consistency of mixed material throughout the application process. Truck mount or self-propelled squeegee/brush equipment shall have at least 2 squeegee or brush devices (one behind the other) to assure adequate distribution and penetration of mixed MasterSeal into bituminous pavement. Hand squeegees and brushes and brushes shall be acceptable in areas where practicality prohibits the use of mechanized equipment.

MIXING PROCEDURES

Mix MasterSeal Concentrate in accordance with the following mix design (based on 100 gallons of MasterSeal Concentrate for ease of calculation):

- MasterSeal Concentrate..... 100 gallons
- Water..... 15-25 gallons
- Top Tuff Polymer Additive..... 1-2 gallons
- Sand (40-70 mesh)..... 300-500 lbs.

MASTERSEAL CONCENTRATE

Asphalt Based Pavement Sealer

SMT-110

REVISED 03/18/15

APPLICATION PROCEDURES

For optimum performance and durability apply a minimum of two coats of properly mixed MasterSeal Concentrate. A third coat of mixed MasterSeal Concentrate may be applied to high traffic areas such as entrances, exits, and drive lanes for added durability. Allow each coat to dry thoroughly before applying successive coats. Allow final coat of MasterSeal to dry for 24 hours prior to opening to vehicle traffic.

APPLICATION CONDITIONS

Mixed MasterSeal Concentrate shall not be applied when temperature is expected to drop below 50°F during application and for a period of at least 24 hours after application.

LINE STRIPING AND TRAFFIC MARKINGS

Use SealMaster 100% Acrylic Traffic paint for line striping and traffic markings.

CAUTIONS

Both surface and ambient temperature shall be a minimum of 50°F and rising during MasterSeal application. Do not apply if temperature is expected to drop below 50°F within a 24 hour period after MasterSeal application.

PACKAGING AND AVAILABILITY

MasterSeal Concentrate is available in 5-gallon pails, 55-gallon drums and bulk tanker load quantities. MasterSeal Concentrate is supported by a national network of SealMaster manufacturing facilities along with a national network of qualified applicators.

WARRANTY AND DISCLAIMER

The statements made on this technical data sheet are believed to be true and accurate and are intended to provide a guide for approved application practices. As workmanship, weather, construction, condition of pavement, tools utilized, and other variables affecting results are all beyond our control, the manufacturer warrants only that the material conforms to product specifications and any liability to the buyer or user of this product is limited to the replacement value of the product only. The manufacturer expressly disclaims any implied warranties of merchantability or fitness for a particular purpose.



Phone: 1-800-395-7325

www.sealmaster.net



Color Concentrate™

A 100% acrylic emulsion coating designed for on-site mixing with silica sand and water. Ideal for color coating tennis courts, basketball courts, and other pavement surfaces. Two coats minimum are recommended. The sand used for mixing with color concentrate should be an 80-100 mesh ultra fine sand. Apply by soft rubber squeegee.

PRODUCT #	DESCRIPTION	Sq. Ft. COVERAGE	WT.	PRICE
C1030P	Forest Green	900	48 lbs.	\$ 70.99
C1030K	Forest Green	5400	305 lbs.	\$441.99
C1030D	Forest Green	9900	570 lbs.	\$716.99
C1050P	Light Green	900	48 lbs.	\$ 70.99
C1050K	Light Green	5400	305 lbs.	\$441.99
C1050D	Light Green	9900	570 lbs.	\$716.99
C1082P	Dark Green	900	48 lbs.	\$ 70.99
C1082K	Dark Green	5400	305 lbs.	\$441.99
C1082D	Dark Green	9900	570 lbs.	\$716.99
C**P	5-gal pail	900	48 lbs.	\$ 68.99
C**K	30-gal keg	5400	305 lbs.	\$425.99
C**D	55-gal drum	9900	570 lbs.	\$692.99

****Product numbers and colors:**

- Beige - C1000
- Brown - C1020
- Red - C1070
- Maroon - C1060
- Gray - C1040
- Blue - C1010

Mixing Procedures:

Color Concentrate™ 55 gallons
 Water 28-33 gallons
 Sand 400 lbs.



Material Requirements (coverage - 180 sf/gal):

.05 to .07 gallon of concentrate per square yard per coat. Two coats are recommended.

Ready-Mix Color

Ready-Mix Color is ideal for maintenance crews and do-it-yourselfers. The proper sand and water is already added. Simply stir, pour, and apply by soft rubber squeegee. Available in 9 standard colors.



PRODUCT #	DESCRIPTION	Sq. Ft. COVERAGE	WT.	PRICE
C1230P	Forest Green	375	60 lbs.	\$61.99
C1250P	Light Green	375	60 lbs.	\$61.99
C1282P	Dark Green	375	60 lbs.	\$61.99
C1200P	Beige	375	60 lbs.	\$59.99
C1220P	Brown	375	60 lbs.	\$59.99
C1270P	Red	375	60 lbs.	\$59.99
C1260P	Maroon	375	60 lbs.	\$59.99
C1240P	Gray	375	60 lbs.	\$59.99
C1210P	Blue	375	60 lbs.	\$59.99

NOTE: Colors will vary somewhat due to printing limitations. Ask your SealMaster Representative for a color chip card for more accurate representation.

Mixing Procedures:

Use as is. Do not dilute. Simply stir, pour, and apply.

Material Requirements (coverage - 75 sf/gal):

.12 to .15 gallon of Ready-Mix Color per square yard per coat. Two coats are recommended.

Color Concentrate™ with Sand

Similar to our standard Concentrate but with sand already added. Color Concentrate™ with Sand takes the guesswork out of choosing the right type of sand. Easy to use, just add water and apply by soft rubber squeegee. Available in 9 standard colors. Packaged in 5, 30, and 55 gallon containers.

PRODUCT #	DESCRIPTION	Sq. Ft. COVERAGE	WT.	PRICE
C1130P	Forest Green	625	66 lbs.	\$ 70.99
C1130K	Forest Green	3750	390 lbs.	\$441.99
C1130D	Forest Green	6875	660 lbs.	\$716.99
C1150P	Light Green	625	66 lbs.	\$ 70.99
C1150K	Light Green	3750	390 lbs.	\$441.99
C1150D	Light Green	6875	660 lbs.	\$716.99
C1182P	Dark Green	625	66 lbs.	\$ 70.99
C1182K	Dark Green	3750	390 lbs.	\$441.99
C1182D	Dark Green	6875	660 lbs.	\$716.99
C**P	5-gal pail	625	66 lbs.	\$ 68.99
C**K	30-gal keg	3750	390 lbs.	\$425.99
C**D	55-gal drum	6875	660 lbs.	\$692.99

****Product numbers and colors:**

- Beige - C1100
- Brown - C1120
- Red - C1170
- Maroon - C1160
- Gray - C1140
- Blue - C1110

Mixing Procedures:

Color Concentrate™ with Sand 30 gallons
 Water 15 gallons



Material Requirements (coverage - 125 sf/gal):

.07 to .09 gallon of concentrate per square yard per coat. Two coats are recommended.



A Division of California Products • An Employee Owned Company
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SECTION 10.4

SITE IMPROVEMENTS
ATHLETIC FACILITIES

EXTERIOR/INTERIOR LINE MARKING PAINT FOR ATHLETIC SURFACES

ACRYLIC LATEX

HI-HIDE PLEXICOLOR® LINE PAINT
TEXTURED OR NON-TEXTURED

DESCRIPTION:

Highly reflective marking paint for use over any bituminous surface or color coating system in recreational or light traffic areas. The finished application is non-glaring, highly resistant to climatic conditions, fast drying easily applied, and provides excellent hiding. Plexicolor Line Paint will not cause crazing, cracking, peeling, or deterioration to asphalt that is typical of solvent-type traffic paints. Also available as a texture line paint coatings fine silica fillers.

SURFACE USES:

Asphalt and color-coated or concrete surfaces:

- Tennis Courts
- Play Areas
- Asphalt Shingles
- Curbs and Berms
- Running Tracks
- Parking Lots
- Restricted Travel Roadways
(Not subjected to wet abrasion)

APPLICATION:

- Brush
- Roller
- Spray and Marking Equipment
- Airless Spray

DRYING TIME:

- 30 minutes to one hour – 1 coat

COLOR RANGE:

White, Yellow, Red, Blue, Green, Orange, Black

COVERAGE:

Approximately 150-200 square feet per gallon.
(One gallon generally required for one doubles tennis court, 481 linear feet – 2” wide).

LIMITATIONS:

- Apply only when ambient temperature is 50°F and rising.
- Do not apply when rain or high humidity is imminent.
- Not for application on general use roadways subjected to skidding tires, snowplows, or chains.
- Keep from freezing. Do not store in hot sun.
- Keep containers tightly closed when not in use.
- Do not apply when surface temperature is less than 50°F or more than 140°F.
- Allow asphalt to cure at least 14 days.

See reverse side for application specifications.

SPECIFICATIONS

PLEXICOLOR LINE PAINT

The Line Paint, as designated on drawings and in specifications, for use over asphaltic and tar emulsion surfaces including slurry coats, shall conform to the following characteristics and performance:

The paint shall be a 100% acrylic emulsion type containing no alkyds, butadiene styrene, or vinyls and shall be thinned with water only. The paint shall also be suitable for application by brush, spray, or roller.

All materials used in the manufacturing of paint shall be of good commercial quality entirely suitable for the purpose intended under normal conditions for use. For white color, the opaque portion of the pigment shall be rutile titanium dioxide and the vehicle shall consist of 100% acrylic polymer dispersed in water together with the minimum amounts of necessary additives; such as pigment dispersents, anti-foaming agents, and preservatives; but no driers shall be used.

The white paint shall meet a minimum requirement of total solids (percent by weight of paint) of 51.5% and a maximum pigment content (percent by weight of paint) of 36%. The white paint shall contain not less than three pounds per gallon of treated rutile titanium dioxide. A minimum fineness of grind of 4 and a viscosity (Krebs Units) of 80 minimum and 95 maximum is required. The paint shall brush easily and have good flowing, leveling, and spreading characteristics and shall be suitable for application by spray equipment or rollers.

This paint shall be suitable for use over all types of bituminous surfaces and, when applied over emulsified asphalt, it shall not cause lifting, crazing, peeling, or other damage to the base.



RALLY MASTER BACKBOARDS®



301 • 607 • 4747

301 • 607 • 4484 Fax

www.rallymasterbackboards.com

Rev: 6/12/15

RALLY MASTER BACKBOARDS

INSTALLATION INSTRUCTIONS

VERTICAL and BACK-SLOPED MODELS

Thank you for purchasing a Rally Master Backboard. Your new backboard will provide years of trouble-free performance, while improving your game. Rally Master Backboards are constructed of durable, high density plastic and corrosion-resistant mounting components. Rally Master Backboards are covered by an industry-leading, twenty-year warranty against structural failure, due to corrosion of any part. (See warranty below).

BEFORE YOU GET STARTED

Two people can install a 10' X 12' Rally Master Backboard in less than three hours. Each 4' X 10' panel weighs 150 lbs. Figure about one hour or less, installation time, per 4' x 10' panel. Use additional helpers during the panel attachment procedure if necessary.

Take the time to read the instructions thoroughly to avoid time consuming mistakes and frustration during the installation procedure!

TOOLS REQUIRED

Level

½” Deep Socket and Ratchet

(2) 6’ Step Ladders

Phillips head screwdriver

Razor Knife

Scrap wood or Shims

Shipped via common carrier-truck

Panels

Horizontal Panel Struts

Vertical Support Posts

Ships via UPS

Hardware Pack

Nuts & bolts, clamps, etc.

CARE OF YOUR RALLY MASTER BACKBOARD

Once installed, your Rally Master Backboard is virtually maintenance-free. It will never require painting, caulking or subsequent reinforcement.

Check the tightness of your mounting hardware periodically to ensure that all fence and panel brackets remain secure. Use only mild soap and water to clean the face of the board.

A NOTE ON EXPANSION AND CONTRACTION OF PANELS

The inherent flexibility of the Rally Master Backboard Panel is the primary reason for its extreme strength and durability. Unlike rigid backboard panels, Rally Master Panels expand and contract as the weather temperature fluctuates. This is especially true in rapid, drastic temperature changes. It is normal for slight bows to be visible in the panels. It is also normal for gaps between the panels to form when the panels contract in cold weather. This in no way affects durability or performance of the product. After initial installation, some adjustment of the panels may be necessary. Simply loosen the panel bolts and push the panels together and retighten as necessary.

CHOOSING A LOCATION FOR YOUR RALLY MASTER BACKBOARD See Diagram A and E

The diagram below shows possible locations on single and multi-court layouts. Note that on multi-court layouts it is advisable to avoid side-fence locations where errant, rebounding balls may interfere with play on other courts. If adjacent courts are separated by a court divider net or fences, side fence mounting locations are OK.

MOUNTING INSTRUCTIONS

Do not drag your panels across your court as damage to the court and or to the panel may occur. Use caution not to scratch your panels during installation. It is recommended that the protective plastic be left on the panel fronts until the completion of installation.

Remove the panels from the cardboard shipping cartons and place the cardboard on the court surface in front of the work area. This will protect the court surface from scratches and dings during installation.

STEP #1 Remove the Horizontal Panel Struts (“HPS”) and Support Posts (“SP”) from the cardboard tube. Lay the HPS to the side. Install the Adjustable Foot Assembly (“AFA”) on the bottom of each SP, screwing the foot piece approximately half way up the threads.

Step # 2

Slip the four Casting Connectors (“CC”) over each SP making certain the hole in the face of each casting aligns with a pre-installed recessed nut in the SP.

Step # 3 Frame Assembly. Refer to **Diagrams B & D**
Lay all SP on the court so that each is spaced evenly with the fence posts to which they will be attached. The Ears on the CC should face downwards and rest on the cardboard wrapping material to protect the

court surface. Lay a HPS in each slot in the face of the CC, ensuring that all HPS are aligned flush with one another on each end. **On longer boards, you will have to splice together HPS as shown on Diagram F.** That is to say, make sure each HPS sticks out the same length past the outside of the SP as the others. A straight edge or string line can be used to ensure such alignment. Once aligned, insert a Casting Bolt (“PB”) through the HPS and CC and tighten into the integral, recessed nut in the SP.

Step # 4

Stand the Frame Assembly up and lean it against the fence so the ears on the CC are facing the fence posts. Tie the Frame Assembly to the fence temporarily so that it cannot fall over during subsequent steps. Place a round, green, plastic protective disk under each adjustable foot.

NOTE: See **Diagram B** Exterior tennis courts have slope built-in to allow for drainage. Therefore, depending upon where on the court you place your backboard, the bottom of the backboard may not ultimately be parallel with the court surface.

Step # 5

Place a level on the bottom HPS and adjust the AFA to ensure the backboard is level.

Step # 6

VARIATIONS EXIST IN THIS STEP DEPENDING UPON WHETHER YOU HAVE A VERTICAL OR BACK-SLOPE MODEL. Refer to “A Visual Guide to Components & Abbreviations Diagram”. Note that a Vertical Model uses (4) *equal*-length ATB; whereas a Back-Sloped model utilizes (3) *variable*- length ATB

(See Diagram D)

Bolt an Aluminum Tie Back (“ATB”) to each CC ear using a 3/8” X 1.25 bolt.

Note that the *slotted* opening in the ATB is to be connected to *slotted* ear on the CC. Do not tighten this connection *completely* as you may need to adjust this connection in a subsequent step.

Step # 7 See Diagram D

From outside the fence, slip a Fence Pole Bracket (“FPB”) around each fence post at a height on the post that lines up to the height of each CC ear. Pull apart the band to slip around fence post. In some cases it may be necessary to cut fence mesh to accommodate proper placement/adjustment of the FPB. Bolt the ATB at each CC to the FPB using 3/8” X 3” Bolt. **NOTE: This bolt is made extra-long to allow it to fully close the FPB that was expanded to get it around the fence post. Always insert this bolt so that the extra length is aimed in the direction of the center of the backboard. This will eliminate any possibility of it snagging on anything **once the nut is****

fully tightened. When all FPB connections are made, recheck that the HFS is level.

IMPORTANT!

Some fences may not have plumb posts due to improper initial installation or due to wear, etc. If a fence post(s) to which an SP is bent, out of plumb, etc. connecting to it may cause the Frame Assembly to end up bowed and or otherwise out of alignment. You may compensate for these conditions by adjusting the fore and aft alignment of the frame assembly at the *slotted connection points where the ATB connects to the CC*. Use a string line or straight edge to ensure that no HPS is/are bowed, make adjustments as necessary and then tighten all these connections.

Step # 8

Once the entire Frame Assembly is LEVEL and all fore and aft connections are secure, you are ready to install the green panels. Apply a strip of vibration dampening tape to the open face of each HPS by removing the backing and sticking it across the face of each HPS. Once installed, take a razor knife and carefully cut a horizontal slit in center of the tape the entire length of each HPS.

Step # 9

Carefully, place the green panels face down on the

court in front of the Frame Assembly being certain to position them so that when stood up, the engraved net line will be at the bottom, facing away from the fence. One panel has been fastened with a metal Rally Master badge. Put this panel on one of the ends of the backboard. Remove the plastic sheet from the rear of each panel. Starting at the right end of the Frame Assembly, stand the first end panel up against the HPS. Use caution on windy days as the panels can be blown over causing injury to workers.

Slide the Square Nuts into the HPS from either end. You will need two Square Nuts per panel in each HPS. Before lifting the panel into position, insert the top two Panel Bolts (“PB”) through the panel. Then while lifting the panel push the Panel Bolts into the HPS and attach them to the Square Nuts inside the HPS. Have one or more persons lift the panel. Once the top PB are tightened, the weight of the panel will be borne by these bolts and subsequent PB installation will be easier. Use scrap wood to support-elevate the panel during this procedure as desired. Install and *partially* tighten all PB in a panel before moving on to the next panel. When installing each subsequent panel, leave approximately 6” of gap between the previously-installed panel and the one being installed so as to provide hand access to the PB connection. Once all the panels are installed, they can be pushed

together along the HPS and then all the PB can be tightened down thoroughly.

Step # 10

Remove the protective plastic film from the face of the panels.

Always leave these instructions with the end user.

Note: Rally Master Panels are made through the extrusion process. Variations in texture and color are to be expected. Such does not affect play or performance. Color variations, if any, will be less noticeable after exposure to the elements and after use.

WARRANTY

Sport Systems, LLC warrants that all Rally Master Panels and mounting components shall be free from structural failure for a period of twenty years from the date of shipping. Sport Systems, LLC's sole obligation under the warranty shall be to repair or replace the defective part(s) only at its sole and absolute option. To make a warranty claim, please send your claim in writing, INCLUDING photos of affected part(s) to:

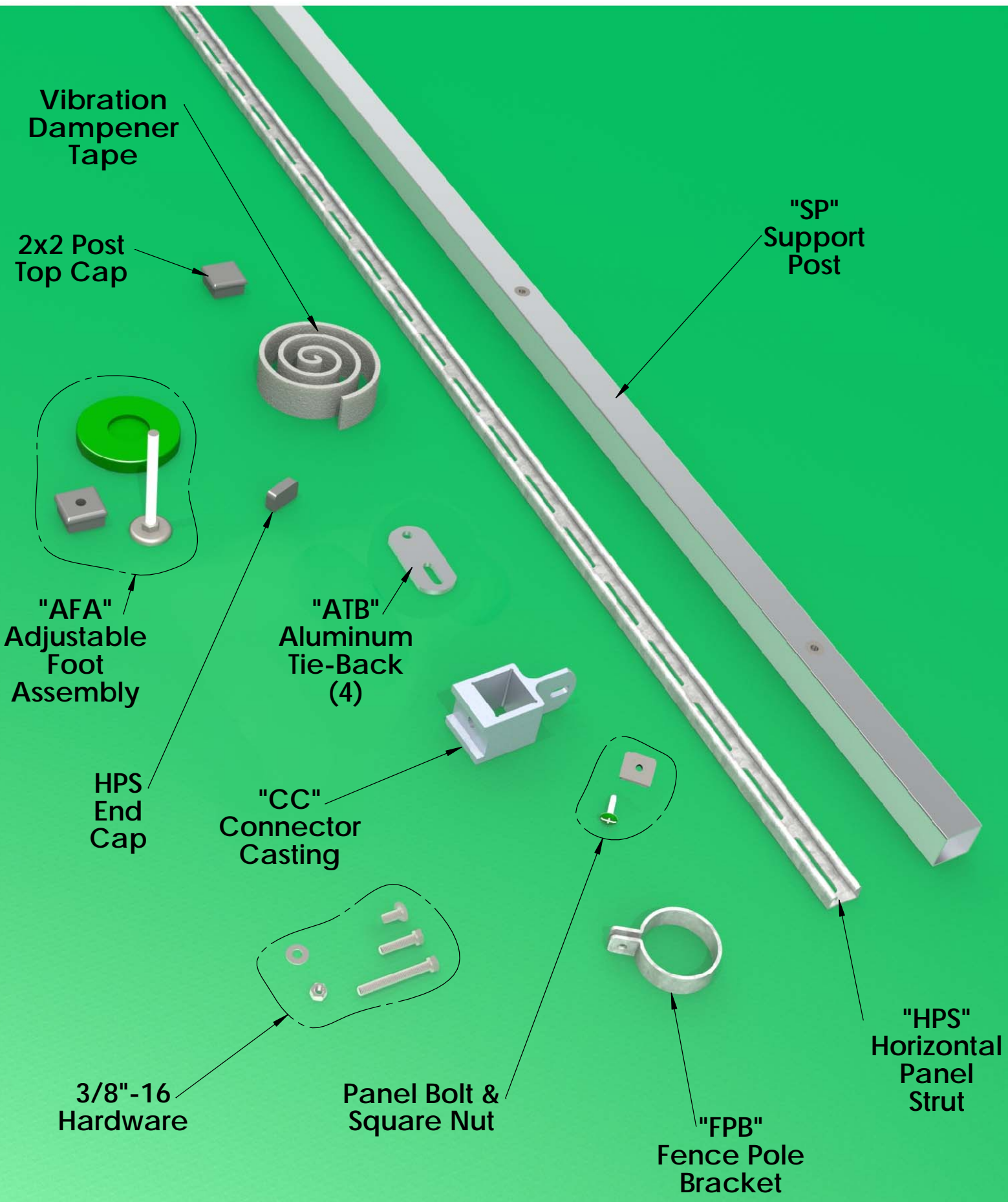
**Sport Systems, LLC
Manufacturing-Warranty Division
10078 Tyler Place**

Ijamsville, Maryland, 21754

We will, at our sole and absolute discretion, determine whether a part repair or part replacement is required. Customer is responsible for all freight charges on parts repaired or replacement under this warranty. Normal wear and tear, damage through Acts Of God, misuse, improper installation, vandalism, and any claim that is not for structural failure are excluded. Rally Master "Catch Nets" and support poles are not covered by a warranty.

Rally Master Backboards® Vertical Model

A Visual Guide to Components & Abbreviations



Vibration Dampener Tape

2x2 Post Top Cap

"SP" Support Post

"AFA" Adjustable Foot Assembly

"ATB" Aluminum Tie-Back (4)

HPS End Cap

"CC" Connector Casting

3/8"-16 Hardware

Panel Bolt & Square Nut

"FPB" Fence Pole Bracket

"HPS" Horizontal Panel Strut

Rally Master Backboard[®]

Vertical Model



Diagram A

Place Center of Backboard as Close to Center of Fence Section as Post Spacing Allows.

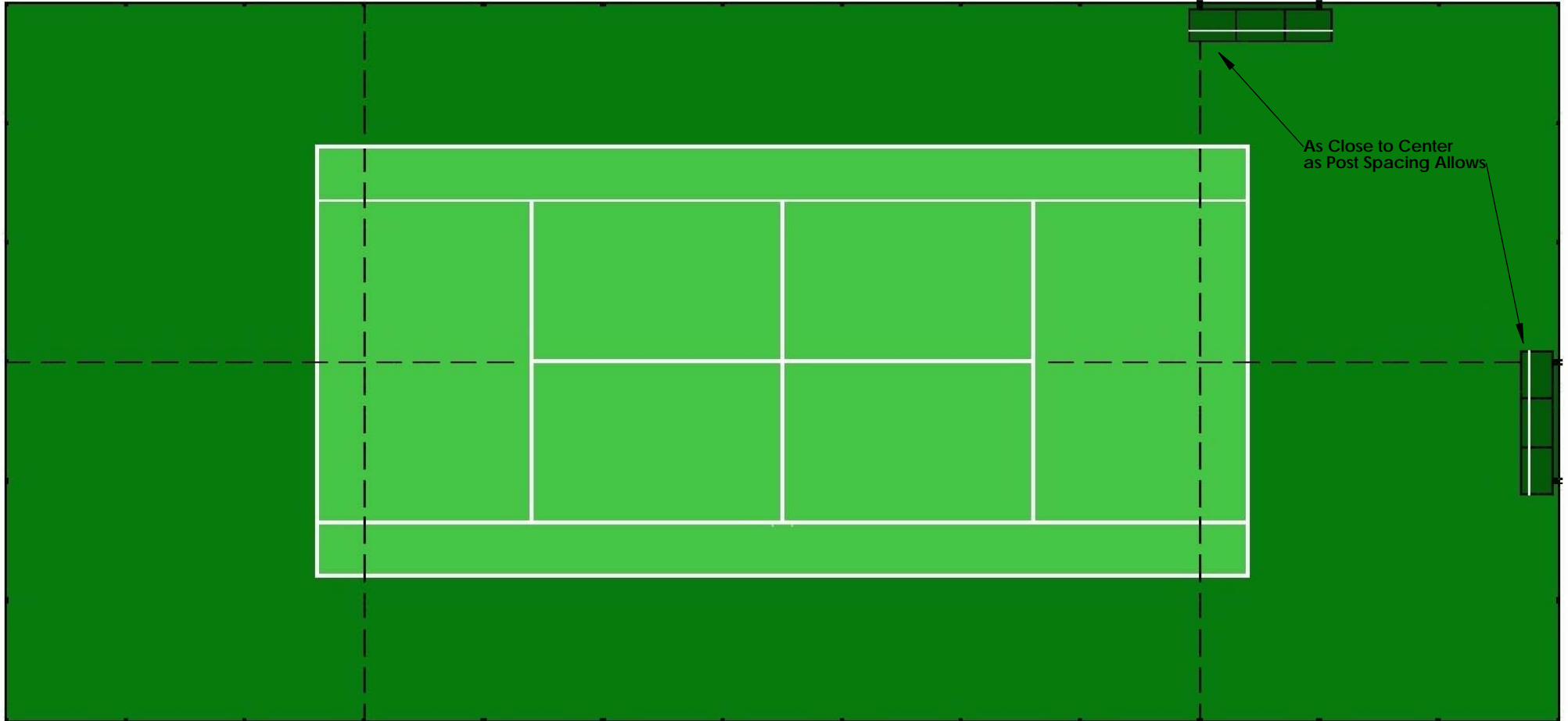
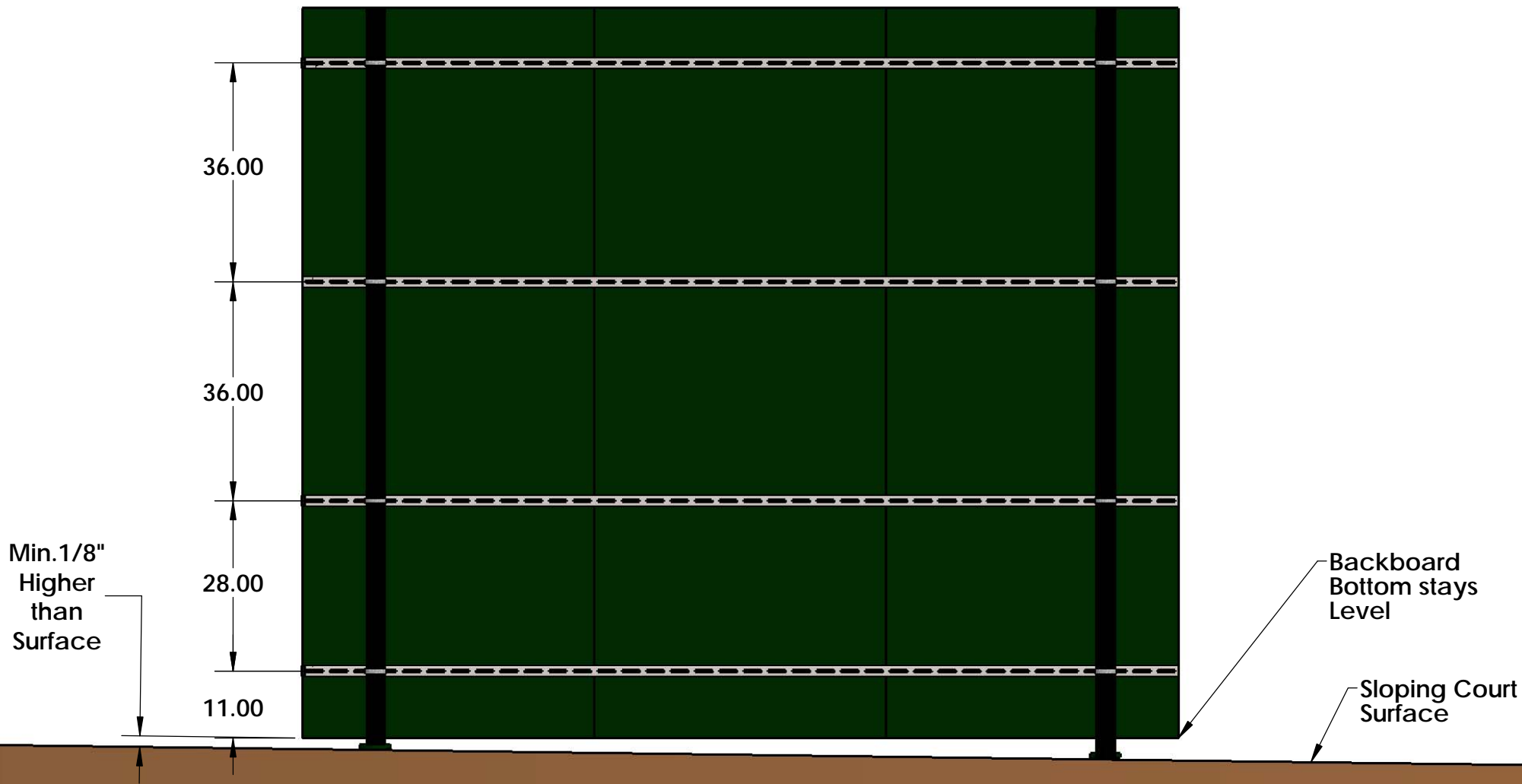


Diagram B

Backboard on Sloping Court
(Rear View)

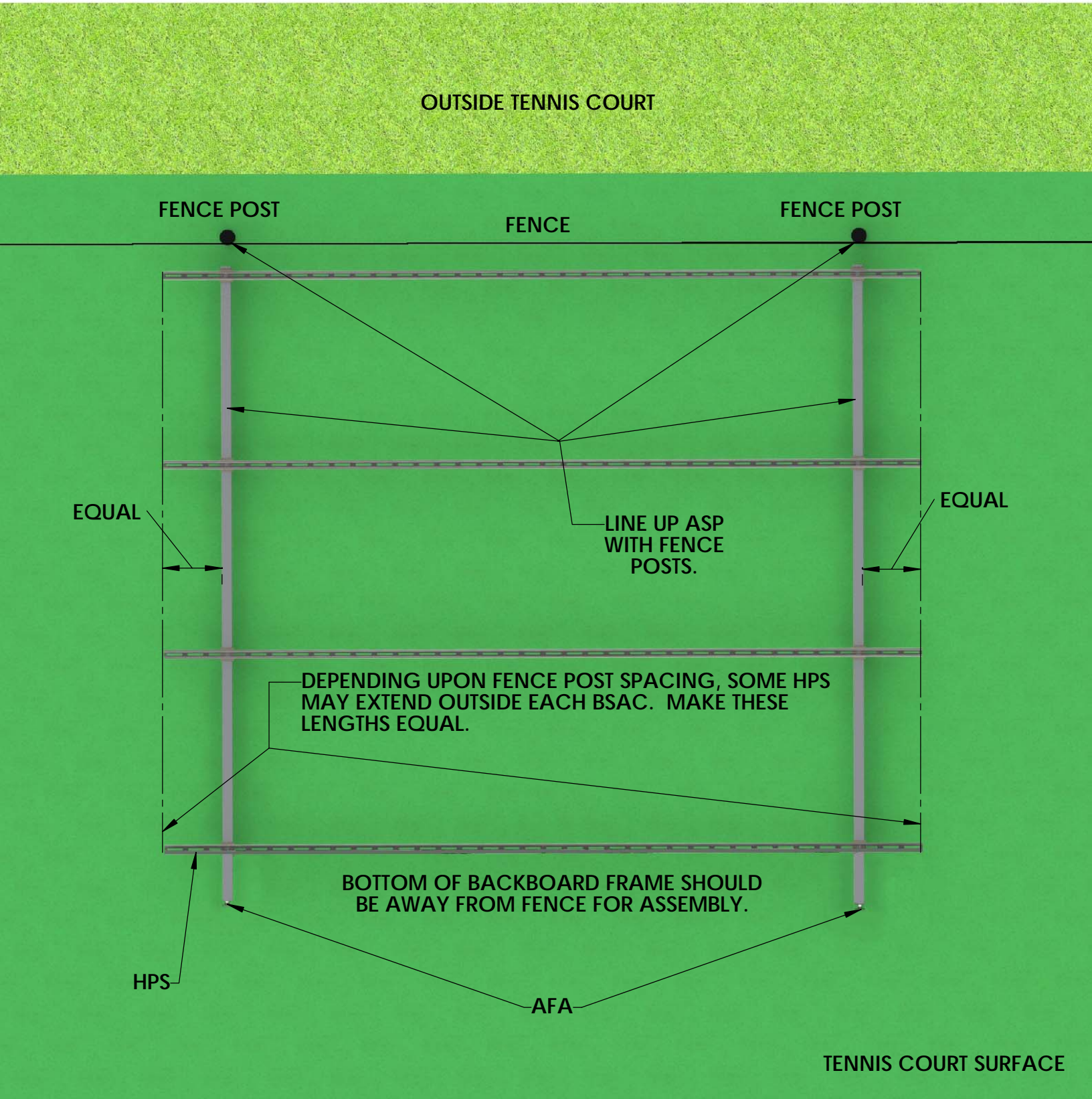


(Fence mesh not shown for clarity)

Diagram C

PLAN VIEW

(Make sure to protect court surface while assembling frame.)



NOTE: THE ASP WILL ATTACH TO THE FENCE POSTS. THE HPS WILL BOLT TO THE ASP AT WIDTHS EQUAL TO THE WIDTH OF THE FENCE POST CENTER-TO-CENTER.

Diagram D

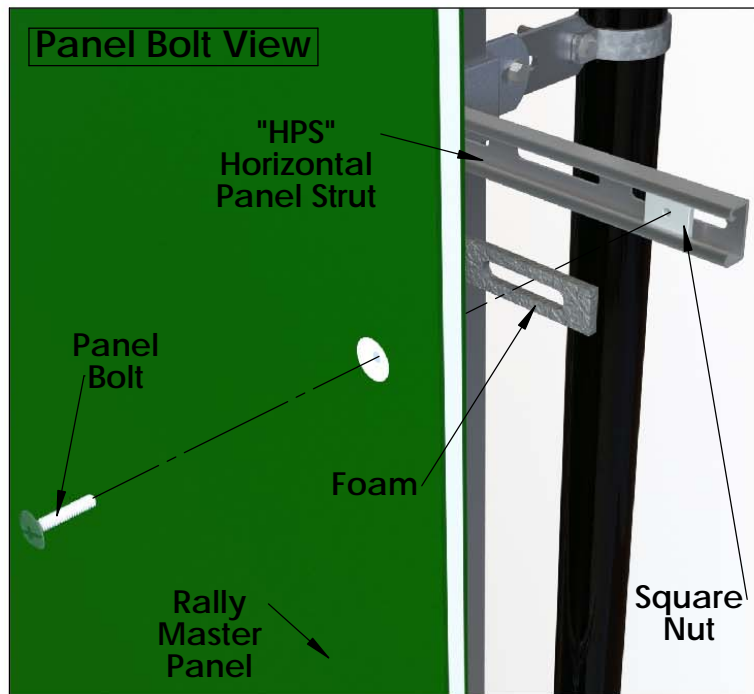
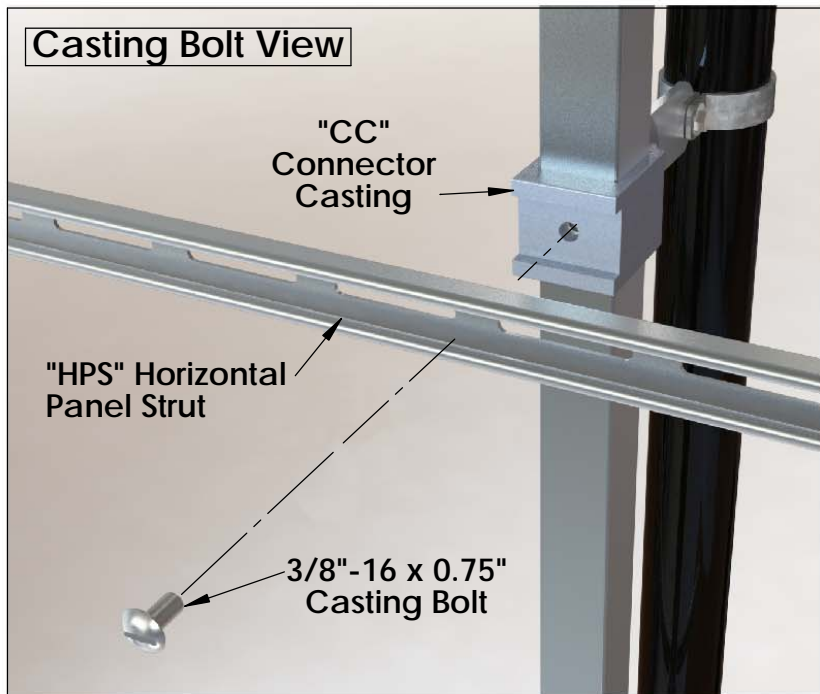
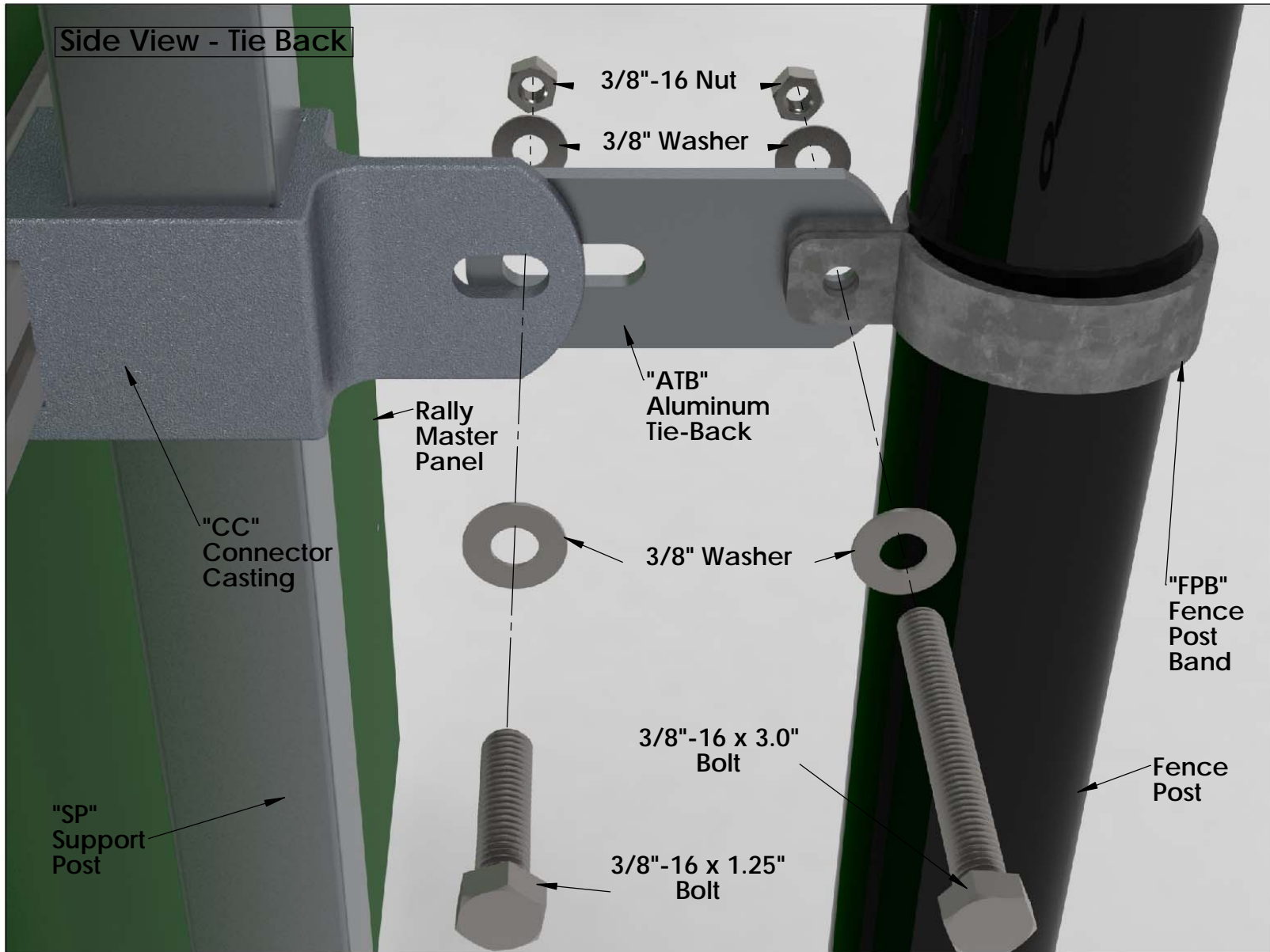
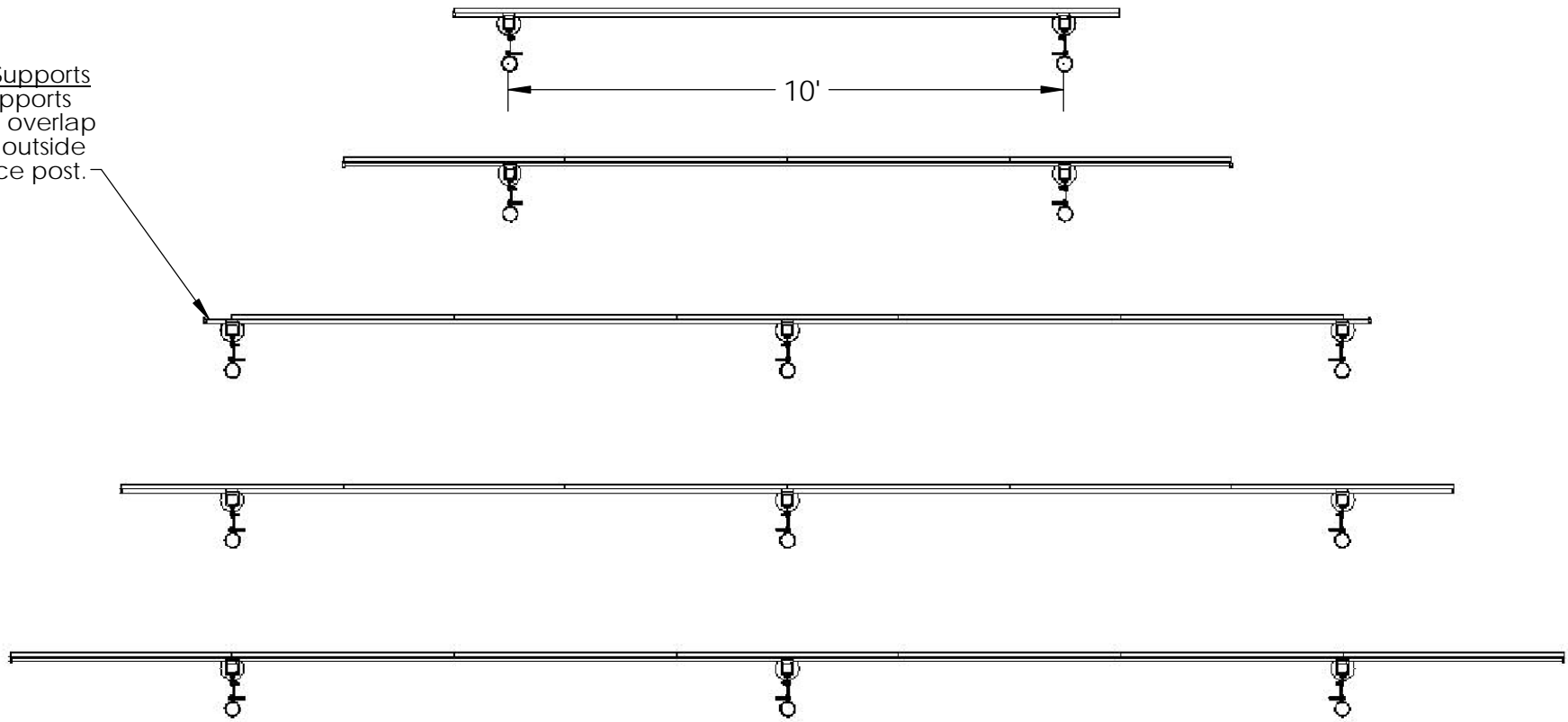


Diagram E

Top View of Backboard Placement in Relation to Fence Posts.
(Assumes 10' spacing on posts)

21' Supports
Supports
must overlap
the outside
fence post.



TUFFY® Windscreen

Fabric and Construction

- Construction: 1000d Vipol® Matrix Mesh (18 X 14 ends/inch).
- Fabric Weight: 10.0 oz. per square yard.
- Tensile Strength: 360 X 320 pounds
- Sewn Hems: Three-Ply hem with ends and corners sewn finished with two rows of *lock-stitched* thread.
- Thread: High heat bonded polyester with UV inhibitors built into yarn.
- Grommets: #2 brass grommets every 12'' on all four sides.
- Seams: 6' Screens are solid panel (no seams).
9' screens are prayer seamed with RF weld and one row of black UV treated *lock-stitched* thread at center of screen (4 ½') with grommets every 12''. RF welding takes the place of any reinforcing tapes providing a stronger seam.
- Colors: Midnight Green, Black, Navy and Royal Blue. Other colors are available.
- Logos: Yes. (Single or Multi-color)
- Warranty: Pro-rated 60 months on material and workmanship.