HADLEY PARK SYNTHETIC TURF AND PARK IMPROVEMENTS 1350 NW 50TH STREET

PROJECT MANUAL & SPECIFICATIONS

PERMIT SET
APRIL 30, 2018

PROJECT No. B-173515
1350 NW 50th STREET
MIAMI, FLORIDA 33142

CITY OF MAIMI
CAPITAL IMPROVEMENTS PROGRAM

Francis Suarez	Mayor
Keon Hardemon	Chairman
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Manolo Reyes	Commissioner
Emilio T. Gonzalez	City Manager

MILLER LEGG
IMPROVING COMMUNITIES. CREATING ENVIRONMENTS.
P 305.599.6381

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.

TABLE OF CONTENTS

DIVISION 4 MASONRY

NOT USED

DIVISION 5 METALS

NOT USED

DIVISION 6 WOOD AND PLASTICS

NOT USED

DIVISION 7 THERMAL AND MOISTURE PROTECTION

NOT USED

DIVISION 8 DOORS AND WINDOWS

NOT USED

DIVISION 9 FINISHES

NOT USED

DIVISION 10 SPECIALTIES

NOT USED

DIVISION 11 EQUIPMENT

NOT USED

DIVISION 12 FURNISHINGS

NOT USED

DIVISION 13 SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 CONVEYING SYSTEMS

NOT USED

SECTION 02011

SOIL BORING DATA

See Attached Report prepared by ECS Florida, LLC.

END OF SECTION

ECS Florida, LLC

Geotechnical Engineering Report

City of Miami Hadley Park - Proposed Improvements

1350 N.W. 50th Street
Miami, Miami-Dade County, Florida 33142

ECS Project Number 25:3279

February 14, 2018

February 14, 2018

Mr. Michael D. Kroll, PLA FASLA
President
Miller Legg
5747 North Andrews Way
Fort Lauderdale, Florida 33309

ECS Project No. 25:3279

Reference: Geotechnical Engineering Report
City of Miami Hadley Park - Proposed Improvements
1350 N.W. 50th Street
Miami, Miami-Dade County, Florida 33142

Dear Mr. Kroll:

ECS Florida, LLC (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our Proposal No. 25:6117 R1-GP dated October 6, 2017. This report presents our understanding of the geotechnical aspects of the project along, the results of the field exploration and laboratory testing conducted, and our design and construction understanding.

It has been our pleasure to be of service to Miller Legg during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Florida, LLC

Lucrèce E. Régisme
Geotechnical Department Manager
lriche@ecslimited.com

Jose N. Gómez, P.E., D.GE
VP/Senior Principal Geotechnical Engineer
P.E. 78289
jgomez@ecslimited.com

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TABLE OF CONTENTS

APPENDICES

Appendix A – Drawings & Reports

- Site Location Diagram
- Boring Location Diagram
- Geologic Map
- USDA Soil Survey Map

Appendix B – Field Operations

- Reference Notes for Boring Logs
- Boring Logs B-1 through B-12
- Exfiltration Testing Result E-1 through E-2

Appendix C – Laboratory Testing

- Laboratory Test Results Summary

EXECUTIVE SUMMARY

The following summarizes geotechnical information and recommendations for the design of structure foundations for the City of Miami Hadley Park - Proposed Improvements project located in Miami, Florida. Further, our principal foundation recommendations are summarized. Information gleaned from this executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The geotechnical exploration performed for the planned development included 12 soil test borings drilled to depths of six to 15 feet below existing grades.

- Based on our subsurface exploration, our soil test borings encountered topsoil as surface cover. The soil profile at the site generally consists of very loose to dense Sand possible fill sampled as (SP) SAND and (SP-SM) sand with silt to depths of two to four feet below existing land surface (bls) underlain by Weathered Limestone to boring termination depth of 15 feet bls.

- The planned scoreboard can be supported by round shaft foundation. See body of the report for soil parameters.

- Concrete slab recommendations are given in section 5.2 of this report.

- Recommendations are given for standard and heavy duty unpaved sections for the proposed fire lane. Details of contained in section 5.3 of this report.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical design, foundation, and pavement, recommendations for the City of Miami Hadley Park - Proposed Improvements project.

The recommendations developed for this report are based on project information supplied by Miller Legg. This report contains the results of our subsurface explorations and laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of planned development.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of proposed improvements described below, 12 soil test borings were performed at locations selected by ECS and approved by Miller Legg; these borings were located within the proposed new non-paved fire lane along the west side of the property, the concrete slabs on the west and east sides of the football/soccer field, within the football/soccer fields and baseball fields, as well as within the new score board area. A laboratory-testing program was also implemented to characterize the physical and engineering properties of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our soil exploration/test boring logs.
- Recommendations for site preparation and construction of compacted fills.
- Recommendations for the non-paved fire lane, paved walks, and concrete slabs for new bleachers.
- Hydraulic conductivity rates.
- Evaluation and recommendations relative to groundwater control.

1.3 AUTHORIZATION

Our services were provided in accordance with our Proposal No. 25:6117 R1-GP and the General Conditions to Subconsultant Agreement between Miller Legg and ECS Florida, LLC, dated January 5, 2018.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The subject site is located within the southeast quadrant of the intersection of N.W. 15th Avenue and N.W. 50th Street in Miami, Florida; addressed 1350 N.W. 50th Street. Figure 2.1.1 below shows the site location.

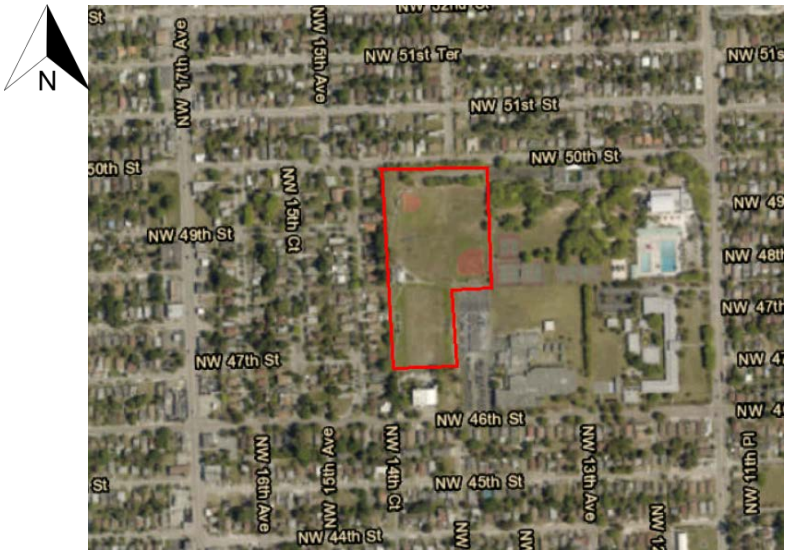


Figure 2.1.1 Site Location

2.2 PAST SITE HISTORY/USES

ECS reviewed aerial photographs of the subject property and immediate surrounding properties on Google Earth and NETR Online Historical Imagery databases. The aerial photographs reviewed were dated 1961, 1969, 1980, 1986, 1994, 1999, 2002 through 2007, 2009 through 2011, 2013, 2014, 2016, and 2017.

The 1961 through 2017 aerial photographs shows the subject site developed with the existing park. The subject site has remained throughout the years as football/soccer and baseball fields. No major changes were observed. Minor changes observed throughout this time period are the addition of walkways, turf improvements, the addition of bleachers, and lighting posts installed throughout the property.

2.3 CURRENT SITE CONDITIONS

A site visit was conducted by a staff project engineer from ECS prior to the start of drilling operations to observe existing site conditions.

The subject property consists of two baseball fields, and a fenced football/soccer field area, and a restroom/concession building. There is an existing scoreboard at the southern boundary of the property utilized by the football/soccer field; as well as two metal bleachers to the east and west side of the football/soccer field. A small building is located midway through the property on its western boundary which includes restrooms and what appears to be a concession stand.

2.4 PROPOSED CONSTRUCTION

Based on the provided project information, we understand that the project consists of the construction of a new non-paved fire lane along the west property line from the project's southern limit to N.W. 50th parking area, placement of new artificial turf on the football/soccer field, a new scoreboard, and two concrete slabs to support new bleachers on the west and east sides of the football/soccer field.

2.4.1 Site Civil Features

Site civil for the site will include grading for non-paved fire lane and concrete slabs. The site is generally flat; fill may be required, cuts are not anticipated. No planned new stormwater management structures were identified to ECS prior to our exploration. We expect that stormwater management will take advantage of existing urban stormwater structures.

2.4.2 Structural Information/Loads

At the time of preparation of this report we were not provided with the new scoreboard characteristics and lateral load conditions at the site.

3.0 FIELD EXPLORATION

3.1 FIELD EXPLORATION PROGRAM

The field exploration was planned with the objective of characterizing the project site in general geotechnical and geological terms and to evaluate subsequent field and laboratory data to assist in the determination of geotechnical recommendations.

3.1.1 Test Borings

The subsurface conditions were explored by drilling 12 soil test borings. A truck-mounted drill rig was utilized to drill the soil test borings. Drilling fluid was used in this process to prevent borehole from collapsing. Borings were generally advanced to depths of six to 15 feet below the existing ground surface within the proposed new non-paved fire lane along the west side of the property, the concrete slabs on the west and east sides of the football/soccer field, within the football/soccer fields and baseball fields, as well as within the new score board area. Subsurface explorations were completed under the general supervision of an ECS geotechnical engineer.

Boring locations were identified in the field by ECS personnel using GPS techniques and visually estimated distances and relationships to existing site features prior to mobilization of our drilling equipment. The approximate as-drilled boring locations are shown on the Boring Location Diagram in Appendix A. Ground surface elevations of the site were not available at the time of preparation of this report.

Standard penetration tests (SPTs) were conducted in the borings at regular intervals in general accordance with ASTM D 1586. Small representative samples were obtained during these tests and were used to classify the soils encountered. The standard penetration resistances obtained provide a general indication of soil shear strength and compressibility.

3.2 REGIONAL/SITE GEOLOGY

South Florida region is located on the southern flank of Florida Plateau, a stable, carbonate platform on which thick deposits of limestones, dolomites, and evaporates have accumulated. The general geology of the upper 200 feet of this platform within the area of South Florida where the proposed project is to be located is composed predominantly of limestone and quartz sand. The geological formation that is usually encountered from top to bottom within Miami-Dade County is the Miami Limestone.

The following table below describes the generalized stratigraphic column of the general local geology and subsurface materials that may be associated with the geologic units:

Table 3.2.1 Local Geology

Geologic Formation	Subsurface Materials
Miami Limestone (Qm)	Oolitic Limestone (small round grains usually of calcium carbonate cemented with sand) with Uncemented Sand.

Geologic Formation details for Table 3.2.1 obtained from the Florida Department of Environmental Protection website, *http://www.dep.state.fl.us/geology/gisdatamaps/state_geo_map.htm*

The following Figure 3.2.1 presents the regional geological map and approximate site location.

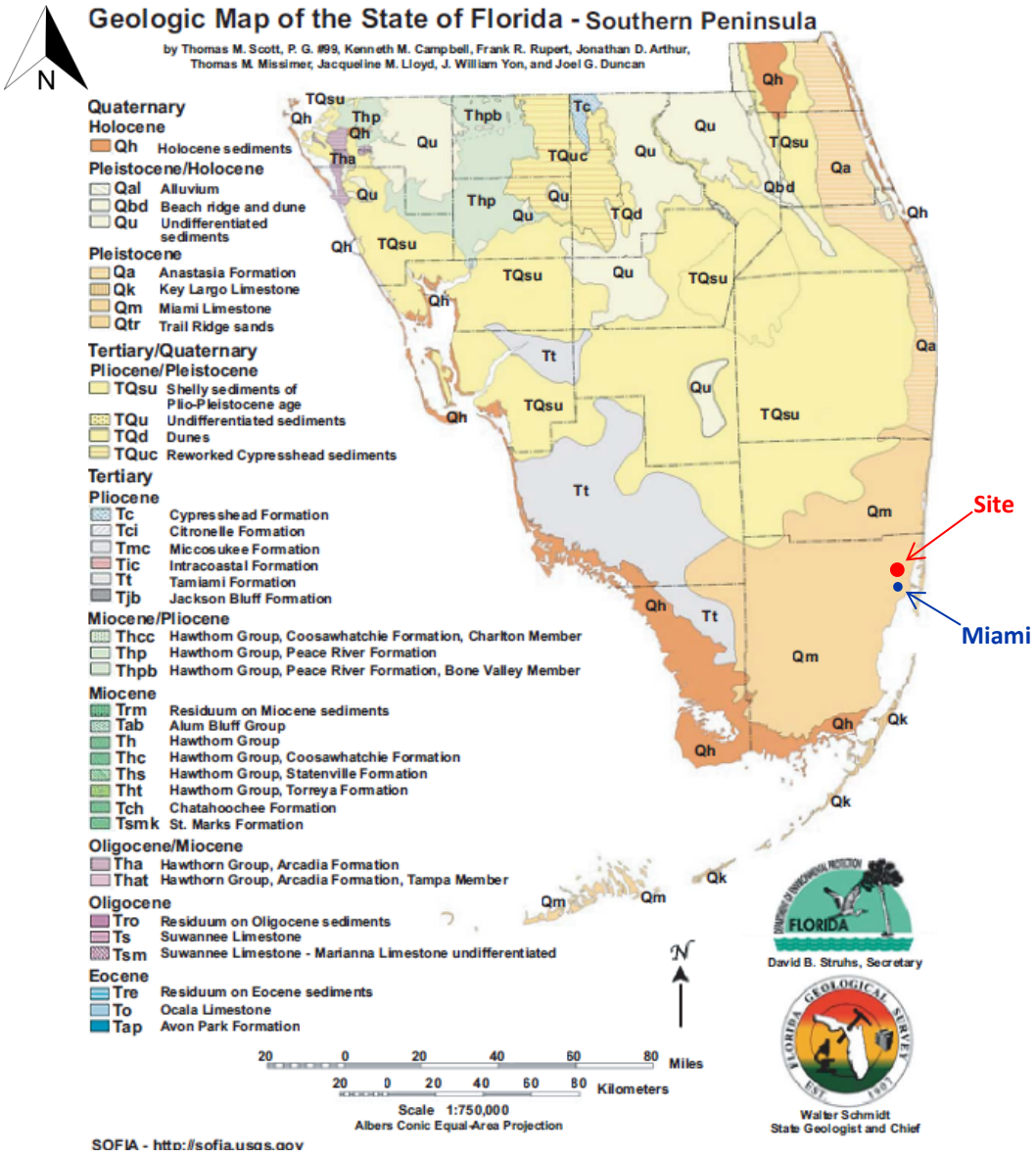


Figure 3.2.1 South Florida Geological Map

Geologic map for Figure 3.2.1 obtained from the United States Geological Survey Publications Warehouse website, *https://sofia.er.usgs.gov/publications/maps/florida_geology/#sections*

3.3 SOIL SURVEY MAPPING

Based on the Soil Survey for Miami-Dade County Area, Florida, (Tabular Data: Version 8, October 5, 2017 and Spatial Data: Version 2, December 13, 2013) by the US Department of Agriculture Soil Conservation Service (USDA); the predominant predevelopment soil type at the site is identified as Urban land. Site soil mapping is shown in figure 3.3.1 below.

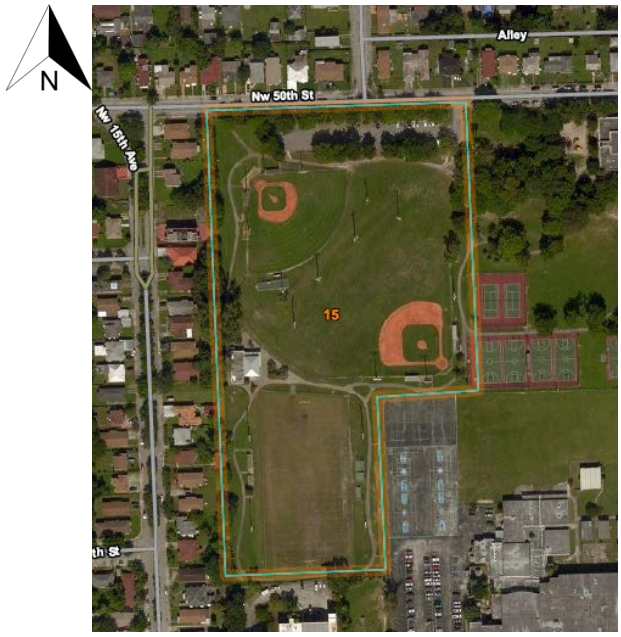


Figure 3.3.1 Site soil mapping

Soil map for Figure 3.3.1 obtained *from* USDA – Natural Resources Conservation Service; https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

3.4 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. Table 3.4.1 below shows surface stratigraphy and the following sections provide generalized characterizations of the soil and weathered limestone strata encountered during our subsurface exploration. Elevations were estimated based on Topographic Survey provided by Miller Legg. For subsurface information at a specific location, refer to the Boring Logs in Appendix B.

Table 3.4.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Approximate Elevation (ft)[2]	Stratum	Description	Ranges of SPT[1] N-values (bpf)
0 – 3.0	EL 14.9 to +13.5	Surface Cover	Topsoil [2.00" – 6.00"] ; 12.00" – 36.00" within the soccer/football field turf areas	-
0.5 – 4.0	EL +13.5 to +9.0	I	Possible Filled Sampled as (SP) SAND/(SP-SM) SAND WITH SILT, Trace Weathered Limestone Fragments, Very Loose to Dense	2 - 38
4.0 – 15.0	EL +11.0 to -1.5	II	WEATHERED LIMESTONE, Very Loose to Medium Dense	2 - 28

Notes: (1) Standard Penetration Test
(2) Please note that the ground surface elevations were not surveyed by a licensed surveyor; these elevations are approximate based on the Topographic Survey provided by Miller Legg.

3.5 GROUNDWATER OBSERVATIONS

Water levels were measured in our borings as noted on the soil boring logs in Appendix B. Groundwater depths measured at the time of drilling were approximately 9.3 to 9.6 feet below ground surface (or EL. +3.0 feet); consider elevation approximate. No further water measurements were conducted after drilling was finished. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors. Based upon our interpretation of the boring data, it appears that the seasonal high groundwater level can be found at a depth(s) of seven and a half feet (or EL. +5.0 feet); consider elevation approximate; once survey elevations are calculated actual elevations must be estimated.

3.6 IN SITU EXFILTRATION TESTING

Constant head open hole exfiltration testing was performed in accordance with procedures of South Florida Water Management District Usual Condition Test procedure found in the SFWMD Environmental Resource Permit Information Manual Volume IV (September 2010 edition) at two locations denoted as exfiltration test E-1 and E-2 on the attached Exfiltration Logs found in the Appendix which includes the hydraulic conductivity (K, value), as well as on the Boring Location Diagram.

For dry bottom retention ponds, it is common to place sod on the pond bottom. Do not use muck grown sod. It will reduce infiltration rates in the pond and the pond will not work as designed.

4.0 LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program. Classification and index property tests were performed on representative soil samples obtained from the test borings in order to aid in classifying soils according to the Unified Soil Classification System and to quantify and correlate engineering properties.

An experienced geotechnical engineer visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and ASTM D-2488 (Description and Identification of Soils-Visual/Manual Procedures). After classification, the geotechnical engineer grouped the various soil types into the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses before the soil descriptions on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

Laboratory testing included two Wash #200 sieve analyses on samples obtained from the Borings B-2 (three to five feet bls), and B-8 (four to eight feet bls), indicating approximately 11.5 to 14.2 of the soil percent at the indicated depths are fine particles passing a number 200 sieve, as indicated on the attached Boring Logs and Laboratory Summary sheet.

5.0 DESIGN RECOMMENDATIONS

5.1 SCOREBOARD

The following sections provide recommendations for foundation design and soil for the proposed scoreboard sign. Characteristics of the scoreboard were not provided at the time of preparation of this report.

5.1.1 Round Shaft Foundation – Scoreboard

Based on the geotechnical analyses and soil test boring data, we recommend using the soil parameters indicated Table 5.1.1.1 below; the following parameters are included: soil unit weights, angle of internal friction, and earth pressure coefficient. It should be noted that if your design analysis requires effective stress parameters for unit weight, subtract 62.4 pounds per cubic feet (pcf) from the unit weights below the groundwater level for the unit weight to account for buoyant stresses in soil.

Table 5.1.1.1: Soil Parameters

Boring Number	Depth (Feet)	SPT "N" Value(1)	Soil Classification	Approximate Soil Unit Weight (PCF)		Soil Angle of Friction (°)	Cohesion (PSF)	Earth Pressure Coefficients	
				X Sat	X Submerged			Active (Ka)	Passive (Kp)
B-3	0 - 2	8	Possible Fill Sampled as (SP) SAND /	100	37.6	30	0	0.33	3.0
	2 – 4	2	Weathered Limestone	100	37.6	27	0	0.37	2.88
	4 - 15	14 - 28	Weathered Limestone	110	47.6	30	0	0.33	3.0

Notes: (1) Blows per foot.

5.2 BLEACHERS CONCRETE SLABS

The on-site natural soils are considered suitable for support of the concrete floor slabs, although moisture control during earthwork operations, including the use of disking or appropriate drying equipment, may be necessary. Based on our subsurface exploration, it appears that the slabs for the structures will bear on compacted structural fill. This material is likely suitable for the support of a slab-on-grade or monolithic slab after the subgrade has been properly prepared and compacted; however, there may be areas of loose or yielding soils that should be removed and replaced with compacted structural fill in accordance with the recommendations included in this report. The following graphic depicts our soil-supported slab recommendations:

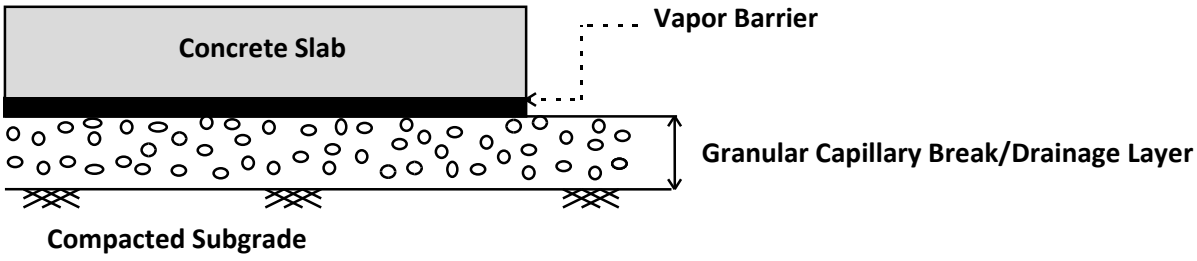


Figure 5.1.2.1 Soil supported slab recommendations

1. Drainage Layer Thickness: four inches
2. Drainage Layer Material: GRAVEL (GP, GW), SAND (SP, SW)
3. Subgrade compacted to 98% maximum dry density per ASTM D698

Subgrade Modulus: Provided the placement of Structural Fill and Granular Drainage Layer per the recommendations discussed herein, the slab may be designed assuming a modulus of subgrade reaction, k_1 of 150 pci (lbs/cu. inch). The modulus of subgrade reaction value is based on a one foot by one foot plate load test basis and assuming that the subgrade is properly compacted.

5.3 FIRE LANE

5.3.1 Unpaved Sections

Subgrade Characteristics: Based on the results of our soil test borings, performed within the proposed unpaved fire lane parking lot, it appears that the soils that will be exposed as pavement subgrade will consist mainly of sandy soils. The pavement design for new pavement sections assumes subgrades consist of suitable materials evaluated by ECS and placed and compacted to at least 98 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D 1557) in accordance with the project specifications.

Considerations: subgrades should be prepared in accordance with the recommendations in the section entitled "**Earthwork Operations**". We are providing recommendations for both standard duty and heavy duty unpaved sections. For the design and construction of exterior pavements, the subgrade should be prepared in strict accordance with the recommendations in the geotechnical report. An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, softening of the subgrade and other problems related to the premature deterioration of the pavement can be expected.

We recommend using a two-layer section consisting of stabilized subgrade and base course. The pavement layers may be placed on existing, prepared subgrade or compacted fill.

Pavement recommendations are based upon local experience with similar pavement conditions, Florida Department of Transportation (FDOT), and AASHTO Guide for Design of Pavement Structures.

A minimum separation of 18 inches should be maintained between the pavement aggregate base (limerock) or base course layer and the seasonal high groundwater levels. In most cases, this separation is available. Recommended unpaved sections are described below in Table 5.3.1.1.

Table 5.3.1.1: Pavement Structures Sections

	Non-Paved	
Component	**Standard**	**Heavy**
Stabilized Subgrade	12”	12”
Base Course (Limerock)	8”	10”
Surface Course	-	-

Aggregate Base Course: Typically, the most prevalent base material in South Florida is limerock. Limerock is readily available from FDOT approved mines in South Florida. Limerock should have a minimum LBR of 100 and should be mined from an FDOT approved source. Limerock should be placed in maximum six-inch lifts and compacted to 98 percent of the Modified Proctor (ASTM D 1557) maximum dry density. Limerock base shall be in accordance with Section 911 and 200 of the FDOT Specifications for Road and Bridge Construction (Current Edition).

Stabilized Subgrade: Stabilized subgrade soil material should be stabilized with rock to a minimum Limerock Bearing Ratio (LBR) of 40 percent, as specified by FDOT requirements for Type B or Type C Stabilized Subgrade. All stabilized subgrade materials should be compacted to 98 percent of the Modified Proctor (ASTM D1557) maximum dry density. Furthermore, the stabilized subgrade may be imported material or a blend of on-site soils and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions. It should be noted that a minimum of 97 percent of the stabilized material should pass a 3½ inch sieve.

Perform compliance testing for base course to a depth of one foot at a frequency of one test per 5,000 square feet, or at a minimum of two test locations, whichever is greater.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

6.1 SUBGRADE PREPARATION

6.1.1 Demolition

The site is developed with one existing building structure within the proposed fire lane area, an existing scoreboard and fields. After demolition of the existing structures, all debris is to be removed from the site. All below-grade objects such as foundations, utilities, etc. are to be excavated, removed transported offsite. Any excavations to remove existing below-grade objects, is to be backfilled with structural fill and compacted per compaction requirements of this report so as to provide a stable subgrade.

6.1.2 Stripping and Grubbing

The subgrade preparation should consist of stripping all concrete, vegetation, rootmat, topsoil, and any other soft or unsuitable materials from the 10-foot construction limits. ECS should be called on to verify that topsoil and unsuitable surficial materials have been completely removed prior to the placement of Structural Fill or construction of structures.

6.1.3 Proofrolling

After removing all unsuitable surface materials, cutting to the proposed grade, and prior to the placement of any structural fill pavement structure or other construction materials, the exposed subgrade should be examined by the Geotechnical Engineer or authorized representative. The exposed subgrade should be thoroughly proofrolled with previously approved construction equipment having a minimum axle load of 10 tons (e.g. fully loaded tandem-axle dump truck). The areas subject to proofrolling should be traversed by the equipment in two perpendicular (orthogonal) directions with overlapping passes of the vehicle under the observation of the Geotechnical Engineer or authorized representative. This procedure is intended to assist in identifying any localized yielding materials. In the event that unstable or “pumping” subgrade is identified by the proofrolling, those areas should be marked for repair prior to the placement of any subsequent structural fill or other construction materials. Methods of repair of unstable subgrade, such as undercutting or moisture conditioning or chemical stabilization, should be discussed with the Geotechnical Engineer to determine the appropriate procedure with regard to the existing conditions causing the instability. A test pit(s) may be excavated to explore the shallow subsurface materials in the area of the instability to help in determined the cause of the observed unstable materials and to assist in the evaluation of the appropriate remedial action to stabilize the subgrade.

6.1.4 Site Temporary Dewatering

General Groundwater Conditions: Groundwater observations are described in Section 3.5 of this report. The depth at which groundwater is present on the site varies with surface elevation. In low-lying areas the presence of groundwater is more pronounced. Soils at contact with groundwater levels were very moist to wet. In most cases, moisture then decreased with depth.

Surface Flows: No stream channels were observed on site.

Based upon our subsurface exploration at this site, as well as significant experience on sites in nearby areas of similar geologic setting, we believe construction dewatering at this site will be limited to mainly removing accumulated rain water and some minor seepage from utility excavation.

Deep wells will not be required for the temporary dewatering system. However, the dewatering operations can be handled by the use of conventional submersible pumps directly in the excavation or temporary trenches to remove water from the excavation. If temporary sump pits are used, we recommend they be established at an elevation three to five feet below the bottom of the excavation subgrade or bottom of footing. A perforated 55 gallon drum or other temporary structure could be used to house the pump. We recommend continuous dewatering of the excavations using electric pumps or manned gasoline pumps be used during construction.

6.1.5 Subgrade Stabilization

Subgrade Compaction: Upon completion of subgrade documentation, the exposed subgrade within the 20-foot expanded building should be moisture conditioned to within +/- two percent of the soil's optimum moisture content and be compacted with suitable equipment (minimum 10-ton roller) to a depth of 10 inches. Subgrade compaction within the expanded fire lane and scoreboard limits should be to a dry density of at least 98 percent of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95 percent should be achieved. ECS should be called on to document that proper subgrade compaction has been achieved.

Subgrade Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits for buildings, fills, and slopes, etc. Field density testing of subgrades will be performed at frequencies in Table 6.1.5.1

Table 6.1.5.1 Frequency of Subgrade Compaction Testing

Location	Frequency of Tests
Concrete Slabs Limits	One test per 2,000 sq. ft. per lift
Unpaved Road Areas	One test per 5,000 sq. ft. per lift
Utility Trenches	One test per 200 linear ft. per lift
All Other Non-Critical Areas	One test per 5,000 sq. ft. per lift

Subgrade Stabilization: In some areas, particularly low-lying, wet areas of the site, undercutting of excessively soft materials may be considered inefficient. In such areas the use of a reinforcing geotextile or geogrid might be employed, under the advisement of ECS. Suitable stabilization materials may include medium duty woven geotextile fabrics or geogrids. The suitability and employment of reinforcing or stabilization products should be determined in the field by ECS personnel, in accordance with project specifications.

6.2 EARTHWORK OPERATIONS

6.2.1 Structural Fill Materials

Product Submittals: Prior to placement of Structural Fill, representative bulk samples (about 50 pounds) of on-site and off-site borrow should be submitted to ECS for laboratory testing, which will include, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. Import materials should be tested prior to being hauled to the site to determine if they meet project specifications.

Satisfactory Structural Fill Materials: Materials satisfactory for use as Structural Fill should consist of inorganic soils classified as SW, SP, GW, GP, GM and GC, or a combination of these group symbols, per ASTM D 2487. The materials should be free of organic matter, debris, and should contain no particle sizes greater than four inches in the largest dimension. Open graded materials, such as Gravels (GW and GP), which contain void space in their mass should not be used in structural fills unless properly encapsulated with filter fabric.

Unsatisfactory Materials: Unsatisfactory fill materials include materials which to not satisfy the requirements for suitable materials, as well as topsoil and organic materials (Pt, OH, OL), Silty/Silt (SM, MH, ML), and Clayey/Clay (SC, CH, CL).

6.2.2 Compaction

Structural Fill Compaction: Structural Fill within the expanded fire lane and score board limits should be placed in maximum 12-inch loose lifts, moisture conditioned as necessary to within +/- two percent of the soil's optimum moisture content, and be compacted with suitable equipment to a dry density of at least 98 percent of the Standard Proctor maximum dry density (ASTM D698). Beyond these areas, compaction of at least 95 percent should be achieved. ECS should be called on to document that proper fill compaction has been achieved.

Fill Compaction Control: The expanded limits of the proposed construction areas should be well defined, including the limits of the fill zones for buildings, pavements, and slopes, etc., at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by a qualified representative of the construction testing laboratory to determine that the minimum compaction requirements are being achieved. Field density testing of fills will be performed at the frequencies shown in Table 6.2.2.1, but not less than one test per lift.

Table 6.2.2.1 Frequency of Compaction Tests in Fill Areas

Location	Frequency of Tests
Concrete Slab Limits	One test per 2,000 sq. ft. per lift
Unpaved Road Areas	One test per 5,000 sq. ft. per lift
Utility Trenches	One test per 200 linear ft. per lift
All Other Non-Critical Areas	One test per 5,000 sq. ft. per lift

Compaction Equipment: Compaction equipment suitable to the soil type being compacted should be used to compact the subgrades and fill materials. A vibratory steel drum roller should be used for compaction of coarse-grained soils (Sands) as well as for sealing compacted surfaces.

Fill Placement Considerations: Fill materials should not be placed on excessively wet soils. Excessively wet soils or aggregates should be scarified, aerated, and moisture conditioned.

At the end of each work day, all fill areas should be graded to facilitate drainage of any precipitation and the surface should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor may need to scarify existing subgrades to a depth on the order of four inches so that a weak plane will not be formed between the new fill and the existing subgrade soils.

Drying and compaction of wet soils is typically difficult during the rainy season. Accordingly, earthwork should be performed during the drier times of the year, if practical. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade subgrade soils. Alternatively, if these soils cannot be stabilized by conventional methods as previously discussed, additional modifications to the subgrade soils such as cement stabilization may be utilized to adjust the moisture content. If cement is utilized to control moisture contents and/or for stabilization, regular Type 1 cement can be used. The construction testing laboratory should evaluate proposed cement soil modification procedures, such as quantity of additive and mixing and curing procedures, before implementation. The contractor should be required to minimize dusting or implement dust control measures, as required.

Fill material should be placed in horizontal lifts in confined areas such as utility trenches, portable compaction equipment and thin lifts of three inches to four inches may be required to achieve specified degrees of compaction.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. We do not anticipate significant problems in controlling moisture within the fill during dry weather, but moisture control may be difficult during extended periods of rain.

6.3 UTILITY INSTALLATIONS

Utility Subgrades: The soils encountered in our exploration are expected to be generally suitable for support of utility pipes. The pipe subgrade should be observed and probed for stability by ECS to evaluate the suitability of the materials encountered. Any loose or unsuitable materials encountered at the utility pipe subgrade elevation should be removed and replaced with suitable compacted Structural Fill or pipe bedding material.

Utility Backfilling: The granular bedding material should be at least four inches thick, but not less than that specified by the project drawings and specifications. Fill placed for support of the utilities, as well as backfill over the utilities, should satisfy the requirements for Structural Fill given in this report. Compacted backfill should be free of topsoil, roots, ice, or any other material designated by ECS as unsuitable. The backfill should be moisture conditioned, placed, and compacted in accordance with the recommendations of this report.

Utility Excavation Dewatering: It is possible that perched water may be encountered by utility excavations which extend below existing grades. It is expected that removal of perched water which seeps into excavations could be accomplished by pumping from sumps excavated in the trench bottom and which are backfilled with FDOT Size No. 57 Stone or open graded bedding material. Should water conditions beyond the capability of sump pumping be encountered, the contractor should submit a Dewatering Plan in accordance with project specifications.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.5 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: During the wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction. Alternatively, during the drier times of the year, such as the summer months, moisture may need to be added to the soil to provide adequate moisture for successful compaction according to the project requirements.

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent

construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of one percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to minimize infiltration of surface water.

Excavation Safety: Cuts or excavations associated with utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or prevent slope failures. Contractors should be familiar with applicable OSHA codes to ensure that adequate protection of the excavations and trench walls is provided.

Erosion Control: The surface soils may be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

7.0 CLOSING

ECS has prepared this report of findings, evaluations, and recommendations to guide geotechnical-related design and construction aspects of the project.

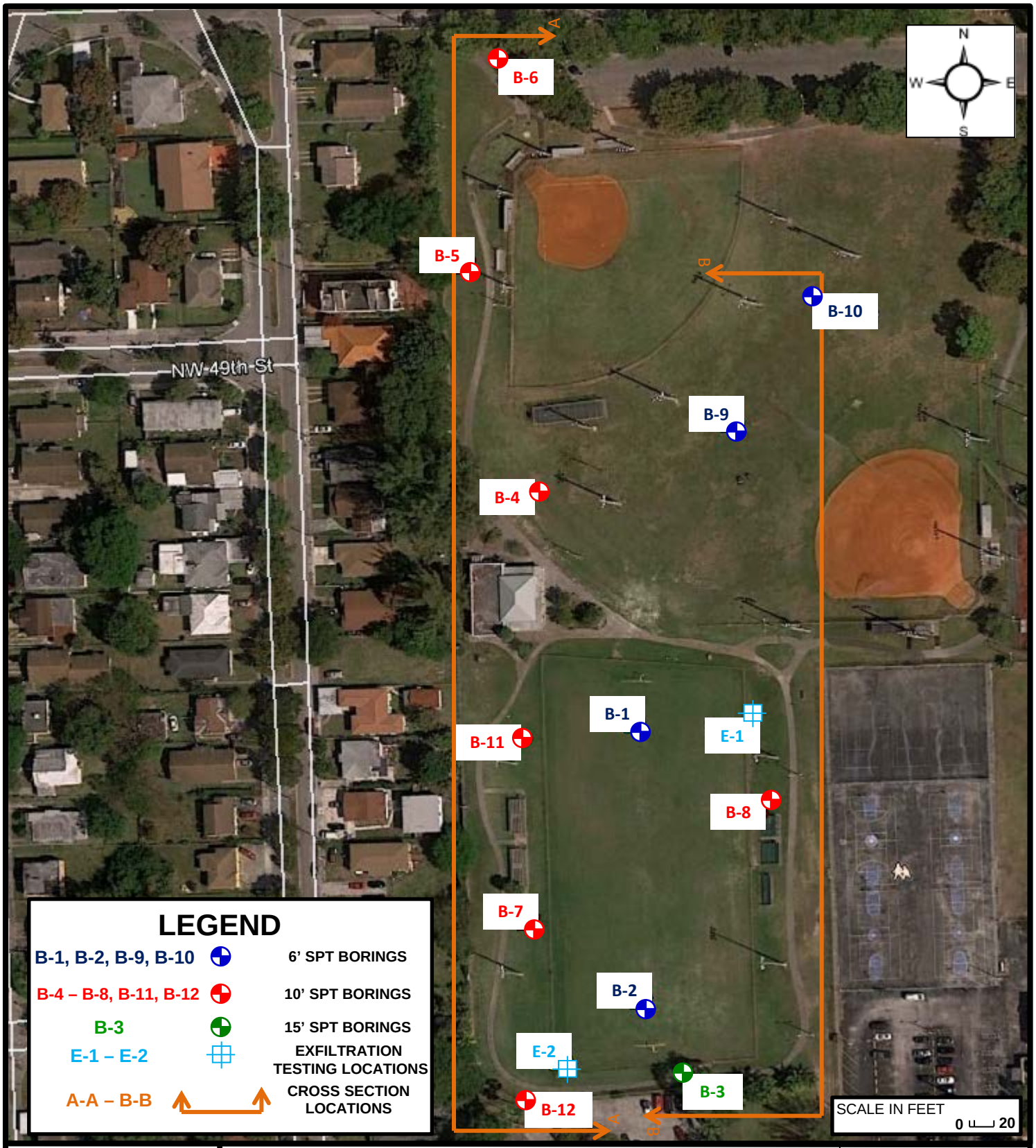
The description of the proposed project is based on information provided to ECS by Miller Legg; If any of this information is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

APPENDIX A – Drawings & Reports

Site Vicinity Diagram
Boring Location Diagram
Geologic Map
USDA Soil Survey Map



BORING LOCATION DIAGRAM
PROPOSED HADLEY PARK IMPROVMENTS

1350 N.W. 50TH STREET, MIAMI, FL
MILLER LEGG

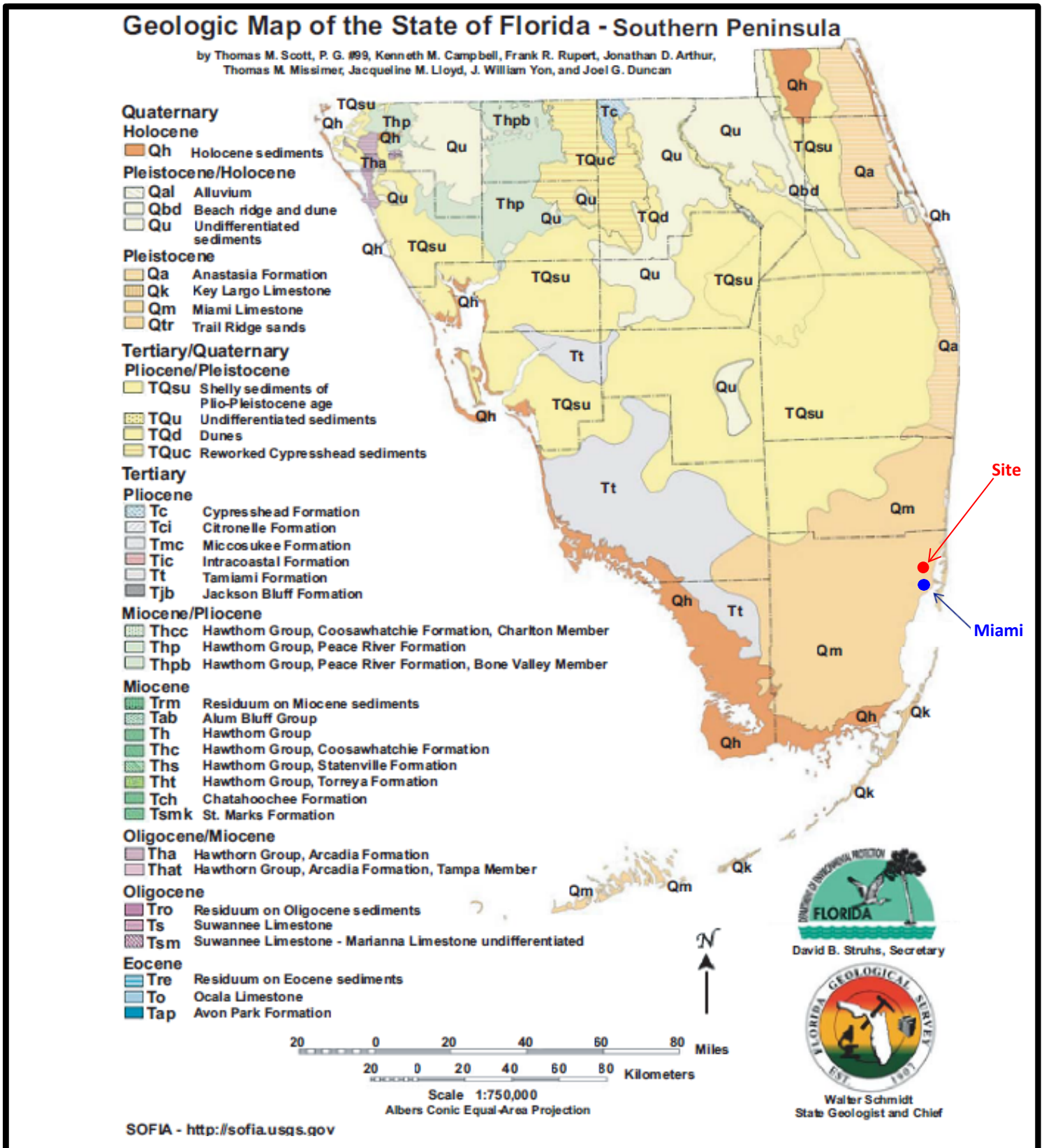
ENGINEER	LER/LMB
PROJECT NO.	3279
DATE	FEBRUARY 2018

SITE VICINITY DIAGRAM
PROPOSED HADLEY PARK IMPROVMENTS

1350 N.W. 50TH STREET, MIAMI, FL

MILLER LEGG

ENGINEER	LER/LMB
PROJECT NO.	3279
DATE	JANUARY 2018



GEOLOGIC MAP
FIGURE 3.2.1

OBTAINED FROM THE UNITED STATE GEOLOFICAL SURVEY PUBLICATIONS WAREHOUSE WEBISTE

https://sofia.er.usgs.gov/publications/maps/florida_geology/#sections

Soil Map—Miami-Dade County Area, Florida
(3279 Soil Map)

Map Scale: 1:3,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Miami-Dade County Area, Florida
Survey Area Data: Version 9, Oct 5, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 11, 2014—Jan 8, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
15	Urban land	12.2	100.0%
Totals for Area of Interest		**12.2**	**100.0%**

APPENDIX B – Field Operations

Reference Notes for Boring Logs
Boring Logs B-1 through B-12
Exfiltration Testing Results E-1 through E-2

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL[3] MAN-PLACED SOILS
GW	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GP	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GM	**SILTY GRAVEL** gravel-sand-silt mixtures
GC	**CLAYEY GRAVEL** gravel-sand-clay mixtures
SW	**WELL-GRADED SAND** gravelly sand, little or no fines
SP	**POORLY-GRADED SAND** gravelly sand, little or no fines
SM	**SILTY SAND** sand-silt mixtures
SC	**CLAYEY SAND** sand-clay mixtures
ML	**SILT** non-plastic to medium plasticity
MH	**ELASTIC SILT** high plasticity
CL	**LEAN CLAY** low to medium plasticity
CH	**FAT CLAY** high plasticity
OL	**ORGANIC SILT or CLAY** non-plastic to low plasticity
OH	**ORGANIC SILT or CLAY** high plasticity
PT	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION		**PARTICLE SIZES**
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	**SPT[5] (BPF)**	**CONSISTENCY[7] (COHESIVE)**
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT[5]	**DENSITY**
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15 - 25
Adjective *(ex: "Silty")*	≥25	≥30

WATER LEVELS[6]		
	WL	Water Level (WS)(WD)
		(WS) While Sampling
		(WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09 Note 16.*

[8] *Percentages are estimated to the nearest 5% per ASTM D 2488-09.*

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369606.313454	1896699.478	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

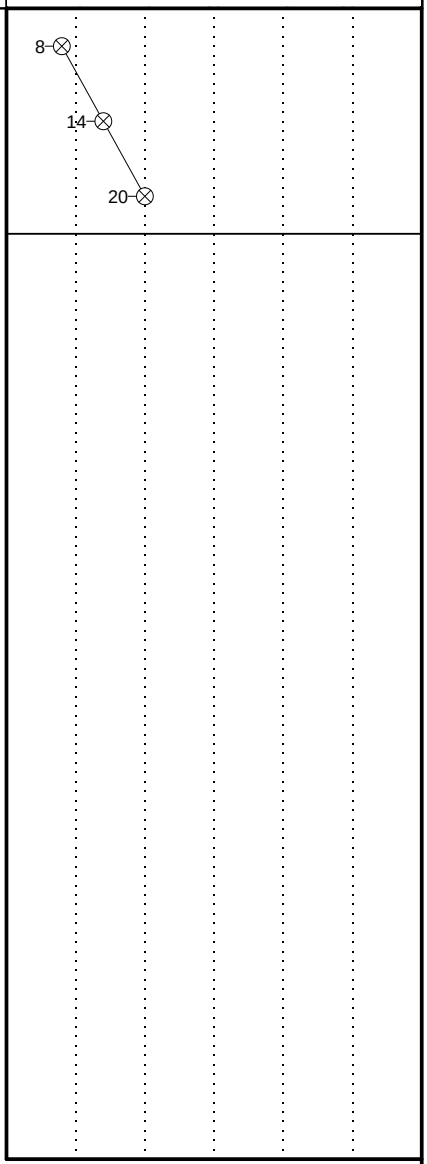
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING ▰ LOSS OF CIRCULATION

SURFACE ELEVATION +14.9 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [12.00"]			1 3
					(Possible Fill) SAND, Trace Weathered Limestone Fragments, Dark Gray to Black, Moist, Loose			5 5
	S-2	SS	24	24	WEATHERED LIMESTONE, Orangish Tan to Light Tan, Moist, Medium Dense			5 6 8 9 10
5	S-3	SS	24	24			10	11 9 9
					END OF BORING @ 6'			
10							5	
15							0	
20							-5	
25							-10	
30							-15	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369334.003742	1896706.039628	4

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING | LOSS OF CIRCULATION (100%)

SURFACE ELEVATION +14.7 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24		10	2 2 2 2 2 2 2 3 4 7 10 7 4
	S-2	SS	24	24			
5	S-3	SS	24	24		5	
10						0	
15						-5	
20						-10	
25						-15	
30							

Topsoil Depth [36.00"]

(Possible Fill) SAND WITH SILT, Trace Weathered Limestone Fragments, and Brick Debris, Dark Gray to Black, Moist, Very Loose

[Wash #200: 14.2%]

WEATHERED LIMESTONE, Orangish Tan, Moist, Loose to Medium Dense

END OF BORING @ 6'

4 5 17

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-3	1 OF 1

PROJECT NAME: City of Miami - Hadley Park

ARCHITECT-ENGINEER:

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369265.1061048	1896742.128867B	

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION +13.4 ft. (Approx.)

CALIBRATED PENETROMETER TONS/FT^2

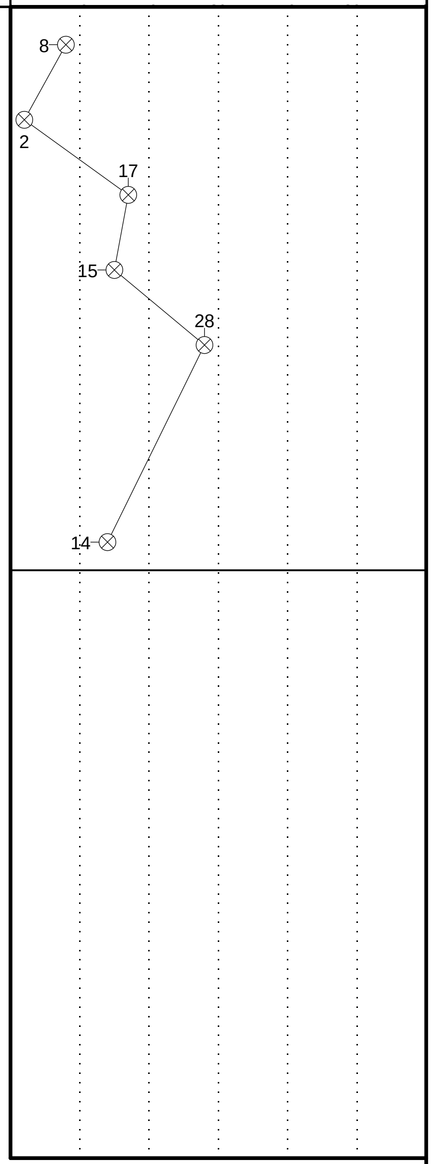
ROCK QUALITY DESIGNATION & RECOVERY — RQD% — REC%

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"
0					Topsoil Depth [2.00"]	
	S-1	SS	24	24	(Possible Fill) SAND, Trace Weathered Limestone Fragments, Brown to Gray, Moist, Loose	2, 6, 2, 1
	S-2	SS	24	24	WEATHERED LIMESTONE, Orangish Tan to Light Tan, Moist to Saturated, Very Loose to Medium Dense	1, 1, 1, 2
5	S-3	SS	24	24		6, 8, 9, 10
	S-4	SS	24	24		11, 9, 6, 7
	S-5	SS	24	24		23, 22, 6, 11
10						
	S-6	SS	18	18		6, 7, 7
15					END OF BORING @ 15'	

Elevation (ft): 10, 5, 0, -5, -10, -15; Depth (ft): 0, 5, 10, 15, 20, 25, 30



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.6 WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369839.2530873	1896597.7719117	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

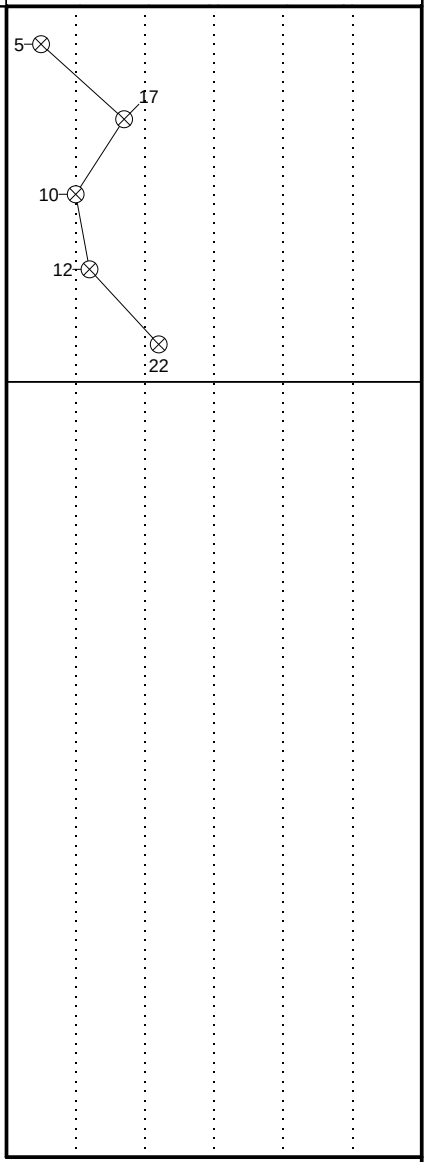
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING ▰ LOSS OF CIRCULATION ⧖

SURFACE ELEVATION +12.5 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [6.00"] (Possible Fill) SAND, Trace Weathered Limestone Fragments, and Wood Debris, Brown to Gray, Moist, Loose		10	2 3 2 5 10
	S-2	SS	24	24	WEATHERED LIMESTONE, Orangish Tan to Light Tan, Moist, Loose to Medium Dense			8 9 10 5 5
5	S-3	SS	24	24			5	5 6 5 7 5
	S-4	SS	24	24				9 8 12 10 5
	S-5	SS	24	24				
10					END OF BORING @ 10'		0	
15							-5	
20							-10	
25							-15	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9370055.788520	1896525.5934339	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

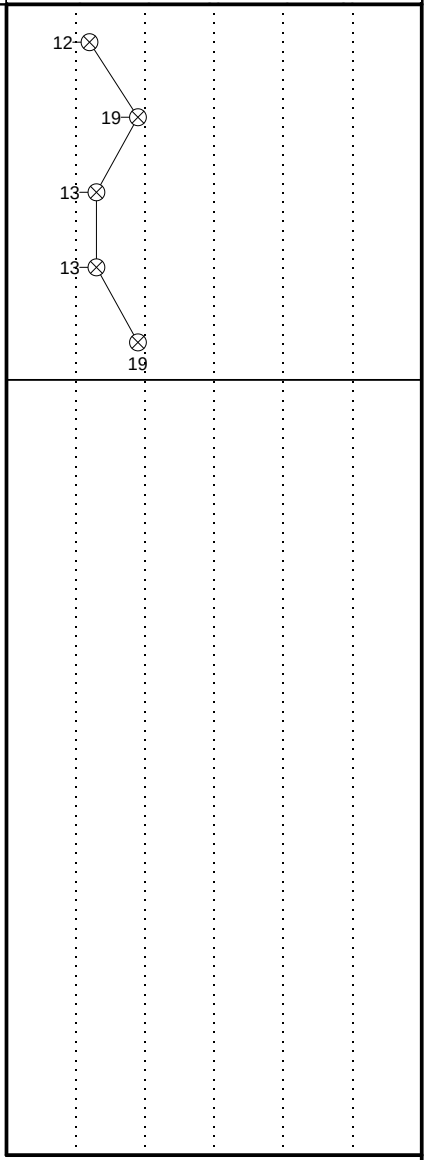
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING ▰ LOSS OF CIRCULATION

SURFACE ELEVATION +12.4 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [6.00"] (Possible Fill) SAND, With Weathered Limestone Fragments, Light Brown, Moist, Medium Dense		10	2 5 7 11
	S-2	SS	24	24	WEATHERED LIMESTONE, Orangish Tan, Moist, Medium Dense			9 9 10 10
5	S-3	SS	24	24				9 7 6 6
	S-4	SS	24	24	(SP) SAND, With Weathered Limestone Fragments, Light Tan, Moist, Medium Dense		5	5 6 7 8
	S-5	SS	24	24				7 9 10 10
10					END OF BORING @ 10'		0	
15							-5	
20							-10	
25							-15	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9370265.762274	1896555.120993	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

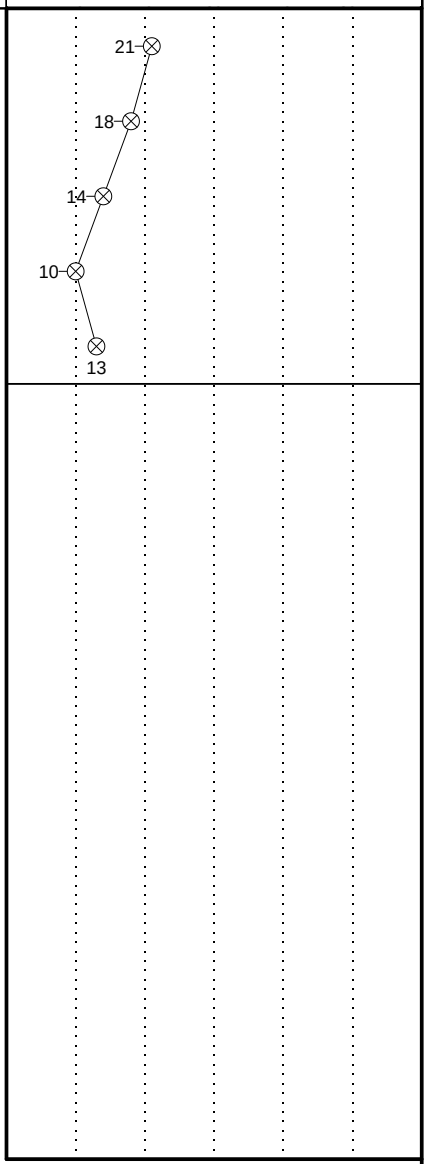
BOTTOM OF CASING ▶ | LOSS OF CIRCULATION (100%)

SURFACE ELEVATION +11.9 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24		10	5 10 11 10
	S-2	SS	24	24			9 10 8 8
5	S-3	SS	24	24		5	6 7 7 8
	S-4	SS	24	24			6 5 5 5
	S-5	SS	24	24			4 6 7 3
10						0	
15						-5	
20						-10	
25						-15	
30							

Topsoil Depth [6.00"]
(Possible Fill) SAND, With Weathered Limestone Fragments, Gray to Orangish Tan, Moist, Medium Dense
WEATHERED LIMESTONE, Orangish Tan to Light Tan, Moist, Medium Dense to Loose

END OF BORING @ 10'



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-7	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369409.463060	1896594.491071	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

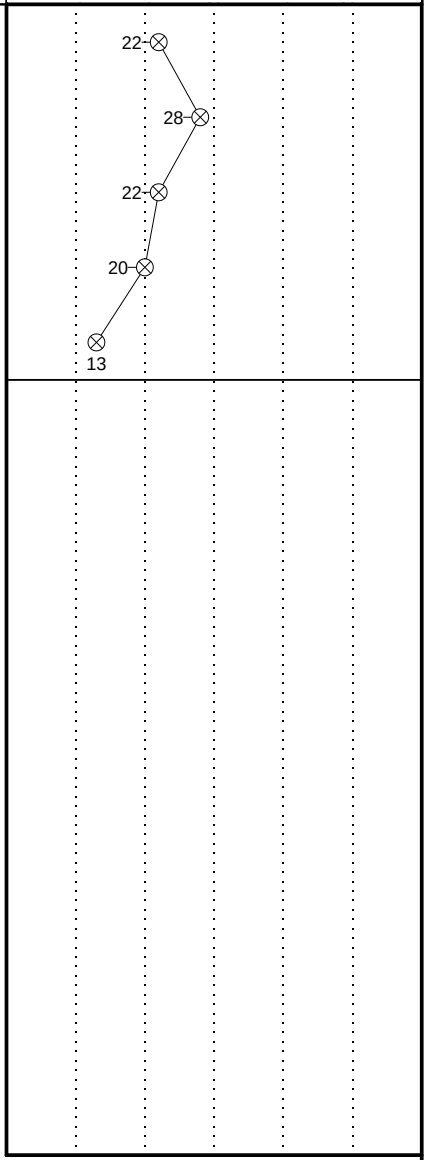
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING ▶ LOSS OF CIRCULATION

SURFACE ELEVATION +12.2 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [3.00"] (Possible Fill) SAND, With Weathered Limestone Fragments, Gray to Orangish Tan, Moist, Medium Dense		10	10 11 11 18
	S-2	SS	24	24	WEATHERED LIMESTONE, Orangish Tan to Light Tan, Moist to Saturated, Medium Dense			11 13 15 11
5	S-3	SS	24	24			5	11 11 11 13
	S-4	SS	24	24				11 10 10 11
	S-5	SS	24	24			0	7 5 8 7
10					END OF BORING @ 10'		-5	
15							-10	
20							-15	
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.3 WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-8	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369540.696656	1896833.992384	5

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC%

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

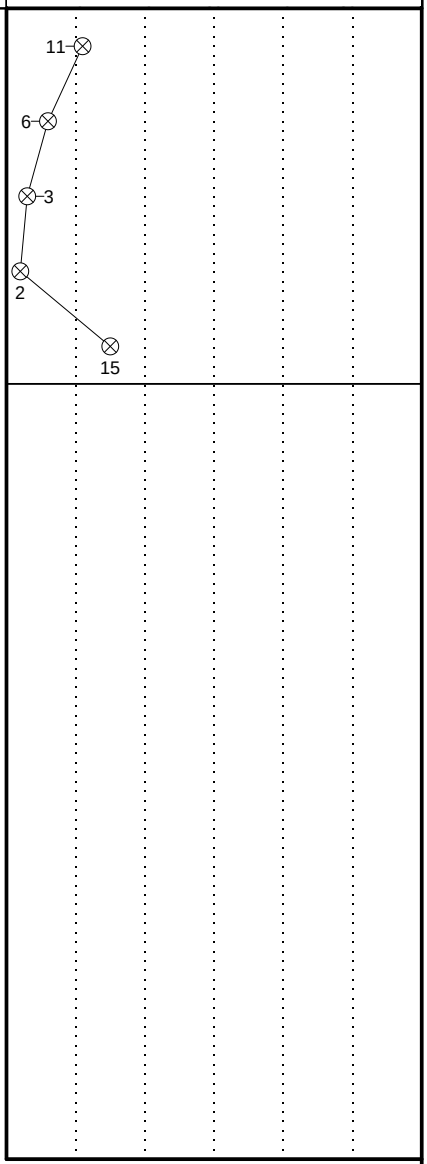
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING LOSS OF CIRCULATION

SURFACE ELEVATION +12.8 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [7.00"] (Possible Fill) SAND, Trace Weathered Limestone Fragments, Gray to Orangish Tan, Moist, Medium Dense to Loose		10	2 4 7
	S-2	SS	24	24				5 2 3
5	S-3	SS	24	24	(Possible Fill) SAND WITH SILT, Weathered Limestone Fragments, and Brick Debris, Gray to Brown, Moist, Very Loose		5	3 3 2
	S-4	SS	24	24	[Wash #200: 11.5%]			3 2 1
	S-5	SS	24	24	WEATHERED LIMESTONE, Orangish Tan, Moist to Saturated, Medium Dense		0	1 1 1
10					END OF BORING @ 10'		-5	1 1 1
15							-10	4 6 9
20							-15	11
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.5 WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-9	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369901.589045	1896791.341465	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

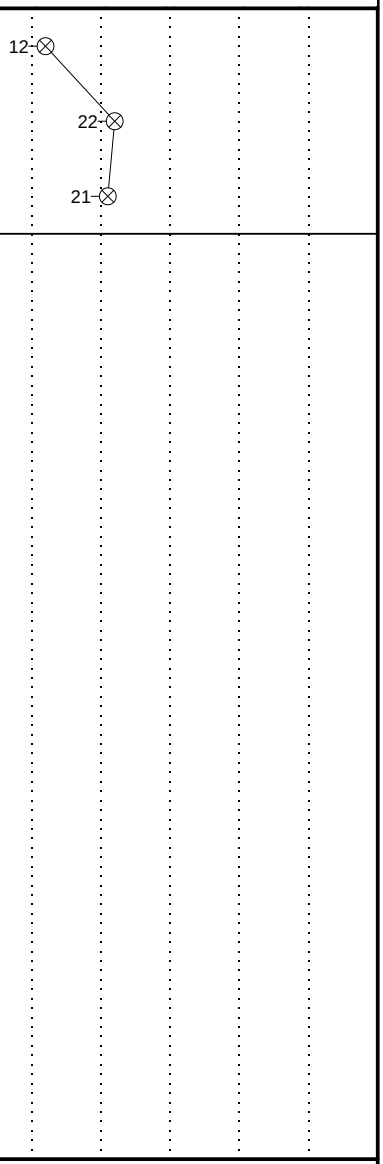
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING ▶ LOSS OF CIRCULATION

SURFACE ELEVATION +12.1 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [6.00"] (Possible Fill) SAND, With Weathered Limestone Fragments, Brown to Tan, Moist, Medium Dense		10	3 5 7 11
	S-2	SS	24	24	WEATHERED LIMESTONE, Light Tan, Moist, Medium Dense			6 9 13 10
5	S-3	SS	24	24				8 10 11 11
					END OF BORING @ 6'		5	
10							0	
15							-5	
20							-10	
25							-15	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-10	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9370036.103481	1896866.800783	5

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC%

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

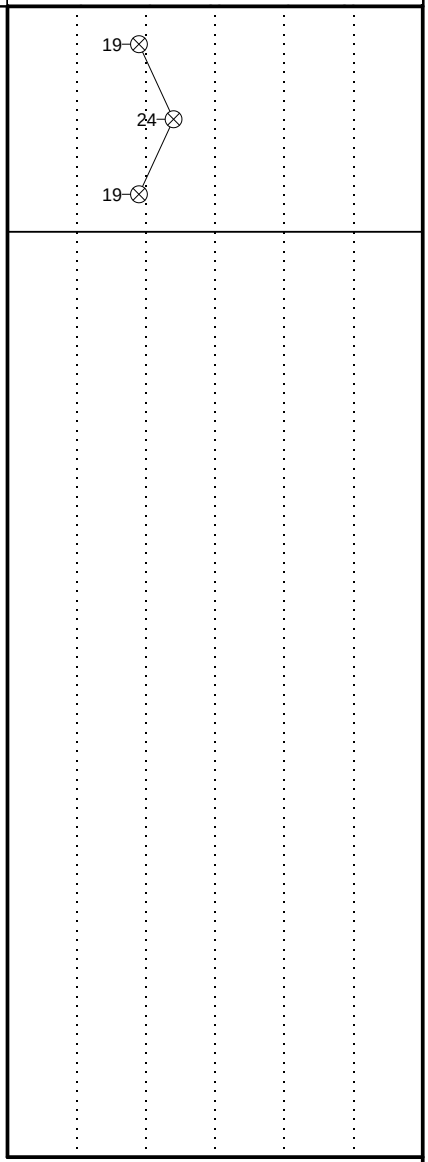
STANDARD PENETRATION BLOWS/FT

ENGLISH UNITS

BOTTOM OF CASING LOSS OF CIRCULATION

SURFACE ELEVATION +12.7 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [6.00"] (Possible Fill) SAND, Trace Weathered Limestone Fragments, Brown to Tan, Moist, Medium Dense		10	3 11 8 7
	S-2	SS	24	24	WEATHERED LIMESTONE, Light Tan, Moist, Medium Dense			5 10 14 8
5	S-3	SS	24	24				8 10 9 10
					END OF BORING @ 6'		5	
10							0	
15							-5	
20							-10	
25							-15	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL N/E WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B-11	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369599.751774	1896584.648552	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING ▶ LOSS OF CIRCULATION

SURFACE ELEVATION +12.6 ft. (Approx.)

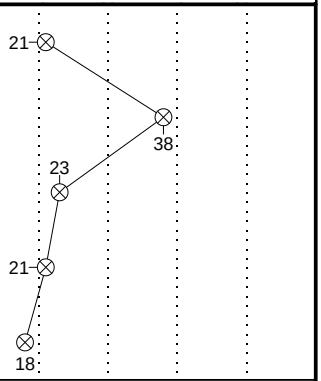
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0							10 10 11 7
	S-1	SS	24	24			15 21 17 18
	S-2	SS	24	24		10	12 11 12 14
5	S-3	SS	24	24			11 10 11 10
	S-4	SS	24	24		5	8 9 9 8
	S-5	SS	24	24			
10						0	
15						-5	
20						-10	
25						-15	
30							

Topsoil Depth [4.00"]

(Possible Fill) SAND, With Weathered Limestone Fragments, Gray to Orangish Tan, Moist, Medium Dense to Dense

WEATHERED LIMESTONE, Light Tan, Moist to Saturated, Medium Dense

END OF BORING @ 10'



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.5 WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

CLIENT	Job #:	BORING #	SHEET
Miller Legg	25:3279	B12	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
City of Miami - Hadley Park	

SITE LOCATION: 1350 NW 50th Street, Miami, Dade County, FL

NORTHING	EASTING	STATION
9369271.667784	1896627.299470	

CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — – REC%

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

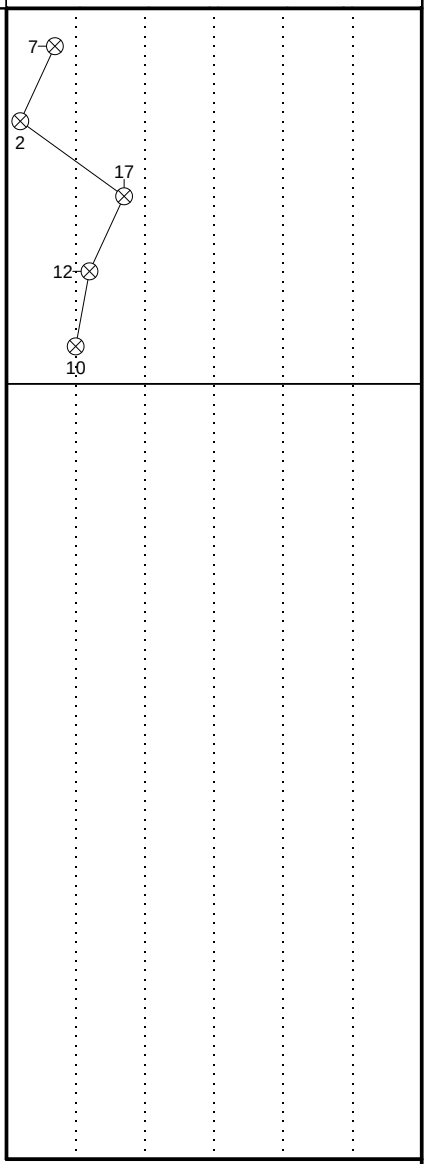
STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING LOSS OF CIRCULATION

SURFACE ELEVATION +12.3 ft. (Approx.)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0	S-1	SS	24	24	Topsoil Depth [3.00"] (Possible Fill) SAND, Trace Weathered Limestone Fragments, Gray to Tan, Moist, Loose		10	3 4 4 3 3 2 1 1 1
	S-2	SS	24	24	(Possible Fill) SAND, Tan, Moist, Very Loose			4 8 9 10 7 6 6 6 6 5 5 5 5
5	S-3	SS	24	24	WEATHERED LIMESTONE, Light Tan, Moist to Saturated, Medium Dense to Loose		5	
	S-4	SS	24	24				
	S-5	SS	24	24				
10					END OF BORING @ 10'		0	
15							-5	
20							-10	
25							-15	
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.3 WS ☐ WD ☒	BORING STARTED 01/17/18	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 01/17/18	HAMMER TYPE Auto
WL	RIG Truck FOREMAN	DRILLING METHOD MUD ROTARY

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL
GM - SILTY GRAVEL
GP - POORLY GRADED GRAVEL
GC - CLAYEY GRAVEL
SW - WELL GRADED SAND
ML - LOW PLASTICITY SILT

ST - SHELBY TUBE
CL - LOW PLASTICITY CLAY
MH - HIGH PLASTICITY SILT
SM - SILTY SAND

RC - ROCK CORE
SP - POORLY GRADED SAND
SC - CLAYEY SAND
CH - HIGH PLASTICITY CLAY

PM - PRESSURE METER
OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
PT - PEAT

WR - WEATHERED ROCK
PWR - PARTIALLY WEATHERED ROCK

- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL
ASPHALT
GRAVEL
CONCRETE
VOID

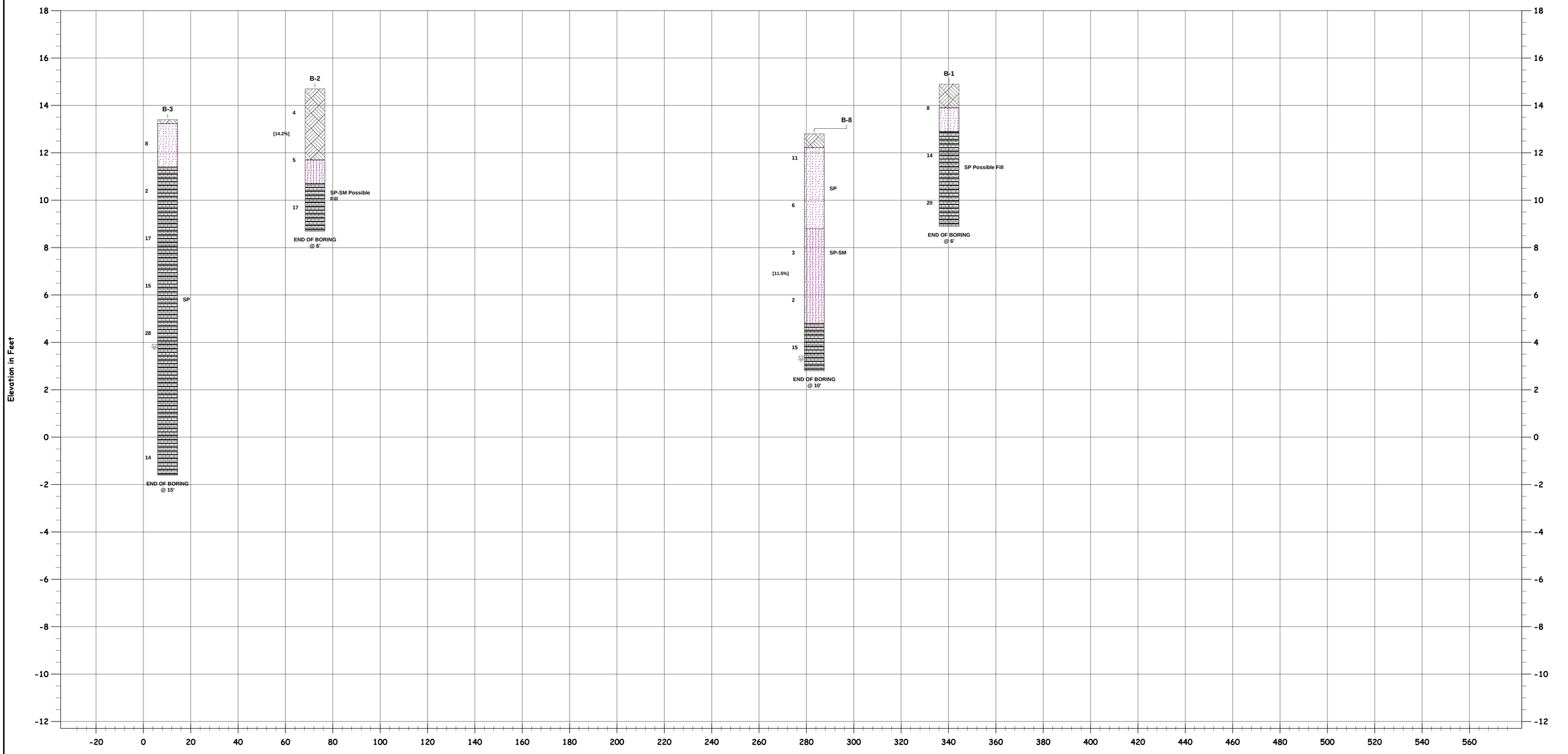
ROCK TYPES

IGNEOUS
METAMORPHIC
SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING
WATER LEVEL - SEASONAL, HIGH WATER
WATER LEVEL - AFTER CASING REMOVAL
WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% | WATER CONTENT% | % PASSING #200 SIEVE (88%) | LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

City of Miami - Hadley Park

1350 NW 50th Street, Miami, Dade County, FL

Subsurface Soil Profile B-B (East)

Miller Legg

PROJECT NO.: 3279	DATE: 2/12/2018	VERTICAL SCALE: 1"=2'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL
GM - SILTY GRAVEL
GP - POORLY GRADED GRAVEL
GC - CLAYEY GRAVEL
SW - WELL GRADED SAND
ML - LOW PLASTICITY SILT

ST - SHELBY TUBE
CL - LOW PLASTICITY CLAY
MH - HIGH PLASTICITY SILT
SM - SILTY SAND

RC - ROCK CORE
SP - POORLY GRADED SAND
SC - CLAYEY SAND
CH - HIGH PLASTICITY CLAY

PM - PRESSURE METER
OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
PT - PEAT

WR - WEATHERED ROCK
PWR - PARTIALLY WEATHERED ROCK

- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL
ASPHALT
GRAVEL
CONCRETE
VOID

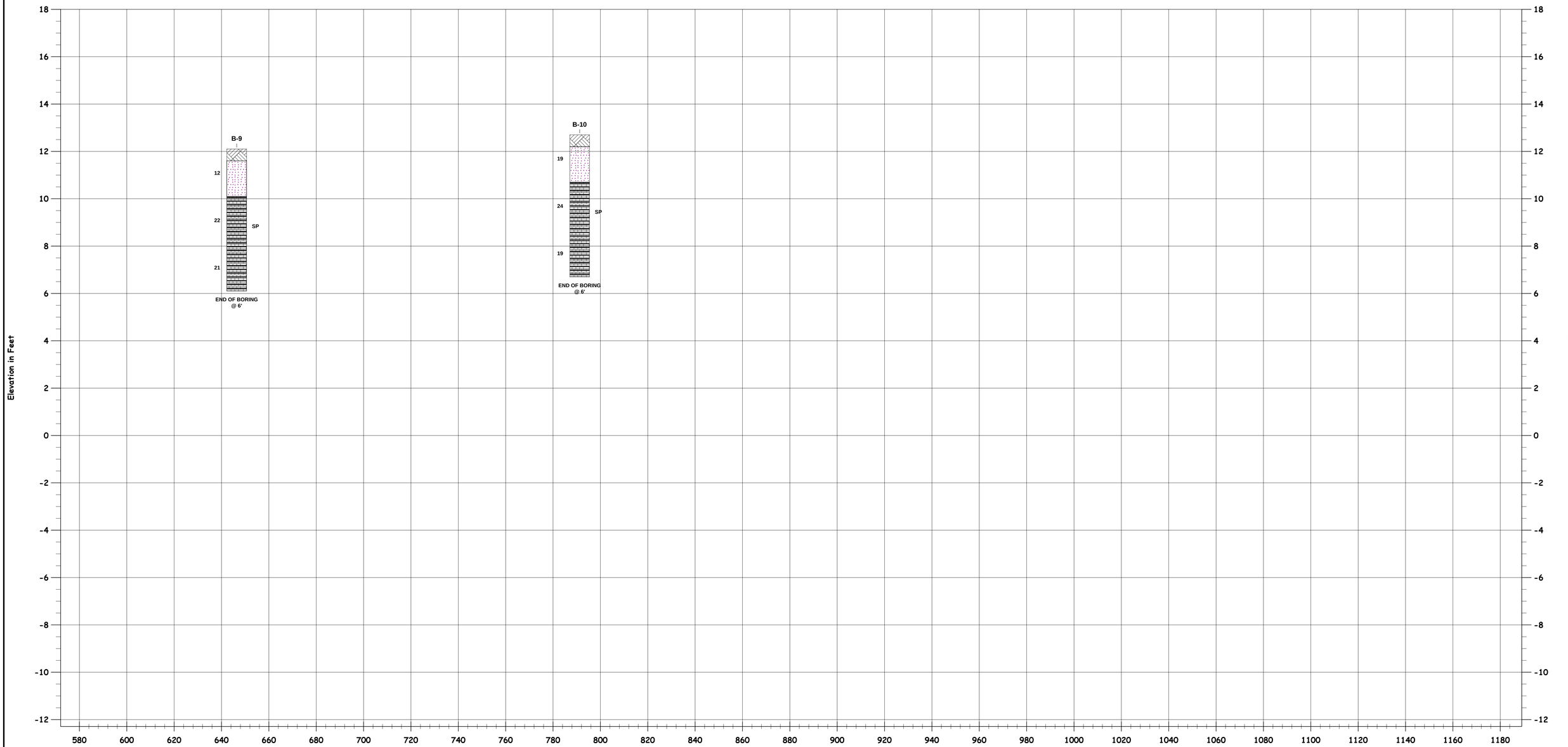
ROCK TYPES

IGNEOUS
METAMORPHIC
SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING
WATER LEVEL - SEASONAL, HIGH WATER
WATER LEVEL - AFTER CASING REMOVAL
WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% | WATER CONTENT% | % PASSING #200 SIEVE (88%) | LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

City of Miami - Hadley Park

1350 NW 50th Street, Miami, Dade County, FL

Subsurface Soil Profile B-B (East)

Miller Legg

PROJECT NO.: 3279 | DATE: 2/12/2018 | VERTICAL SCALE: 1"=2'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL
GM - SILTY GRAVEL
GP - POORLY GRADED GRAVEL
GC - CLAYEY GRAVEL
SW - WELL GRADED SAND
ML - LOW PLASTICITY SILT

ST - SHELBY TUBE
CL - LOW PLASTICITY CLAY
MH - HIGH PLASTICITY SILT
SM - SILTY SAND

RC - ROCK CORE
SP - POORLY GRADED SAND
SC - CLAYEY SAND
CH - HIGH PLASTICITY CLAY

PM - PRESSURE METER
OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
PT - PEAT

WR - WEATHERED ROCK
PWR - PARTIALLY WEATHERED ROCK

- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL
ASPHALT
GRAVEL
CONCRETE
VOID

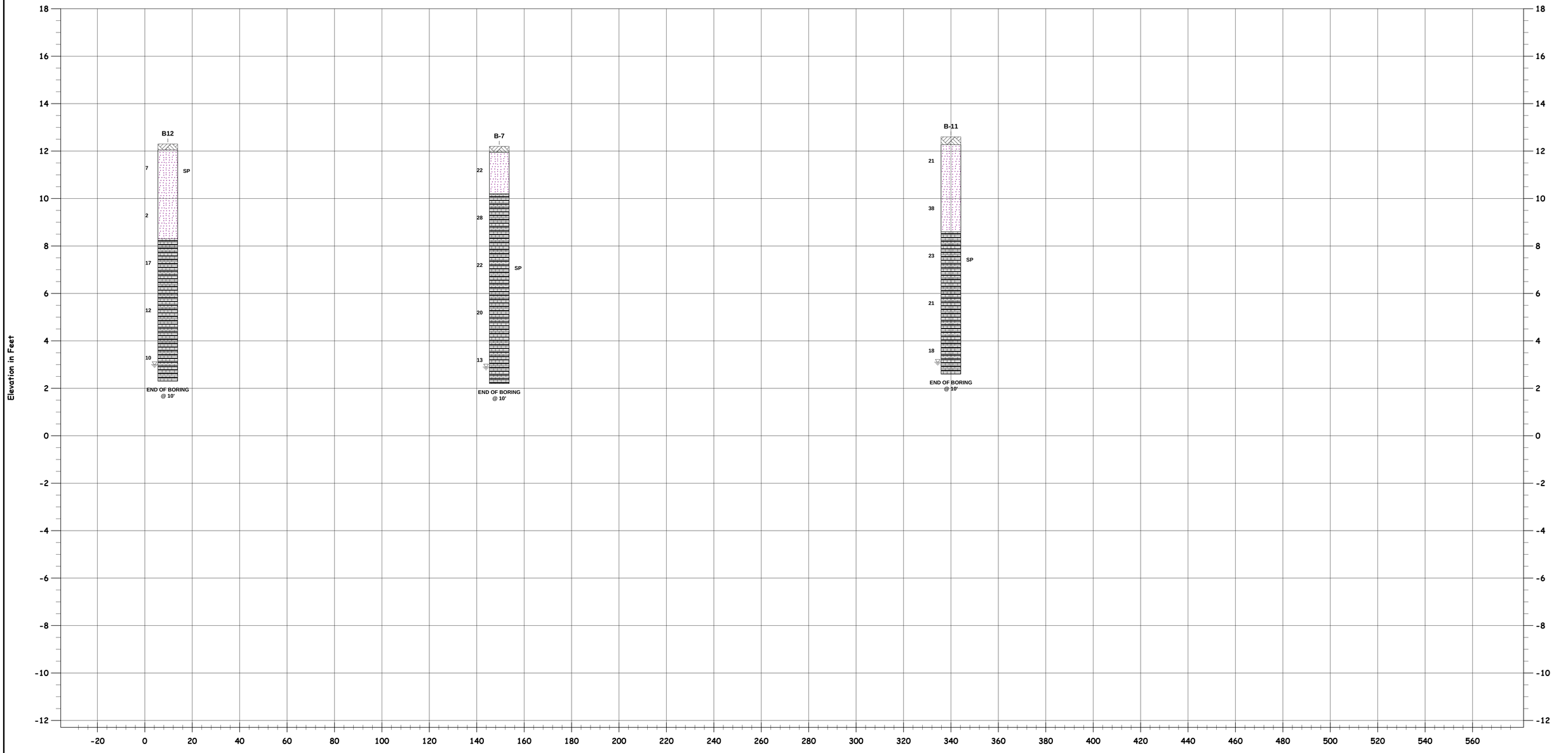
ROCK TYPES

IGNEOUS
METAMORPHIC
SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING
WATER LEVEL - SEASONAL, HIGH WATER
WATER LEVEL - AFTER CASING REMOVAL
WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% | WATER CONTENT% | % PASSING #200 SIEVE (88%) | LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

City of Miami - Hadley Park

1350 NW 50th Street, Miami, Dade County, FL

Subsurface Soil Profile A-A (West)

Miller Legg

PROJECT NO.: 3279	DATE: 2/12/2018	VERTICAL SCALE: 1"=2'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL
GM - SILTY GRAVEL
GP - POORLY GRADED GRAVEL
GC - CLAYEY GRAVEL
SW - WELL GRADED SAND
ML - LOW PLASTICITY SILT

ST - SHELBY TUBE
CL - LOW PLASTICITY CLAY
MH - HIGH PLASTICITY SILT
SM - SILTY SAND

RC - ROCK CORE
SP - POORLY GRADED SAND
SC - CLAYEY SAND
CH - HIGH PLASTICITY CLAY

PM - PRESSURE METER
OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS
OL - LOW PLASTICITY ORGANIC SILTS AND CLAY
PT - PEAT

WR - WEATHERED ROCK
PWR - PARTIALLY WEATHERED ROCK

- FILL
- POSSIBLE FILL
- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL
ASPHALT
GRAVEL
CONCRETE
VOID

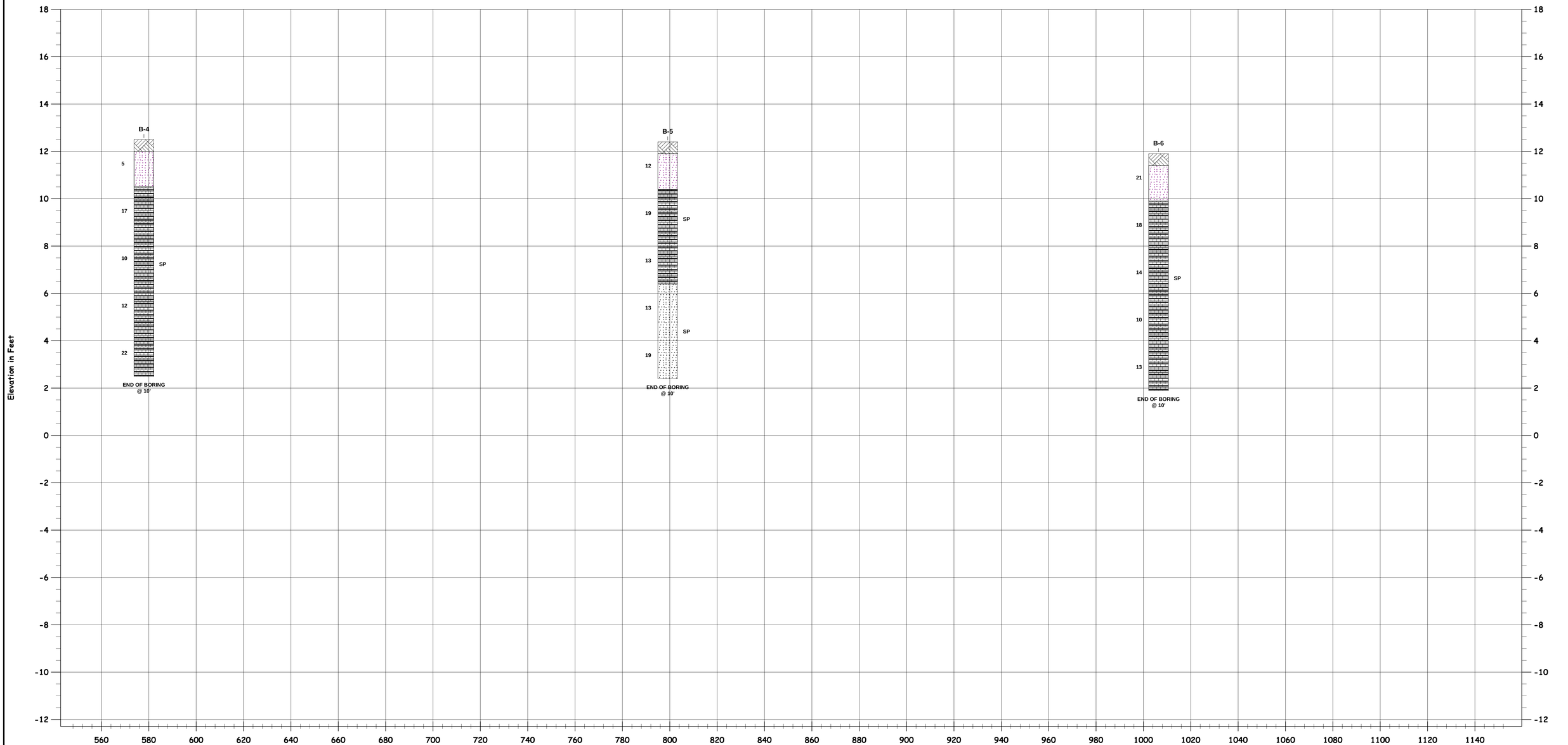
ROCK TYPES

IGNEOUS
METAMORPHIC
SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING
WATER LEVEL - SEASONAL, HIGH WATER
WATER LEVEL - AFTER CASING REMOVAL
WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% | WATER CONTENT% | % PASSING #200 SIEVE (88%) | LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

City of Miami - Hadley Park

1350 NW 50th Street, Miami, Dade County, FL

Subsurface Soil Profile A-A (West)

Miller Legg

PROJECT NO.: 3279	DATE: 2/12/2018	VERTICAL SCALE: 1"=2'

Job No.: 25:3279
Exfiltration Location: E-1
Test Date: 1/17/2018

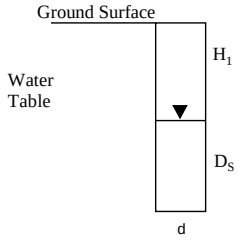
EXFILTRATION LOG
City of Miami - Hadley Park
CONSTANT HEAD OPEN HOLE TEST

SOIL PROFILE:

Depth (Feet)			Description
0.0	to	4.0	(Possible Fill) SAND, Trace Weathered Limestone Fragments
4.0	to	8.0	(Possible Fill) SAND WITH SILT, Weathered Limestone Fragments
8.0	to	15.0	WEATHERED LIMESTONE

15 ft Total Exfiltration Depth
10 ft Groundwater Depth Below Existing Grade

CALCULATIONS:



0.67	d	= Diameter of Casing (ft)
10	H	= Depth to Water Table (ft)
5	D_s	= Saturated Hole Depth (ft)
13.9	W	= Water added during test interval (Gal)
0	t_1	= Time at Start of Test (sec)
600	t_2	= Time at End of Test (sec)

K = Hydraulic Conductivity (cfs/ft^2 -ft. head)

$$K = \frac{4*Q}{\pi * d(2H^2 + 4H * D_s + H * d)} = \underline{\mathbf{1.5E\text{-}05}}$$

Job No.: 25:3279
Exfiltration Location: E-2
Test Date: 1/17/2018

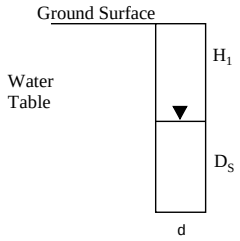
EXFILTRATION LOG
City of Miami - Hadley Park
CONSTANT HEAD OPEN HOLE TEST

SOIL PROFILE:

Depth (Feet)			Description
0.0	to	2.0	(Possible Fill) SAND, Trace Weathered Limestone Fragments
2.0	to	4.0	(Possible Fill) SAND
4.0	to	10.0	WEATHERED LIMESTONE

15 ft Total Exfiltration Depth
9.5 ft Groundwater Depth Below Existing Grade

CALCULATIONS:



0.67	d	= Diameter of Casing (ft)
9.5	H	= Depth to Water Table (ft)
5.5	D_s	= Saturated Hole Depth (ft)
14	W	= Water added during test interval (Gal)
0	t_1	= Time at Start of Test (sec)
600	t_2	= Time at End of Test (sec)

K = Hydraulic Conductivity (cfs/ft^2 -ft. head)

$$K = \frac{4*Q}{\pi * d(2H^2 + 4H * D_s + H * d)} = \underline{\mathbf{1.5E\text{-}05}}$$

APPENDIX C – Laboratory Testing

Laboratory Test Results Summary

ECS Florida, LLC
West Palm Beach, FL
Laboratory Testing Summary

Printed on: February 2, 2018

Project Name: City of Miami - Hadley Park

Project No.: 25:3279
Project Engineer: Lucrèce E. Regisme **Principal Engineer:** Jose N. Gómez, I **Summary By:Lacey M. Bland**

Boring Number	Sample Number	Depth (feet)	Soil Type [1.]	MC (%) [2.]	Atterberg Limits [3.]			Percent Passing No.200 Sieve[4.]	Moisture - Density Correlation [5.]		LBR Value (%) [6.]	OC (%) [7.]	Grain Size Analysis [8.]	Corrosion Series			
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)				Ph [9.]	Resisitivity [10.]	Chlorides [11.]	Sulphates [12.]
B-2	S-2	3.00-5.00	SP-SM					14.2									
B-8	S-4	4.00-8.00	SP-SM					11.5									

Notes: 1. ASTM D 2487, 2. ASTM D 2216, 3. ASTM D 4318, 4. ASTM D 1140, 5. ASTM D 1557-12, 6. FM5-515, 7. D2974 − 14
Definitions: MC: Moisture Content, Soil Rypes: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit. PI: Plasticity Index, LBR: Limerock Bearing Ratio, OC: Organic Content (ASTM D 2974)

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. Sheeting 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 UTILTY 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	COHESIONLESS SOIL
Under slabs and pavement	95%
Under walk areas, top 12 inches	95%
Under walk areas, below top 12 inches	90%
Under landscape areas	85%
Under other areas noted on Site Plan	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 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 by 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 form 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 lighting 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 of 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 Marcelled 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 leafs 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, fy = 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 specifed.

C. Line Post Size Schedule.

Height above grade	6 & 8 ft	4 ft
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.

Height above grade	6 & 8 ft	4 ft
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.

Gate leaf width	4-1 to 8 ft	up to 4 ft
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: Marcelled 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.

Gate leaf width	4-1 to 8 ft	4 ft or less
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 50º 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 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) Zl33.1 – 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 Zl33.1.

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

B. requirements.

C. B. The sod supplier shall certify on the invoice that the sod product is Floratam St.

D. 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 s ections 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. Confrim 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 Fianl 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, anc 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.
   g. 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. Princept 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 ony 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 betwwen 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 ½” 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 horticultrual strapping guys evenly spaced.
   c. Anchor each horticutural strap to one, capped #4 rod, 18” long, driven at a 45 degree agle 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 equlateral 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. 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". Excludeexterior 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 32 12 16 ASPHALT PAVING
PART 1 GENERAL

1.1 SUMMARY

A. Provide hot-mixed asphalt paving for asphalt paths.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Test Reports: Submit for review test reports.

1.3 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of approved manufacturers that have been in satisfactory use in similar service for three years. Use experienced and certified installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Construction Tolerances: Limerock Base Course Thickness: 4” minimum; LBR 100. Surface Course Thickness: 1”. Base Course Surface Smoothness: Within 1/4”. Surface Course Surface Smoothness: Within 3/16”. No ponding is allowable. Crowned Surfaces: Within 1/4” from template.

PART 2 PRODUCTS

2.1 MATERIALS

A. Hot-Mixed Asphalt Paving: Application: Paths. Asphalt-Aggregate Mixture: Plant-mixed, hot-laid asphalt-aggregate mixture, Type S-III
ASTM D 3515, complying with FDOT and DPW regulations. Prime Coat: Cut-back asphalt, ASTM D 2027. Tack Coat: Emulsified asphalt, ASTM D 977. Herbicide Treatment: EPA registered chemical for weed control.

PART 3 EXECUTION

3.1 INSTALLATION

A. Asphalt/Aggregate Mixture Type S-III, one lift: Comply with FDOT or DPW Standard Specifications for Highways and Bridges. Class as required by loading and use.

B. Remove loose material from compacted subbase. Proof roll and check for areas requiring additional compaction. Report unsatisfactory conditions in writing. Beginning of work means acceptance of subbase.

C. Apply prime coat to prepared subbase. Apply tack coat to previous laid work and adjacent in-place concrete surfaces.

D. Place asphalt concrete at minimum temperature of 225 degrees F in strips not less than 10' wide overlapping previous strips. Complete entire base course before beginning surface

course.

E. Begin rolling when pavement can withstand weight of roller. Roll while still hot to obtain maximum density and to eliminate roller marks.

F. Test in-place asphalt work for thickness and smoothness. Remove and replace defective work and patch to eliminate evidence of patching.

END OF SECTION

SECTION 32 18 23.29
SYNTHETIC FIELD SPORT SURFACING

PART 1 GENERAL

1.1 SUMMARY

A. Provide synthetic turf athletic surface system.

B. Furnish labor, materials, tools and equipment necessary to install monofilament artificial grass FieldTurf or approved equal, as indicated on the plans and as specified; including components and accessories required for a complete installation including an acceptance of prepared sub-base.

Coordinate with related trades to ensure a complete, integrated, installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.

1.2 REFERENCE STANDARDS

A. FM Factory Mutual

1. P7825 - Approval Guide; Factory Mutual Research Corporation; current edition

B. ASTM – American Society for Testing and Materials.

1. D1577 - Standard Test Method for Linear Density of Textile Fiber
2. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
3. D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering
4. D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
5. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
6. F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
7. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
8. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
9. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
10. F2117 – Standard Test Method for Vertical Rebound Characteristics of Sports Surface Systems: Acoustical Measurements (Soccer)
11. BS7044, Section 2.2 Methods for Determination of Person/Surface Interaction Method 1: Determination of Traction (Rotational Resistance)
12. F1551-03 Suffix: DIN 18-035, Part 6: Water Permeability of Synthetic Turf Systems
13. ASTM F355-10, Procedure A: Testing Services Inc test number TSI 1202

1.3 SUBMITTALS

A. Comply with Submittals Procedures. Submit for approval before fabrication.

B. Shop Drawings:

1. Indicate field layout; field marking plan and details for the specified sports; i.e., NCAA Football; roll/seaming layout; methods of attachment, field openings and perimeter conditions.
2. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
3. Provide joint submission with related trades when requested by Architect.

C. Product Data:

1. Submit manufacturer's catalog cuts, material safety data sheets, brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
3. Submit data in sufficient detail to indicate compliance with the contract documents.
4. Submit manufacturer's instructions for installation.
5. Submit manufacturer's instructions for the care and maintenance of the synthetic turf system, including painting and markings.

D. Samples: Submit samples, 9 x 12 inches, illustrating details of finished product.

E. Product Certification:

1. Submit manufacturer’s certification that products and materials comply with requirements of the specifications.
2. Submit test results indicating compliance with Reference Standards.

F. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Specifications, General Requirements.

G. List of existing installations: Submit list including respective Owner’s representative and telephone number.

H. Warranties: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.

I. Submit Bills of Lading/Material Delivery Receipts for synthetic turf infill materials. Bills of lading shall bear the name of the project/delivery address, quantity of materials delivered, source/location of origin of infill materials and/or manufacturer, and date of delivery.

J. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:

1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.
2. Primary & Secondary Backing Weights, ASTM D5848.
3. Tuft Bind, ASTM D1335.
4. Grab Tear Strength, ASTM D1682 or D5034.
5. Water Permeability, ASTM D4491

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The turf contractor and the turf manufacturer:

1. Experienced in the manufacture and installation of infilled spined and ridged

monofilament grass system for a minimum of three years. This includes use of a spined and ridged monofilament fiber, backing, the backing coating, and the installation method.

2. Manufacturer must own and operate its own manufacturing plant. Manufacturing the fiber, tufting of the field fibers into the backing materials and coating of the turf system must be done in-house by the turf manufacturer.
3. Manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.
4. Must have 500 fields in play for at least two years with a spined and/or ridged monofilament fiber. Fields 65,000 ft² or more.
5. Must have a minimum of 500 fields that are at least 8 years old, which is equal to the respective warranty period.
6. Must have a minimum of 60 installations in the State/Province of Florida.
7. Must have a minimum of 1 FIFA 2-Star recommended field in North America.
8. Must have a minimum of 5 NFL game and/or practice fields in play for the previous year.
9. Must have minimum of 50 NCAA Division 1 game and/or practice fields installed for (football or soccer).
10. Must have a minimum of 1000 installations in North America, each of 65,000 ft² or more. Fields 65,000 ft² or more of the specified infill material and a spined and/or ridged monofilament fiber.
11. Must provide third party certification confirming minimum requirement of 9 lbs tuft bind.
12. Must provide third-party laboratory testing proving heat reduction qualities of the same infill used in the proposed turf system.

B. Installer: Company must specialize in performing the work of this section. Provide competent workmen skilled in this specific type of synthetic grass installation.
   1. The designated Supervisory Personnel on the project certified, in writing by the turf manufacturer, as competent in the installation of specified monofilament material, including sewing seams and proper installation of the infill mixture.
   2. Installer certified by the manufacturer and licensed.
   3. The installer supervisor must have a minimum of 5 years' experience as either a construction manager or a supervisor of synthetic turf installations.

C. Pre-Installation Conference: Conduct conference at project site at time to be determined by Owner. Review methods and procedures related to installation including, the following:
   1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
   2. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, The Owner's representative, and the Architect.

D. The Contractor must verify special conditions required for the installation of the system.

E. The Contractor must notify the Owner of discrepancies.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 60 00, Product Requirements.
B. Prevent contact with materials that may cause dysfunction.
C. Deliver and store components with labels intact and legible.
D. Store materials/components in a safe place, under cover, and elevated above grade.
E. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
F. Inspect delivered materials and products to ensure they are undamaged and in good condition.
G. Comply with manufacturer's recommendations.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate the Work with installation of work of related trades as the Work proceeds.
B. Sequence the Work in order to prevent deterioration of installed system.

1.7 GUARANTEE

A. The Contractor shall provide a guarantee to the Owner that covers defects in materials and workmanship of the turf for a period of eight years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's guarantee include general wear and damage caused from UV degradation. The guarantee must specifically exclude vandalism, and acts of God beyond the control of the Owner or the manufacturer. The fully third party insured; pre paid for the entire 8 year term and be non-prorated. Owner must provide a warranty to the Owner that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and written directives of the manufacturer's representative. Before final payment for the synthetic turf, submit to owner notification in writing that the field is officially added to the annual policy coverage, guaranteeing to the Owner. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:

1. Pre-Paid 8-year insured warranty.
2. Insured Warranty Coverage must be provided in the form of 1 single policy.
3. Maximum per claim coverage amount of $32,000,000.
4. Minimum of $32,000,000 annual aggregate.
5. Must cover full 100% replacement value of total square footage installed, minimum of $7.00 per sq ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
6. Policies that include self insurance or self retention clauses will not be considered.
7. Policy cannot include form of deductible amount.

8. Sample policy must be provided at time of bid to prove that policy is in force. A letter from an agent or a sample Certificate of Insurance will not be acceptable.

C. The artificial grass system must maintain a G-max of less than 200 for the life of the Warranty as per ASTM F1936.

1.8 MAINTENANCE SERVICE

A. Train the Owner's facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.

B. Manufacturer must provide maintenance guidelines and a maintenance video to the facility maintenance staff.

PART 2 PRODUCTS

2.1 MATERIALS

A. Synthetic turf Athletic Surfacing Systems:

Manufacturer: FieldTurf USA Inc or approved equal
175 N. Industrial Blvd
Calhoun, GA 30701
P: 800-724-2969

Application: Multiuse practice field.

Type: Monofilament Synthetic Turf Model: FieldTurf Revolution 360 CoolPlay

2.2 MATERIALS AND PRODUCTS

A. Artificial grass system materials shall consist of the following:

Carpet made of “spined and/or ridged” monofilament polyethylene fibers tufted into a fibrous, non-perforated, porous backing.

Infill: Controlled mixture of graded sand and cryogenic rubber crumb that partially covers the carpet. A top infill layer of granulated cork is mandatory.

Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass monofilament.

B. The installed artificial grass monofilament shall have the following properties:

Standard	Property	Specification
ASTM D1577	Fiber Denier	10,800
	HALS UV Stabilizer	10,000ppm
	Inner Face Support Ridges	≥6
	Outer Face Support Ridges	≥10
ASTM D5823	Pile Height	2 ¼ inch
ASTM D5793	Stitch Gauge	¾ inch
ASTM D5848	Pile Weight	40oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	61+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+ lbs

ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM D4491	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Infill Material Depth	1.5 inches
	Sand Infill Component	6.2lbs/square foot
	SBR Rubber Infill Component	1.8lbs/square foot
	Granulated Cork Component	0.2lbs/square foot
	Total Product Weight	1238oz/square yard

C. Carpet: spined and/or ridged monofilament fibers tufted into a primary backing with a secondary backing.

D. Carpet Rolls 15 foot wide rolls.
   Rolls long enough to go from field sideline to sideline.
   Where the playing field is for football, the perimeter white line tufted into the individual sideline rolls.

E. Backing:
   Primary backing: a double-layered polypropylene fabric
   Secondary backing: an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.
   Perforated (with punched holes), backed carpet are unacceptable.

F. Fiber 10,800 denier, low friction, and UV-resistant fiber measuring not less than 2 ¼ inch high.
   Systems with less than a 2 ¼ inch fibers are unacceptable.

G. Infill materials approved by the manufacturer.
   Infill a resilient layered granular system, comprising selected and graded sand and cryogenically hammer-milled SBR rubber crumb with a top layer of granulated cork.
   Artificial Grass products without cryogenically processed SBR rubber and a top layer of granulated cork will not be acceptable.
   The sand component of the infill must represent a minimum of 51% or more of the total infill, by weight.
   Granulated cork must be pre-washed by the cork supplier before arrival at the field(s).
   Granulated cork must have a bulk density of 0.19 g/cm3 +/- 15%.

H. The sand infill must comply within the following characteristics:

1. Average Particle size between 20 and 30 mesh [calculated based on summing the midpoint of sieve pan fractions times the % retained on given screen fractions]

2. Average Particle shape > 0.4 on the Krumbein scale

3. Particle structure predominantly single grain

4. Produce < 0.4%, -50M in API crush test at 80psig

I. Non-tufted or inlaid lines and markings painted with paint approved by the synthetic turf manufacturer.

J. Thread for sewing seams of turf as recommended by the synthetic turf manufacturer.

K. Glue and seaming fabric for inlaying lines and markings as recommended by the synthetic turf manufacturer.

2.3 QUALITY CONTROL IN MANUFACTURING

A. The manufacturer must own and operate its own manufacturing plant. Manufacturing the fiber, tufting of the field fibers into the backing materials and coating of the turf system must be done in-house by the turf manufacturer. Outsourcing of these major processes is unacceptable.

B. The manufacturer must have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.

C. Primary backing inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.

D. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.

E. The manufacturer's full-time, in-house, certified inspectors must perform turf inspections at levels of production including during the tufting process and at the final stages before the turf is loaded onto the truck for delivery.

F. The manufacturer must have its own, in-house laboratory where samples of turf are retained and analyzed, based on standard industry tests, performed by full-time, in- house, certified inspectors.

G. The manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.

2.4 QUALITY CONTROL IN FIBER MANUFACTURING

A. The master batch formula must include a UV stabilizer package added to its polymer base.

B. The LLDPE used to make the artificial grass fiber must to be "C6" LLDPE.

C. UV protection must include: (1) primary antioxidants; (2) secondary antioxidants; and

(3) UV stabilizers.

D. Each finished fiber must have at least 6 inner face support ridges and 10 outer face support ridges.

2.5 FIELD GROOMER & SWEEPER

Deliver to the Owner:

1. Field Groomer shall include a towing attachment compatible with a field utility vehicle.
2. Field Sweeper shall include a towing attachment compatible with a field utility vehicle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-base leveling is complete before installation.

B. Examine the surface to receive the synthetic turf and accept the sub-base planarity in writing before installation.

1. Acceptance is dependent upon the Owner's test results indicating compaction and planarity are in compliance with manufacturer's specifications.
2. The surface accepted by Installer as "clean" as installation commences and maintained in that condition throughout the process.

C. Compaction of the aggregate base 95%, in accordance with ASTM D1557 (Modified Proctor procedure); and the surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-½ inch from design grade.

D. Correct conditions detrimental to proper completion of Work.

E. Do not proceed until unsatisfactory conditions are corrected.

F. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Before the beginning of installation, inspect the sub-base for tolerance to grade.

B. Sub-base acceptance subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.

C. Verify dimensions of the field and locations for markings measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements made.

D. When requested by Architect, installed sub-base tested for porosity before the installation of the monofilament turf. A sub base that drains poorly is an unacceptable substrate.

3.3 INSTALLATION – GENERAL

A. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake cutting, sewing, gluing, shearing, topdressing or brushing operations.

B. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.

C. Designs, markings, layouts, and materials must conform to currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic grass installation.

3.4 INSTALLATION

A. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.

B. Install carpet rolls directly over the properly prepared aggregate base. Extreme care taken to avoid disturbing the aggregate base, both in regard to compaction and planarity.
   1. Repair and compact disturbed areas of the aggregate base as recommended by manufacturer.

C. Full width rolls laid out across the field.
   1. Turf of sufficient length to permit full cross-field installation from sideline to sideline.
   2. No cross seams will be allowed in the main playing area between the sidelines.
   3. Each roll attached to the next roll utilizing standard art sewing procedures.
   4. When the rolls of the playing surface have been installed, the sideline areas installed at right angles to the playing surface.

D. Artificial turf panel seams sewn along the selvedge edging flap of the turf roll. Seams secured by other means including gluing are unacceptable. Installation 99% sewn.
   1. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in logos or inlaid lines as required by the specifications.
   2. Seams flat, tight, and permanent with no separation or fraying.
   3. In the case of lines and logos, turf carpet/field fibers must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.

E. Infill Materials:

1. Infill materials applied in numerous thin lifts. The turf brushed as the mixture is applied. The infill material installed to a depth determined by the manufacturer.
2. Three-layered infill installed in a systematic order.
3. Infill materials installed to fill the voids between the fibers and allow the fibers to remain vertical and non-directional. The Infill installation consists of a base layer of sand followed by a homogenous mixture of the sand and the cryogenically processed rubber. A final application of specifically sized granulated cork completes the system. The Infill installed to the depth of 1 ½ inch. Infill density consist of no more than 6.2 pounds of sand, 1.8 pounds of rubber, and 0.2lbs or cork per square foot. The Infill placed so that there is a void of ¾ inch to the top of the fibers.

F. Non-tufted or inlaid lines and markings painted in accordance with turf and paint manufacturers' recommendations. Number of applications will be dependent upon installation and field conditions.

G. Synthetic turf attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.

H. Upon completion of installation, the finished field inspected by the installation crew and an installation supervisor.

3.5 BASE/DRAINAGE GENERAL SPECIFICATIONS

A. GENERAL

Comply with the installation procedures outlined under this section.

B. SUB-GRADE PREPARATION AND DESIGN

(e) Standard proctor on sub base layer[1]

(f) Soil unconfined compressive strength at different depths.[1]

[1]ASTM Test Method D2487

[1]ASTM Test Method C566

[1]ASTM Test Method D2434 or D3385

[1]ASTM Test Method D422

ASTM Test Method D698

1. The soil bed or sub-grade must have a minimum slope of 0.5% or more, depending on the soil analysis, from the longitudinal center of the field towards the sidelines.

2. The soil bed or sub-grade must be compacted in both directions to attain the specified compaction rate, which is generally 95% standard, Proctor.

3. The soil bed or sub-grade must be prepared to tolerances of not more than ½ inch from design grade to allow for even drainage.

4. After the existing sub-grade has been graded, contoured and sloped as required, it compacted using 10 ton vibrating roller, as close as possible to 95% Proctor density.

5. Install geo-textile fabric to cover the soil bed. A porous non-woven polypropylene stabilization fabric (Mirafi 140 NL, or equal). Place over the base aggregate overlapping the seams properly. Depending on the result of the soil analysis, a moisture barrier may be substituted for the permeable geo-textile liner. If a moisture barrier is to be installed, a minimum 20 mil thick.

D. INSTALLATION OF PERIMETER COLLECTORS

1. Excavate perimeter drainage collector trenches minimum 20 inch wide and 20 inch deep. The construct trenches with a minimum 0.5% slope.

2. Backfill and compact trenches to a minimum 95% of the maximum density.

3. Place fabric in the perimeter trench first. Install a separate fabric from the fabric on the field. Overlap field and trench liners at least 18 inch in the direction of runoff flow.

4. Overlap seams a minimum of eight inches. When overlapping fabric, lap in direction the runoff flows.

5. Weight down the fabric with ballast to prevent fabric movement by wind.

6. Perimeter Collector Pipe: Place 8-12 inch O.D corrugated, perforated plastic pipes in the collector trenches. Make the centerline of the pipe coincide with the centerline of the trench. Collector headers must be drained to an approved, storm sewer, or approved discharge outlet. Use pre-manufactured fittings for connections into the collector drainage network.

7. Install a minimum of 2 inch clean, drainable crushed stone aggregate placed in the bottom of the collector trenches, on top of the geotextile. The crushed aggregate must be compacted.

8. Place a minimum of 4 inch clean, crushed aggregate on the sides of the underdrain pipes and headers, and 6 inch minimum of the aggregate on top of the pipe network, compacted.

E. INSTALLATION OF THE PREFABRICATED COMPOSITE (FLAT) FIELD DRAIN SYSTEM

1. Install minimum 1 inch x 12 inch prefabricated under-drain system in herringbone design as shown on drawings with lines approximately 20 foot on center and connect to perimeter drains.

2. Install according to the manufacturer's specifications, 1 inch x 12 inch Horizontal Strip Drain (Horizontal Drain) by American Drainage Systems, or equal, prefabricated flat composite under drain lines to perimeter drain lines according the manufacturer's specifications.

3. Supply related materials.

4. Tape the under drains every 15 foot to the fabric using suitable tape.

5. Do not crush or otherwise damage the strip drains when applying aggregate.

F. INSTALLATION OF THE OPEN GRADE CRUSHED STONE BASE COURSE

1. The crushed base stone must be laid without damaging or disturbing the soil bed, geo- textile liner or membrane, or the underlying flat composite drains. Do not to create depressions in the sub-grade with heavy equipment. The specified stone or aggregate supplied must conform to the recommended specifications, as noted above. The finished crushed stone or aggregate base supplied must be stable and permeable. The stone damp when transported to site and kept damp during installation, to minimize segregation of the materials.

2. If the required compacted depth of the base course exceeds 6 inch, constructed in 2 or more layers or lifts of approximate equal thickness. Each layer must be compacted in both directions to attain the specified compaction rate.

3. The open graded aggregate base course must be sloped 0.5% from the center longitudinal axis towards the sidelines or as specified on the Plans.

4. The grade of the base course must not vary from the specified grade by more than ½ inch from design grade.

5. The base course must be compacted in both directions to attain the specified compaction rate, which is generally 95% standard, Proctor.

G. INSTALLATION OF THE CRUSHED STONE FINISHING LAYER

1. The final lift of aggregate layer must not be more than 2 inch deep.

2. The final lift material must be sloped 0.5% from the center longitudinal axis towards the sidelines unless otherwise specified.

3. The final grade must be compacted in both directions to attain the specified compaction rate, of 95% standard.

4. The final grade of the finishing stone must not vary from the specified grade by more than ¼ inch from design grade, nor by more than ¼ inch when measured under a 10 foot straightedge, in directions. Laser guided fine grading is mandatory. This tolerance is required over the entire field. Check the tolerance-to-grade by means of an orbital laser once the stone is fine graded and compacted to proper density. The turf installation company must not begin work until the base has been tested for compaction, tolerance to grade, and porosity.

3.6 FIELD MARKINGS

A. Field markings installed in accordance with approved shop drawings. If football is designated as the primary sport, five yard lines will be tufted-in.

B. Balance of sports markings will be inlaid or painted in accordance with the Drawings.

C. Center field logo either painted or inlaid according to artwork indicated on Drawings and in accordance with manufacturer's standard palette of turf colors.

D. End-zone letters and logos either painted or inlaid according to artwork and fonts indicated on the Drawings, and in accordance with manufacturer's standard palette of turf colors.

3.7 FIELD MAINTENANCE – ALTERNATE

A. Perform regularly scheduled periodic maintenance twice per year. The maintenance will include a complete inspection and repair including materials and cleaners of areas of the field including: Fiber fibrillation analysis, Seam analysis, Perimeter anchoring, Excessive wear analysis, UV fade inspection, Infill – consistency in depth, Infill – migration analysis, Glued inlay analysis, Base stability analysis, Painted marking inspection, Debris removal, Brushing, Aerating, Grooming, Removal of weeds and moss, Removal of stains, Keeping the infill level.

B. The inspection and maintenance will be performed by a FieldTurf Authorized Maintainer, if the person is not the same as the previous visit, then credentials must be submitted for approval before the visit.

C. Approximate number of times is 2 times per year for 8 years through the warranty period.

3.8 ADJUSTMENT AND CLEANING

A. Do not permit traffic over unprotected surface.

B. zprovide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.

C. Usable remnants of new material is the property of the Owner.

D. Keep the area clean throughout the project and clear of debris.

E. Surfaces, recesses, enclosures, and related spaces cleaned as necessary to leave the work area in a clean, immaculate condition ready for occupancy and use by the Owner.

3.9 PROTECTION

A. Protect installation throughout construction process until date of final completion.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 -GENERAL

1.01 RELATED WORK:

A. Temporary water supply for construction - Division l:
B. Temporary toilet facilities for construction -Division 1.
C. Fire protection during construction - Division 1.
D. Fire protection - Section l5300.

l.02 SCOPE:

A. Work required under this section consists of furnishing interior plumbing work and related items to provide and erect a complete working system in accordance with the contract documents to a location as indicated on the drawings.

l.03 A COMPLETE WORKING SYSTEM:

A. Shall be one in which all materials and equipment have been assembled together, cleaned, tested, balanced and guaranteed permitting its immediate functioning thereof.

l.04 SHOP DRAWINGS:

A. Method of submittal shall be as specified in Division l, General Requirements.

1.05 RECORD DRAWINGS:

A. Submit as-built drawings as called for in Division l, General Requirements.

l.06 QUALITY ASSURANCE:

A. Equipment, devices, accessories, products, fixtures, etc., where specified by make or catalog number shall be interpreted as establishing a standard of quality. Equipment of equal quality, design and function may be submitted to the Architect-Engineer for review as per Division l, General Requirements.
B. All equipment, accessories and products shall be:
   l. The standard product of approved manufacturers, substantiated by previously published data.
   2. Essentially duplicate equipment and materials that have been in satisfactory use for a period of no less than two years.
   3. The best quality available in each specified type or class, new and free from defects in manufacture or performance.
   4. Equipment or materials of the same type or class shall be the product of a single manufacturer regardless of location within the system.
   5. Each system component shall be installed in strict accordance with manufacturer's recommendations for the specific service conditions.
   6. Permanently marked with manufacturer's identification showing:
      a. Manufacturer
      b. Capacity
      c. Service rating
      d. Type, grade or class of each item as applicable
      e. Certification or approval if applicable.

7. Manufactured in compliance with the latest standards, methods, techniques and codes applicable at the time of bidding.

C. All field fabrication or equipment assembly shall be performed be certified labor in its trade, per manufacturer's recommendations or as herein specified or shown on contract drawings.

I.07 CLEANING AND ADJUSTING:

A. Clean fixtures, equipment, piping and exposed work. Show traps, wastes, supplies free and unobstructed. Plated, polished bronze or painted surfaces bright and clean.

B. After installation adjust valves, faucets and automatic control devices for quiet operation. Balance system as required for proper operation.

PART 2 - (NOT USED)

PART 3 - (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 15 – Mechanical.

END OF SECTION

SECTION 15410

PIPING (PLUMBING)

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Piping for plumbing work.

1.02 RELATED SECTIONS:

A. Mechanical General Provisions - Section 15010.
B. Flashing and Sheet Metal - Section 07600.
C. Laboratory Equipment - Section 11600.
D. Valves, Cocks and Faucets (Plumbing) - Section 15430.
E. Plumbing Equipment - Section 15450.

1.03 SUBMITTALS:

A. Submit properly identified manufacturer's product data.
B. Submit shop drawings on the following:
   1. Pipe and Fittings: Manufacturer's name and mill reports.
   2. Expansion Joints: Catalog cuts.
   3. Dielectric Unions: Catalog cuts.

PART 2 -PRODUCTS

2.01 MATERIALS:

A. Materials shall be new, unused and best of their respective kinds, free from defects in workmanship, in conformance with latest publications in force at time of bidding and as specified and/or shown on drawings.
B. Copper Tubing:
   1. Type K or L: Seamless hard drawn or annealed, ASTM B88.
   2. Type DWV: Seamless hard drawn, ASTM B306.
C. Polyvinyl chloride Pipe (PVC):
   1. Threaded: Schedule 80, ASTM D2665.
   2. Non-Threaded: Schedule 40, ASTM D2665.
D. Solder Metal: 95-5 Sn-Sb (tin-antimony Grade 95TA) ASTM B32.
E. Joint Compound: Tite-Seal or accepted equivalent.
F. Vent Flashing: Provide lead flashing for vents through the roof for installation as specified in Roofing Section.

PART 3 -EXECUTION

3.01 INSTALLATION:

A. Run piping as indicated on drawings subject to modifications as required to suit field conditions, to avoid interference with other trades and for proper, convenient and accessible location of all parts of the piping system.
B. Run piping in wall chases, recesses, pipe shafts and hung ceilings where provided.
   1. Do not run gas or water piping in floor fill.
   2. Run piping as high as possible under building, above ceilings and close to slabs.

3. Do not permanently close up, fur in or cover piping before examination and final tests.

C. Run piping straight and where concealed as direct as possible with risers erected plumb and true.
   1. Install piping with minimum 1-inch clearance between finished pipe coverings and adjacent work.
   2. Support piping from structure above, maintaining maximum headroom available at all times.

D. Do not run piping in telephone rooms, electrical equipment rooms and/or closets, transformer vaults or in rooms containing related equipment, or close to or above control panels, switchboards and electric motors except for required branch piping to pumps. If pipes are installed in these rooms they shall be relocated at no extra cost to Owner.

E. Provide control valves where noted or required for complete regulating control of all system, plumbing fixtures and equipment.
   1. Provide valves in accessible locations or with access panels thereto.

F. Fittings, Valves and Hangers on Chrome Plated Piping:
   1. Chrome plated finish to match.

G. Provide reducing fittings for changes in pipe sizes.
   1. Bushings will not be permitted.

H. Provide extra heavy pipe for nipples where unthreaded pipe is less than 1-1/2 inch.
   1. Do not use close nipples; use shoulder nipples.
   2. Provide galvanized iron sleeves for pipes passing through roof slabs, interior floors, ceilings, walls and/or partitions.

I. Expansion Swings:
   1. Make adequate provisions for proper expansion and contraction of piping and for piping passing through building expansion joints.
   2. Make branch connections from risers with ample swing or offset to avoid strain on fittings or short pipe lengths. Anchor horizontal runs of pipe over 50 feet in length to walls or supporting structure about midway of run to allow expansion evenly divided toward ends.
   3. Provide sufficient number of elbow swings or accepted expansion joints to allow proper expansion and contraction of mains and risers.

J. Pipe Grades:
   1. Lay horizontal soil and waste pipes and storm drainage pipes to ¼ or 1/8 inch per foot grade according to size/code unless otherwise noted on drawings.
      a. Horizontal vent lines shall have a minimum grade back to the stacks and/or vertical lines and shall run as direct and free from bends as possible.

      b. Lay underground piping on clean sand be 2 inches cover minimum under slabs. 12 inches cover minimum outside.

3.02 PIPING MATERIALS BY SYSTEM:

A. Sanitary Soil and Waste Piping:
   1. PVC drainage pipe Schedule 40 with socket fittings.

B. Domestic Water Supply Piping:
   1. Above Ground: Copper tubing type L with bronze or wrought copper solder joint fittings.
   2. Underground: Type K soft tempered copper with cast bronze or soldered joint fittings.

C. Condensate Drainage Piping:
   1. Above ground: DWV copper pipe with cast brass or wrought copper solder joint drainage fittings.
   2. Underground: PVC drainage pipe Schedule 40 with socket fittings.

3.03 PIPE CLEANING SYSTEMS:

A. Domestic Water Piping: Flush clean domestic water distribution systems for cold water before placing in service.

3.04 TESTS:

A. Furnish necessary instruments, test equipment and personnel required to perform tests and remove test equipment and drain pipes after tests have been made and accepted.
B. After portions of mechanical work are completed and ready for testing, give 48 hours notice to Project Architect and perform tests in his/her presence.
C. Test(s) may be made of isolated portions of such piping as will facilitate the general progress of installation.
   1. Any revisions subsequently made in piping system shall require re-testing of such affected portions of piping systems.
   2. Subject piping and connections to a hydrostatic or pneumatic pressure test prior to painting, installation of insulation or concealment.
   3. Sanitary:
      a. Apply a water test to all parts of drainage systems before pipes are concealed or fixtures set in place.
      b. Close openings of each system to be tested tightly except highest openings above roof and fill entire system with water up to overflow point of highest opening.
      c. Subject all parts of systems to not less than ten feet of hydrostatic head, except uppermost ten feet of piping directly below opening.
         1) Water shall remain in the systems for not less than 60 minutes after which time no leaks occur at any point and no lowering of water level at overflow point is visible.
   4. Water Supply Piping:
      a. Apply a pressure test to all parts of water system before piping is concealed or insulated and before fixtures and equipment are connected.
      b. Apply a hydrostatic pressure of not less than 200 psig for a period of two hours, with no leaks occurring at any point in the system.

         1) Water used for tests shall be obtained from a potable source of supply.

3.05 CLEANING AND ADJUSTING:

A. Clean fixtures, equipment, piping and exposed work.
   1. Show traps, wastes and supplies free and unobstructed.
   2. Plated, polished bronze or painted surfaces bright and clean.
B. After installation adjust valves, faucets and automatic control devices for quiet operation.
   1. Balance system as required for proper operation.

3.07 DISINFECTION:

A. After cleaning and testing domestic water system, disinfect by introducing a solution of calcium hypochlorite with 50 parts per million of chlorine.
   1. Open and close all valves while system in being chlorinated. After disinfecting agent has been applied for 24 hours, test for residual chlorine at ends of pipe.
   2. If less than 5 ppm is indicated, repeat process until it is equal to or greater than 5 ppm or in accordance with AWWA C601 Standards.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 15 – Mechanical.

END OF SECTION

SECTION 15421

DRAINS, FLOOR SINKS AND CLEANOUTS

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Drains, floor sinks and cleanouts.

1.02 RELATED SECTIONS:

A. Mechanical General Provisions - Section 15010.
B. Joint Sealers - Section 07900.
C. Piping (Plumbing) - Section 15410.

1.03 SUBMITTALS:

A. Submit properly identified manufacturer's product data for approval before commencing work.
B. Submit Shop Drawings on the Following:
   1. Drains: Catalog cuts.
   2. Floor Sinks: Catalog Cuts.
   3. Catalog cuts.

PART 2 -PRODUCTS

2.01 DRAINS, FLOOR SINKS AND CLEANOUTS (INCLUDING CLEANOUT ACCESS COVERS):

A. Model Numbers are taken from Josam.
   1. Wade and Zurn will be acceptable if they meet all requirements specified herein.
B. Drains:
   1. Shower Stall: Coated cast iron floor drain, two piece body, double drainage flange, invertible non-puncturing flashing collar, weep holes, bottom outlet-inside caulk connection and adjustable satin Nikaloy 6" x 6" super-flo strainer, Josam 30,000-S Series.
   2. Toilet Room: Same as Shower Stall above except for option -50 (Trap Primer).
   3. Mechanical Equipment Room: Josam 32120-50 series modular coated cast iron floor drain with double drainage flange, non-puncturing flashing collar, weepholes, bottom outlet inside caulk connection, round top, removable shallow sediment bucket, trap primer connection, and medium duty anti-tilting super-flo grate with perimeter drainage slots.
   4. Kitchen: Josam 49020-55 series floor sink with trap primer, Jiffie-joint connection, acid-resisting porcelain enameled interior, double drainage flange, weep holes, bottom outlet inside caulk connection, aluminum internal dome strainer, Nikaloy sanitary sloped rim, and Nikaloy anti-tilting 12" x 12" super-flow grate.

   5. Roof: Josam 21000-11-22-Z series coated cast iron roof drain with sealing gasket, large cast iron locking dome, non-puncturing clamp ring with internal gravel stop, adjustable top with wide roof flange, large sump with anchor flange and bottom outlet inside caulk connection.
   6. Mechanical Pent-house: Josam 24000 50-Z coated cast iron with round heavy-duty anti-tilting Nikaloy grate with perimeter drainage slots, medium sump and bottom outlet inside caulk connection.

7. Area Drain: Josam 354709-3 coated cast iron floor sump with double drain age flange, weepholes, bottom outlet inside caulk connection, square top, medium duty grate, and sediment bucket. If drain occurs over occupied area use option (41) flashing clamp.
8. Area Drain: Josam 24000-Z coat cast iron with round heavy-duty anti-tilting grate with perimeter drainage slots, medium sump and bottom outlet.
9. Area Drain: Josam 36780-coated cast iron deep drain with double drainage flange, weep holes, side outlet hub connection, removable sediment bucket and heavy-duty hinged grate.
10. Trench: Josam WF65-2 square, satin Nikaloy strainer with composition decking flange, adapted for 3 1/2" I.P.S. thread.
11. Funnel Drain: Josam 30000-E3, coated cast iron, two-piece body, double drainage flange, flashing collar; weep holes, oval 9" x 4" funnel.
12. Rectangular Drain: Josam 30000 R with 5" x 13" strainer.
13. Can Wash: Josam 39220 coated cast iron, double drainage flange; weep holes, round top, removable deep sediment bucket, bronze adjustable spray nozzle.

C. Floor Sinks:
1. Kitchen: White, acid resisting epoxy body interior, lift-out basket with square frame and loose grate, Josam 49010 grates to be full, 1/2 or 3/4 as required, 3" pipe size.
2. Pulper Room: White, acid resisting epoxy body interior, with square frame and half grate, Josam 49010-3, 4" pipe size.
3. Extractor Equipment Room: Same as Pulper Room above, but without grate, Josam 49010-2, 4" pipe size.
4. Stainless Steel: Josam 48530, with No. 4 polished interior, weep holes, internal dome strainer square 12" x 12" grate.

D. Cleanouts and Cleanout Access Covers:
1. Floor, Interior Finished Rooms: Cast iron, adjustable inside caulk outlet, brass internal plug, Nikaloy scoriated cover plate secured by countersunk plug, Josam 56020-15.
2. Stack Base (For use in block walls): Cast iron "T" branch tee with plated cast iron countersunk plug, lead seal, satin stainless steel round access cover plate secured with countersunk screw, Josam 58790-15.
3. Stack Base For use in plasters walls: Cast iron "T" branch tee coated cast iron countersunk plug, lead seal, cast brass round access cover with anchor lugs, satin stainless steel cover secured with countersunk screw, Josam 58750-15.
4. Stack Base for use in tile walls: Cast iron "T" branch with brass countersunk plug, cast brass square access cover with satin top, anchor lugs, cover plate secured with four screws, Josam 58770-15.
5. Exterior, Heavy Duty: cast iron, inside caulk outlet brass internal plug, ductile iron scoriated heavy-duty cover, Josam 58440-15.

6. Cleanout Size: Full pipe size up through 4 inches, pipe cleanouts with bodies of standard pipe size and caulking ferrules conforming in thickness to that required for pipe and fittings of same metal.
7. Removable Cleanout Plugs:
   a. Brass with screw threads and to extend no less than 1/4 inch above pipe hub.
   b. Plugs shall have raised nut, except where flush with floor, then provide a recessed socket.

E. Wall Access:
1. Cast bronze, polished chrome plated square frame and cover, Josam 58640.
2. Size: 10" x 10" opening or larger, as required.

PART 3 -EXECUTION

3.01 INSTALLATION:

A. Cleanouts:
   1. Place pipe cleanouts at the foot of each soil and waste stack in sanitary system and place pipe cleanouts in horizontal runs not to exceed 50 foot spacing.
   2. Install access covers as specified hereinbefore.

B. Flush Cleanouts: Flush cleanouts with recessed sockets (without access covers) may be used in non-finished areas such as equipment rooms, storage rooms and the like, if top of hub is installed in level position and top of cleanout plug is flush with the concrete floor.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 15 – Mechanical.

END OF SECTION

SECTION 15440

PLUMBING FIXTURES, TRIM AND SUPPORTS

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Plumbing fixtures, trim and supports.

1.02 RELATED SECTIONS:

A. Mechanical General Provisions - Section 15010.
B. Piping Specialties (Plumbing) - Section 15120.
C. Piping (Plumbing) - Section 15410.
D. Valves, Cocks and Faucets (Plumbing) - Section 15430.
E. Piping Specialties (Plumbing) - Section 15435.

1.03 SUBMITTALS:

A. Submit properly identified manufacturer's product data for approval before commencing work.
B. Submit Shop Drawings on the following:
   1. Fixture Trim: Catalog cuts
   2. Faucets: Catalog cuts.
   3. Fixtures: Catalog cuts with rough-in dimensions.
   4. Carriers: Catalog cuts

1.04 QUALITY ASSURANCE:

A. Laboratory fixture trim and accessories shall be Kewaunee, T&S Fixtures, Water Saver Faucet Co., Chicago Faucets or accepted equivalent.
B. Plumbing: Fixtures shall be first quality vitreous china (unless specified otherwise) and trim first quality chrome plated brass. Models specified are American Standard; Kohler and Crane are equivalent. Flush valve models specified are Sloan; Delany and Watrous are equivalent. Toilet seats specified are Church; Olsonite, and Beneke are equivalent. Sinks specified are based on Elkay, others accepted where equivalent.

PART 2 -PRODUCTS

2.01 FIXTURES (Refer to Plumbing Fixture Schedule on Plans)

2.02 CARRIERS:

A. All carriers to be fully bolted to floor and installed as recommended by manufacturer.
B. Lavatory:
   1. Josam 17100-63 rectangular structural steel uprights with integral welded heavy steel foot. Cast iron concealed arms.
   2. Lavatory (Wheelchair) Josam #17100-63-67-65 rectangular structural steel uprights with the integral welded steel foot. Ductile iron concealed arms for wheelchair fixture.

C. Urinal:
Josam 17810-63 rectangular structural steel uprights with integral welded steel foot, hanger bracket, lower bearing plate.

D. Water Closets:
1. Horizontal: Josam 11674-1-2-7 left hand, single no-hub, with water pipe support, standard barrel, positioning frame and test cap.
2. Horizontal Double: Josam 11694-1-2-6 back-to-back, no-hub fitting, with single 2-inch vent no-hub, 2 fixture positioning frames, two test caps, two water supply pipe supports.
3. Vertical Double: Josam 11754-1-2-6 back-to-back, no-hub fitting with 4-inch branch inlet, 2 inch single no-hub vent, same side, two fixture-positioning frames, two test caps, two water supply pipe supports.
4. Josam 14104-1-6-2 single on stack, 4-inch waste, 2-inch vent, standard barrel, positioning frame, test cap, pipe support.
5. Josam 11724-1-6-2 back-to-back, 2-inch vent, standard barrel, positioning frame, test cap, pipe support.
6. Wheelchair: Use option -35 for high rough support on any of the above.

PART 3 -EXECUTION

3.01 EQUIPMENT AND FIXTURE CONNECTIONS:

A. Provide necessary material and labor to connect fixtures and equipment having plumbing connections including fixtures and equipment specified and furnished in other sections.

B. Supply Pipe Cut-Off Valves:
1. Equip supply pipes to each item of equipment or fixture (except faucets furnished with an integral stop) with a cut-off valve to enable isolation of the item of equipment or fixture for repair and maintenance without interfering with operation of other items of equipment or fixtures.

C. Supply Pipe Support: Anchor supply piping to all items of equipment or fixtures to prevent movement.

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 15 – Mechanical.

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 -GENERAL

1.01 SECTION INCLUDES

A. General provisions for electrical work.

1.02 RELATED SECTIONS

A. Raceways And Conduits - Section 16112.
B. Wire And Cable - Section 16120.
C. Outlet, Pull And Junction Boxes - Section 16131.
D. Grounding - Section 16450.
E. Panelboards - Section 16470.
F. Lighting Fixtures And Lamps - Section 16510.

1.03 DEFINITIONS

A. "Provide" shall mean, "furnish and install".

1.04 PERMITS, INSPECTIONS AND CERTIFICATES

A. The Contractor shall obtain and pay for all permits, certificates of inspection, taxes and other fees required to complete the project.

1.05 SPECIFICATIONS, CODES AND STANDARDS

A. All work performed under Division 16 shall comply with the latest issue of the National Electrical Code unless more stringent requirements are included in this specification or on the drawings.
B. In addition to the NEC all work shall comply with all governing local codes and ordinances, with all OSHA requirements and all appropriate sections of the NFPA.
C. All equipment installed under Division 16 shall bear the UL label whenever such label is available.
D. In addition, equipment shall conform to the appropriate publication or standards of the following agencies:
   1. American National Standards Institute (ANSI).
   2. Underwriters Laboratories (UL).
   3. National Electrical Manufacturers Association (NEMA).
   4. Institute of Electrical and Electronics Engineers (IEEE).
   5. Insulated Power Cable Engineers Association (IPCEA).
   6. American Society For Testing and Materials (ASTM).
   7. Federal Specifications (Fed. Specs).

1.06 SUPERVISION AND SKILLED WORKMEN

A. All work shall be installed by a company regularly engaged in this type work. The work shall be performed by experienced and qualified personnel.
B. The Contractor shall place a competent supervisor on the job and he shall be retained on the job until completion of the project insofar as possible.

1.07 SCHEDULING OF WORK AND SYSTEM INTERRUPTIONS

A. Where existing systems in operation must be interrupted to perform new work the contractor shall notify the owner in advance exactly when the interruption will occur and for how long.
B. The amount of advance notice required shall be obtained from the Owner. The Contractor shall also notify the Owner immediately when the existing system is restored. Where multiple outages are required, the Owner shall be notified of each one.

1.08 FIELD MEASUREMENTS AND SITE INVESTIGATION

A The Contractor shall have visited the job site before bidding and ascertained all existing conditions, which will affect his work. Failure to do so will not be accepted as a reason for requesting extra pay in the event that existing conditions result in extra materials or labor.
B. Any existing conditions found by the Contractor, which will adversely affect the work, shall immediately be brought to the attention of the Architect-Engineer.

1.09 ITEMS REQUIRED BUT NOT SPECIFIED

A. Miscellaneous items obviously required for a complete and operating system but not specifically called for on the drawings or in the specifications shall be provided by the Contractor at no extra cost to the Owner (nuts and bolts, masonry anchors, conduit and equipment supports, drilling, welding, scaffolding, crane service, etc.).

1.10 DEVIATION FROM CONTRACT DRAWINGS

A. The drawings are diagrammatic and show the general arrangement of the systems and equipment to be included in the Contract. The Contractor shall install the equipment according to the drawings as far as possible. However, the Contractor shall coordinate his work with the architectural, structural, HVAC and plumbing trades in order to prevent space conflicts. Where conflicts occur that cannot easily be resolved, the Architect-Engineer shall be notified before proceeding with the work. Where directed to make modifications to the work to resolve such conflicts, the contractor shall do so without extra cost.

1.11 DAMAGED EQUIPMENT

A. Damaged or corroded equipment shall not be installed.
B. Any equipment - existing or new - damaged during construction - shall be replaced with new identical equipment by the Contractor at no cost to the Owner.

C. Small scratches to the surface of painted equipment shall be touched-up with a brush - except where such damage is easily noticeable in finished areas. In such cases, the entire surface shall be re-finished equal to the factory finish.

1.12 DIVISION OF WORK AMONG TRADES

A. It is the intent of this specification to clarify the scope of work to be performed under Division 16. However, where conflicts arise concerning division of work between the electrical sub-contractor and other sub-contractors, the General Contractor shall determine such allocation of materials and labor. Neither the Owner nor the Architect-Engineer shall make such determination.

1.13 ADDENDUM AND CHANGE ORDERS

A. Where Change Orders are issued as a "CPR" (Change Proposal Request) the Contractor shall submit a price for extra pay for making such change. The Contractor shall not proceed with the change until notified by the Owner.
B. Where an ITC (Information to Contractor) is issued to clarify but not change the work, the Contractor shall perform the indicated work at no extra cost, provided the work indicated on the ITC does not in fact results in extra work.

1.14 SUBMITTALS

A. Submit shop drawings for review as indicated in Contract Documents and Division 1. Shop drawings shall be submitted in complete groups, loose-leaf bound and indexed, including schedule drawings, manufacturer's scale drawings, wiring and control diagrams, catalog cuts, pamphlets, descriptive literature and performance and test data, all properly identified.
B. Submit maintenance manuals for approval. Manuals shall be separate from shop drawings required in (A) above and shall be loose-leaf bound or otherwise arranged into separate manuals for each system and major item of equipment. The manuals shall include operating and maintenance instructions, parts lists, manufacturers and local suppliers addresses and pertinent descriptive data.
C. Submit samples if requested by the Owner or Architect-Engineer.
D. As-Built Drawings: The contractor shall obtain from the owner a complete set of blue line prints of the electrical work (A "Bid Set"). The contractor shall keep this set in good clean condition and shall mark in red ink all deviations from the original drawings. The markings shall be made periodically as the work progresses and on completion of the job the set of "As-Built" drawings shall be signed by him (in ink), dated, marked "As-Built", and turned over to the Owner. Deliverance of this set of as-built drawings shall be a condition of final payment.

1.15 EQUIPMENT SUBSTITUTIONS

A. Where an item is specified by performance ratings rather than by manufacturer and catalog number, submit Proof-of-Compliance with specifications.
B. Where an item is specified by manufacturer and catalog number either:
   1. Submit shop drawings for the exact item specified – or
   2. Submit proof that the substituted item is equal in all required characteristics. Minor differences that do not affect safety, economy, durability or performance will be overlooked.

C. Test reports from a nationally recognized testing agency will be accepted as proof of compliance.
D. Where submittals do not contain adequate Proof of Compliance they will be automatically rejected.

1.16 WIRING OF EQUIPMENT FURNISHED BY OTHERS

A. Provide power and control circuits for all electrically operated or electrically controlled equipment furnished under other divisions of the specifications - whether shown on the drawings or not. Coordinate with other trades for requirements.

1.17 TEMPORARY POWER FOR CONSTRUCTION

A. Provide temporary service, distribution, branch circuits and outlets required by this and other trades during construction. Pay utility bills for this service. All wiring for temporary power shall be installed according to the NEC and shall be maintained in a safe and useable condition to satisfy all requirements.

1.18 ELECTRICAL WORK

A. All electrical work shall be performed by the electrical contractor.

PART 2 -PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment installed on the project shall be new, of recent manufacture, in perfect condition and shall be the standard product of a manufacturer regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All components of a piece of equipment shall be mechanically and electrically compatible with the overall mechanical and electrical ratings of the piece of equipment in which installed.
B. All equipment of a similar nature shall be made by the same manufacturer. Example: All panelboards shall be by the same manufacturer.
C. All hardware and accessory fittings shall be of a type designed for the use intended. All components shall have corrosion protection suitable for the atmosphere in which they are installed.
D. All equipment installed shall be made in the United States and shall bear the UL Label in all cases where this label is available.
E. Switchgear and controls shall be installed in standard NEMA type enclosures compatible with the ambient atmosphere.
F. All equipment shall have voltage, current and frequency ratings compatible with the system in which installed.
G. Materials shall meet all safety requirements of the NEC and UL.
H. Light fixtures installed outdoors shall bear the UL label indicating approval for house in wet or moist atmospheres. Fluorescent lamp ballasts shall bear the CBM/ETL label.

PART 3 -INSTALLATION

3.01 COORDINATION WITH OTHER TRADES

A. The electrical contractor shall plan and layout his work in order to be compatible with the building structure, the HVAC systems and the plumbing systems. Where failure to coordinate his work with other trades results in equipment having to be removed and relocated, the contractor shall perform such removal and relocation at no cost to the Owner. Where equipment has to be moved the Architect-Engineer shall determine which equipment has to be moved regardless of which equipment was installed first.

3.02 COORDINATION WITH UTILITIES

A. Installation of underground ducts and conduits for in- coming power service shall be thoroughly coordinated with each utility giving service. Duct and conduit sizes and material types shall be as shown on the drawings. Details of routing, burial depth, size of bends and termination at each end of service shall be as required by the utility.

3.03 CUTTING AND PATCHING

A. All openings through walls, ceilings and floor slabs required for the installation of electrical equipment shall be provided by the electrical contractor.

3.04 SLEEVES AND ACCESS PANELS

A. All conduit sleeves through walls or slabs and all access panels required for the installation of equipment furnished under Division 16 of the specifications shall be provided by the electrical contractor. Access panels required for the installation of equipment furnished under Division 15 of the Specifications shall be provided by the Mechanical Contractor. Such access panels shall be provided with a finish equal to the existing surface and shall result in smooth and close fitting edges.

3.05 EQUIPMENT SUPPORTS

A. All metal framing, chains, hooks, masonry anchors and equipment racks required to support electrical equipment shall be provided by the electrical contractor. Ceiling support system for lay-in tile ceiling shall not be included in Division 16 of the Specifications. Where light fixtures and air conditioning ductwork are installed using the same means of support, said means of support shall be provided by the Mechanical Contractor.

3.06 REMOVALS, RELOCATIONS, MODIFICATIONS

A. Where existing equipment is shown to be removed, relocated or modified the electrical contractor shall provide all required equipment, materials and labor to perform such work. In those cases where a manufacturer is required to modify existing equipment, the price quoted by the manufacturer for making such modification shall be paid by the electrical contractor including costs of manufacturers personnel sent to the job site and all required testing equipment. In those cases where equipment is shown to be relocated, all damage done during such relocation shall be paid for by the electrical contractor. Where equipment is shown to be removed from the job site and disposed of, the electrical contractor shall make all required preparations and provisions for accomplishing such disposal including liability for the disposal location.

3.07 CLEAN-UP AND PAINTING

A. After all systems and equipment have been installed the contractor shall clean up all electrical equipment inside and outside the enclosures. All grease, dust, rust and chipped plaster and concrete shall be removed from the installed equipment. Each piece of equipment shall be thoroughly cleaned and left in brand new condition. Special attention shall be given to the interior of panelboards and other similar equipment.

B. All light fixture lenses and reflectors shall be thoroughly cleaned. The project will not be accepted as being finished until all such dirt and contamination has been removed.

C. The contractor shall provide touch-up painting where finished surfaces have received minor scratches during installation. Where electrical equipment with painted surfaces has been installed in finished areas, any such damage to the painted surfaces that cannot be corrected with minor touch-up painting shall be re-finished at the factory at no cost to the Owner. Equipment installed in finished areas having noticeable damage to the finished surface will not be accepted.

3.08 EQUIPMENT IDENTIFICATION

A. For panelboards, control system cabinets and all other similar cabinets - provide black and white laminated plastic nameplates (white letters against a black background) fastened in place with chrome plated nuts and bolts. Bolts to have round-slotted heads. A list showing the exact wording and letter size shall be submitted for approval as part of the shop drawings.
B. Equipment that cannot be identified by such nameplate shall be identified either by stencilling with black paint or by indented plastic tape. The shop drawing list shall indicate which equipment is to be labeled in this manner.
C. All panelboards shall contain a typewritten directory behind plastic inside the door.
D. All feeder conductors in pull boxes, junction boxes, manholes, wire ways, and other similar enclosures shall be identified by a metal tag with letters and numbers indented thereon to show its source. Feeders originating at the main switchboard shall have an "F" number (F1, F2, F3, etc.) as shown on the switchboard schedule of the contract drawings. Feeders originating at a distribution panel shall have a circuit number same as shown on the panel schedule. Lighting and receptacle branch circuit conductors need not be so identified.

3.09 FINAL TESTS AND DEMONSTRATIONS

A. On completion of the work and as a condition for final payment, the contractor shall make the following tests and demonstrations:
1. Energize and operate all systems in their normal intended manner.
2. Manually trip and reset all circuit breakers under normal load current.
3. Operate ammeter and voltmeter selector switches on each phase.
4. Close, open and re-close all safety switches (both fused and non-fused) under normal load current.
5. Operate all motor starters by the installed control system. Demonstrate all required interlocking.
6. Test all receptacles with test lamp or voltmeter.
7. Test the grounding system and furnish test reports of ground resistance measurements as required in the "Grounding" Section of the specifications.
8. Operate all light switches, time switches and photoelectric switches.
9. Furnish test reports showing correct settings of circuit breakers in panelboards - where so specified.
10. Furnish megger readings of insulation resistance measurements on all wire and cable - where so specified.
11. Verify, by actual operation, all communication and signal systems and all control systems and equipment.

3.10 GUARANTEES AND WARRANTIES

A. All systems and components shall be guaranteed for a period of one year from date of final acceptance against all defects in material and workmanship. Any defects found during this time shall be corrected by the contractor at no cost to the Owner. Where the contractor is notified in writing during this period of such defect and fails to take corrective action, the Owner shall have others do the work and the contractor hereby agrees to pay all costs for such work.
B. All warranties furnished by manufacturers on installed equipment shall be turned over to the Owner. Where warranty periods longer than one year are specified, they shall be provided by the contractor as a part of the contract price.

3.11 OWNER INSTRUCTIONS

A. After completion of "Final Tests and Demonstrations" the Contractor shall furnish experienced personnel to instruct the Owner or his elected representatives in the correct operation of all installed systems and equipment.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16112

RACEWAYS AND CONDUITS

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Raceway and conduits for electrical work.

1.02 RELATED SECTIONS:

A. Electrical General Requirements - Section 16010.
B. Earthwork For Utilities - Section 02225.
C. Firestopping - Section 07270.
D. Outlet, Pull And Junction Boxes - Section 16131.
E. Grounding - Section 16450.

1.02 SUBMITTALS:

A. Submit for review, properly identified manufacturer's product data giving materials, finishes, accessories and installation directions where required. Submit samples as requested.

1.04 LABELING:

A. Materials to bear U.L. labels.

PART 2 -PRODUCTS

2.01 RIGID CONDUIT:

A. Rigid Galvanized Steel Conduit (RGS): Hot dipped galvanized or electro-galvanized, with corrosion resistant coating on the inside threaded standard weight steel conduit conforming to ANSI C80.1-1966, and Article 346 of the NEC. Minimum size 3/4 inch unless noted otherwise.
B. Intermediate Metal Conduit (IMC): Hot dipped galvanized or electro-galvanized, threaded, steel conduit conforming to ANSI C80.1-1966 and Article 345 of the NEC. Minimum size shall be (1/2 inch) (3/4 inch), unless otherwise noted.
C. Rigid Mon-Metallic: Schedule 80, PVC plastic 90o C. conforming to ANSI C33.91, UL 651, and Article 347 of the NEC. Minimum size 3/4 inch unless noted otherwise.

2.02 ELECTRICAL METALLIC TUBING (EMT):

A. Galvanized steel tubing with smooth interior coat of lacquer or enamel.
B. Conform to ANSI C80.3-1977, and UL 797, and Article 348 of the NEC.
C. Minimum size (1/2 inch) (3/4 inch) unless noted otherwise.

2.03 CONDUIT FITTINGS:

A. For Rigid Steel Conduit and Intermediate Metal Conduit: Zinc or cadmium plated steel or galvanized malleable iron conforming to ANSI C80.4. For aluminum conduit: Steel, malleable iron, or UL Listed copper free aluminum alloy fittings may be used. All fittings shall be threaded type, (threadless fittings

shall not be used) (or threadless steel UL Listed concrete-tight type. Die cast zinc alloy fittings shall not be used.

B. For rigid PVC conduit; 90C. PVC fittings UL listed. Fittings to match conduit; conforming to UL 651.

C. For EMT fittings shall be zinc or cadmium plated steel or malleable iron of the compression type, or stainless steel multiple point locking type.

D. All bushings and connectors shall incorporate an insulating insert of at least 150C. rated plastic or 105C. rated nylon. Conduit bushings made entirely of nonmetallic material shall not be used. Grounding and bonding bushings shall have clamp type terminal for copper conductor.

E. Expansion fittings and sealing fittings - UL listed with ground continuity means.

2.05 CONDUIT SUPPORTS:

A. Straps: Formed zinc coated steel or malleable iron one-hole pipe straps or conduit clamps sized for conduits or tubing.

B. Fastenings: Zinc coated or cadmium plated steel screws, bolts, toggles and expansion anchors as required.

C. Electrical steel channels, trapeze, clamps and supports, concrete inserts galvanized steel or plated steel with galvanized conduit clamps and threaded 1/4 inch diameter minimum suspension rods.

D. For individual branch circuit EMT or flexible metal conduit concealed above accessible hung ceilings only, "caddy clips" spring steel conduit clamps.

2.06 CONDUIT COATINGS:

A. On steel conduit buried directly in the earth, either factory applied PVC coating or two coats bitumastic paint, Koppers No. 50 or equivalent.

2.07 WIREWAYS AND AUXILIARY GUTTERS:

A. Hot dip galvanized code gauge sheet steel, complete with knockouts, enclosures and removable covers unless indicated as hinged. Units to be as manufactured by Square D, Hoffman, Keystone or Lee Products.

B. Exterior locations to have weather tight gasketed covers and joints, drip proof rain shields and shall be painted after installation with exterior enamel paint.

C. Wire ways and gutters shall conform to Articles 362 and 374 of the National Electrical Code.

2.08 SURFACE RACEWAYS:

A. Only where specifically indicated. UL Listed and conform to Fed. Spec. W-C-582, and Articles 352 and 353 of the National Electrical Code. Surface raceways shall be as manufactured by Wiremold or Walker Parkersburg.

2.09 PULL WIRES:

A. Galvanized steel or nylon rope of sufficient strength to pull in the maximum size conductors into the trade size conduit. Minimum strength shall be 200 lbs.

PART 3 -EXECUTION

3.01 GENERAL:

A. Provide where indicated and where required all ducts, conduits, tubing, wire ways and gutters, to form a complete and integrally grounded raceway system. The system shall be installed in accordance with all

National Electrical Code and local code requirements. All 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 all empty raceways where no conductors are installed in this Contract. Allow 10 inches minimum slack at each end of pull wire and securely calk in place.

C. The minimum size of rigid conduit, EMT conduit shall be in accordance with NEC except as follows:
   1. Unless otherwise specified or shown on the drawings.
   2. Where the conduit is an unbraced vertical drop or subject to damage in which case it shall be a minimum of 3/4 inch.

D. The Contractor's attention is directed to check the size of all raceways to determine that the green equipment ground conductor, specified, shown or required can be installed in the same raceway with phase and neutral conductors in accordance with the percentage of fill requirements of NEC. If necessary, the Contractor shall increase the duct, conduit, tubing or raceway sizes shown or specified to accommodate all conductors without additional cost to the Owner.

3.02 RACEWAY AND CONDUIT USE LOCATIONS:

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

B. For exterior locations raceways shall be as follows:
   1. Below grade direct buried - galvanized rigid steel (GRS) painted or PVC jacketed rigid steel. Where specifically noted on plans use Schedule 80 PVC.
   2. Below grade concrete encased - RGS or Schedule 80 PVC.
   3. Flexible Conduit - PVC jacketed with liquid tight fittings.
   4. Exposed Conduit - GRS or IMC.
   5. Gutters, wire ways, and troughs shall be of the gasketed rain tight type.

C. For interior locations raceways shall be as follows:
   1. Under slabs on grade rigid PVC with RGS elbows.
   2. Embedded in concrete walls or floor on or below grade: RGS with concrete tight steel fittings.
   3. Embedded in concrete walls or floors above grade. EMT with concrete tight steel fittings.
   4. Concealed in masonry walls - EMT with concrete tight fittings.
   5. Concealed in dry wall construction, or in suspended ceilings - EMT.
   6. No exposed work unless shown on drawings or approved by Owner.

3.03 RACEWAY AND CONDUIT INSTALLATION:

A. Route feeders, homeruns and conduits where indicated, except that minor deviations as accepted will be permitted.

B. The routing of conduit, as shown on the plans, is general. Before installing any work, examine the working layouts of all other trades to determine exact locations and clearances. Where equipment is installed by other trades requiring connection under this Section, determine exact conduit entry locations from the approved shop drawings. Modifications to conduit runs shown on the electrical drawings as found necessary from the above shall be made without additional cost to the Owner, and shall be subject to the acceptance by the Architect-Engineer. In determining clearances note that at no place shall conduit be run within 6 inches of any heated pipe or duct. Where crossing same is unavoidable, the conduit must be kept at least 1 inch from the outer covering.

C. In finished spaces conduits, fittings, outlet boxes, and pull boxes shall be installed concealed in ceilings, floor slabs, walls or partitions of the buildings. Where concealed conduits are installed, sufficient space must be left over conduit and coupling for the applications of finished floor, walls and ceilings. Examine the architectural drawings, and if necessary, confer with the Architect-Engineer to determine

the type of construction in which concealed conduits will be run and the space avail able for such conduits. Unless otherwise shown on the drawings, conduit and EMT may be run exposed on unfinished walls in mechanical rooms.

D. Avoid running conduit on the roof. If unavoidable conduit shall be RGS or IMC a minimum of 12 inches above the roof supported on galvanized steel struts, horizontally and vertically, with pitch pans on supports and roof penetrations.

E. Conduits Penetrating Waterproof Membranes under Floor Slabs on Grade: Coordinate installation of conduits prior to installation of waterproof membrane. Membrane to be sealed waterproof to conduits as specified in Section 01043 prior to pouring of slab over membrane. Provide Schedule 40 galvanized steel pipe sleeves for conduits penetrating floor slabs as specified in Section 01043.

F. Conduits Penetrating Waterproof Membranes on Walls: Provide properly coordinated Schedule 40 galvanized steel pipe sleeves for conduits in concrete forms as specified in Electrical General Provisions.
Membrane to be sealed waterproof to conduits as specified in waterproofing section.

G. Conduit Embedded In Concrete:

1. Conduit embedded in poured concrete shall be of the specified type, unless otherwise indicated. 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. Metallic conduit buried in the ground shall be of the specified type. 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. Lateral spacing of conduits buried in concrete slabs shall be not less than three diameters except where drawings definitely indicate that the concrete slab has been specially designed to accommodate a closer spacing of conduits entering panelboards, etc., or the arrangement is accepted by the Architect-Engineer.
2. In general, conduits shall not be run through beams, except where clearly indicated on drawings specified herein, or where permitted by the Architect-Engineer.
3. No vertical conduit passing through horizontal concrete beams shall interfere with reinforcing. Where accepted by the Architect-Engineer, horizontal conduit may pass through beams, provided they are not closer than 6 inches clear and are confined to middle half of span.
4. Where metallic conduits are installed in close proximity to reinforcing steel bars, paint the bars with approved bituminous compound in the area of possible contact between the conduit and reinforcing steel. Tie the conduit to the steel with nylon or other nonconductive ties.
5. Properly support conduit to be embedded to maintain correct location and spacing during concreting operations. If necessary, provide suitable metal supports for this purpose.
6. Where a concrete embedded conduit passes through an expansion or contraction joint in the structure, install the conduit at right angles to he joint, and provide an approved conduit expansion fitting at the joint installed in accordance with the manufacturer's instructions. Paint the conduit with an approved bituminous compound for one foot on either side of the expansion joint.
7. All conduits concealed in slabs on grade shall be installed over vapor barrier. All underground rigid conduit not encased in concrete shall be painted with one coat of bitumastic asphalt compound.
8. Factory applied plastic resin; epoxy or coal tar coated metal conduit and fittings may be used, provided that coating holidays and abrasions to coating are repaired with compatible mastic.
9. At any one point no more than two lines of conduits shall intersect in any portion of slab. In all such cases, conduit shall be re-routed through other areas, or be run under the slab and stubbed through the slab at the required locations. All conduits and pipes shall have a minimum cover of one inch of concrete. Install no conduit in slabs 3 inches thick or less. Under no conditions shall aluminum conduit be buried in concrete slabs. Slab installed conduit shall be stubbed within webbing of block and shall be extended vertically concurrent with laying of block. Determine

centerline of block partitions measured from column centerlines.

H. Conduit Bending, Cutting and Placement:

1. Conduit bends and offsets shall be avoided where possible. Required bends shall be made with standard benders designed for the purpose and with a minimum radius of six times the internal conduit diameter. Make all conduit bends in accordance with the NEC unless otherwise shown on the contract drawings. Use of a pipe tee or vise for bending conduit will not be permitted. Conduit, which has been crushed or deformed, shall not be installed. All bends shall be free from dents or flattening. No more than 360 degrees in bends shall be permitted in conduit between any two terminations of pull boxes. Make no bend in surface raceways. Use factory formed fittings for surface raceways.
2. The ends of all conduits shall be carefully reamed out free from burrs before installation and after threading. All cuts shall be made square. Coupling of conduit by means of running threads is not permitted. Where it is impossible to run the conduit and coupling sections together, an Erickson coupling or other approved combination coupling shall be used. All joints shall be made up tight. Joints in all conduits concealed in slab, floor fill, earth, etc., shall be made using approved silicone paint on threads.
3. Take care to 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.
4. During installation of conduit, all unfinished runs and terminations in pull boxes, cabinets, etc. shall be capped until such time that conductors are installed.
5. Plastic caps designed for this specific purpose shall be used to cover and align conduits prior to concrete pours and shall remain on conduit stub-ups until such time as conduit is extended. Caps shall have self-aligning, interlocking male or female wings molded on each side. Duct or electrical tape and wire are unacceptable.

I. Conduit Connections:

1. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to all 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 liquid-tight, 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, one locknut being inside and one locknut outside and (2) in EMT or flexible metal conduit, the one locknut shall be made wrench-tight. All locknuts shall be the bonding type with sharp edges for digging into the metal wall of an enclosure and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections. All vertical runs of conduit or EMT terminating in the bottoms of wall boxes or cabinets, etc., shall be protected from the entrance of foreign material prior to the installation of conductors.
2. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of the plastic coupling fitting and on the outside of the conduit ends. Conduit and fitting shall be slipped together, until seated, with a slight twist to set the joint tightly, and the conduit then rotated one-half turn to distribute the cement evenly. Excess cement built up on the surface of the conduit shall then be removed.
3. The end of each conduit 1 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 inches and larger, insulated bushings with ground stud shall be used. If insulated bushings are of the fully insulated type, additional locknuts shall be used inside the junction box or cabinet before installing the bushing.
    a. Conduit entering main distribution panel feeder pull boxes shall be provided with insulated bushing with ground stud regardless of size.
4. The conduit system shall be installed 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 installed.

5. Install conduit so that any moisture collecting in the conduit will be drained to the nearest outlet or pull box, where possible.
6. Care shall be taken to see that all light and power conduit run from a permanent and continuous ground return back to the service ground connection point. Conduits used on systems, which are entirely isolated from the light and power distribution system shall be electrically continuous and grounded in an approved manner. All cable trays shall be grounded to the conduit system.

J. Conduit Penetrations, Supports:

1. Sleeves, conduits or other pipes passing through floor slabs and beams, or walls shall be at such location as not to impair the strength of the structure. Conduits penetrating the walls or smoke partitions shall be fire stopped (sealed). Filling materials for openings in floors shall be fire-resistive, and finished so as to prevent passage of water, smoke and fumes. Filling material for openings in walls shall be fire-resistive where it occurs in firewalls, and shall be installed so as to prevent the passage of air, smoke or fumes. Where conduit and wiring passes through firewalls or floor slabs, the Contractor shall fill the opening with fireproof sealant, as specified in the Fire stopping section.
2. Roof penetrations shall be made using approved flashings and counter flashings. 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.
3. 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.
4. Where unused sleeves or slots are provided for future installation of conduit, etc., they shall be suitably identified if not readily recognizable.
5. All 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.
   a. Supports shall be rigid enough to prevent distortion of conduits during wire pulling.
6. Support individual conduits not larger than 1-1/2 inch diameter by means of one-hole pipe straps or individual pipe hangers. Support individual horizontal conduits larger than 1-1/2 inch diameter by individual pipe hangers.
7. Conduit in hung ceilings shall be supported in approved manner similar to exposed conduits.
8. 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.
9. Space conduits installed against concrete or masonry surfaces away from the surface by clamp backs or other approved means.
10. In dry locations, spring steel fasteners, clips, or clamps specifically designed for supporting exposed single conduits may be used in lieu of pipe straps or pipe hangers. Hanger rods used with spring steel fasteners shall be not less than 1/4-inch diameter steel with corrosion resistant finish.
    a. Spring steel fasteners shall be specifically designed for supporting single conduits or EMT. Type, size and spacing of spring steel fasteners together with accessories shall by approved by the Architect-Engineer and the Contractor shall submit all applicable load and rating data for approval. Wire shall not be used as a means of support. Nails are not allowed for the support of conduit.
11. Where two 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.

12. All 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.

K. Fittings:

1. Expansion Fittings: Each conduit that is buried 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-dipped galvanized malleable iron and shall have a factory-installed packing, which will prevent the entrance of water, a pressure ring and a grounding ring.
2. 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.
3. Sealing Fittings: Sealing fittings for use with rigid steel conduits shall be of the threaded, zinc or cadmium coated, cast or malleable iron type and sealing fittings for use on aluminum conduit hall be of the threaded cast aluminum type. Fittings used to prevent passage of water vapor shall be of the continuous drain type.
4. Sealing fittings shall be installed and sealed in accordance with 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.
5. Install conduit-sealing fittings on all conduits entering or leaving anesthetizing locations. Fittings shall be Russell & Stoll Type ES or approved equal.
6. Compression fittings shall be made up weather tight in accordance with manufacturers recommendations.

L. Conduit Fastening: Fasten raceways as follows:

1. To Wood: Wood screws, sheet metal screws or screw type nails.
2. To Hollow Masonry: Toggle bolts or expansion bolts as required. Holes not used to be filled.
3. To Concrete or Solid Brick Masonry: By expansion bolts. Holes drilled to a depth of more than 1-1/2 inch.
4. To Steel Work: Machine screws, welded threaded studs, or spring-tension clamps. Raceways or pipe straps shall not be welded to steel structures.
5. To Light Steel Construction Partitions: Sheet metal screws. Bar hangers may be attached with saddle ties of 16-gauge double strand zinc-coated steel wire.
6. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws.
7. Conduits, tubing or raceways to be continuous from outlet to outlet and from outlet to cabinet, junction box or pull box.
8. Surface Wire ways and Auxiliary Gutters: Fasten in accord with manufacturer's directions with fastenings appropriate for surface as hereinbefore specified.

M. Flexible Conduit:

1. 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 in addition be of the liquid-tight type when installed under any of the following conditions:
   a. Exterior locations.
   b. Moisture or humidity laden atmosphere where it is possible for condensation to accumulate.
   c. Corrosive atmospheres.
   d. Where water or spray due to wash-down operations is frequent or possible.
   e. Wherever there is a possibility of seepage, dripping, etc., of oil, grease or water.

2. Flexible conduit shall be used for short connections to control devices, recessed fixtures and similar items. Connection between structure and first point of attachment to vibrating

equipment to be flexible. Flexible conduit shall be installed with sufficient slack to avoid tension.

N. Surface Raceways:
   1. Surface metal raceways shall be used only 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.
   2. Fasten surface raceways to surface in manner similar to methods specified hereinbefore.
   3. Each surface metal raceway outlet box to which a lighting fixture is attached shall be of sufficient diameter to provide a seat for the fixture canopy.
   4. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a back plate and a canopy, with or without extension ring, the back plate and canopy will serve as the outlet box and no separate outlet box need be provided.
   5. A surface metal raceway outlet box shall be provided, in addition to the back plate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.

O. 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 in accord with previous requirements for conduit and tubing with following additional requirements:
   1. No length of run to exceed 75 feet for 3/4 inch size and 150 feet for l inch or larger sizes.
   2. Raceways to contain not more than two 90-degree bends or equivalent.
   3. Additional pull or junction boxes to be installed to comply with above limitations whether or not indicated.
   4. Inside radii of bends in conduits of 1 inch or larger to be not less than 10 times nominal diameter.
   5. Provide pull wire in all empty raceways.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16120

WIRE AND CABLE

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Wire and cable for electrical work.

1.02 RELATED SECTIONS:

A. Mechanical General Provisions - Section 16010.

1.03 SUBMITTALS:

A. Submit for review, properly identified manufacturer's product data including electrical and mechanical properties.

1.04 LABELING:

A. Materials to bear Underwriter's Laboratories labels.

PART 2 -PRODUCTS

2.01 WIRE AND CABLE:

A. Wire and cable shall be soft annealed 98% conductivity copper with 600 volt A.C. thermoplastic insulation unless otherwise noted and shall be new and manufactured not more than l2 months prior to installation.
   1. Each coil or reel shall bear Underwriter's label and all wire marked with AWG or circular mil wire size, voltage rating, insulation type, type stranding and the manufacturer's name.
   2. Unmarked wire found installed shall be replaced at no additional cost to the Owner.
   3. Wiring shall conform to NEMA WC-5, NEMA WC-7, IPCEA S-61-402 and IPCEA S-66-524.
   4. Wiring insulation shall be THHN/THWN 75 degrees C.

2.02 LIGHT AND POWER WIRING CIRCUIT CONDUCTORS:

A. Light and power wiring circuit conductors shall be solid in sizes No. 10 AWG and smaller, and concentric strand Class B for conductors No. 8 AWG and larger.
B. Stranded copper conductors No. 14 AWG may be used for final connections to individual recessed lighting fixtures and for control and signal circuit wiring only with crimp-on type terminations. Do not use stranded wire for wiring to receptacles.

2.03 WIRING INSULATION SHALL BE AS FOLLOWS:

A. For feeders and motor and equipment power circuits type (THW - 75 degrees C.) and/or (XHHW - 75 degrees C. in wet or dry locations) or (MTW - 90 degrees C. in dry locations).
B. For branch circuit wiring for lighting and power circuits type (THW - 75 degrees C.) (TW - 60 degrees C.) (THHN/THWN - 75 degrees C)
C. For wiring through fluorescent fixtures where fixture is used as wireway shall be type THHN 90 degrees C.

2.04 COLOR CODING:

A. 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 tape such as that manufactured by the Minnesota Mining and Manufacturing Company for this purpose. Should tape be used, it shall cover not less than 6 inches of cable within enclosure.

B. Colors to be used in coding shall be:

120/208-Volt System	277/480 Volt System
Neutral - White	Neutral - Gray
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Ground - Green	Ground - Green

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

C. All other colors (violet, traced, etc.) shall be reserved for, and shall only be used for switch legs, control or communication circuits.

D. Conductors for control wiring shall be color-coded, using different color-coding than for the energy conductors specified above.

2.05 MINIMUM WIRE SIZE:

A. Minimum wire size shall be No. 12 AWG, except control wiring may be No. 14 AWG if distance is less than 200 feet. Use No. 12 AWG for control over 200 feet, unless otherwise noted.

2.06 WIRE AND CABLE CONNECTORS AND TERMINATIONS:

A. For splices in branch circuit conductors solid or stranded size No. 10 AWG and smaller use UL Listed soft plastic wire nut with sharp self-cutting interior threads, 3M Scotchlok, Ideal Supernut or T&B Piggy of the size to match the wire.

B. 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", Burndy "Vinylug" or approved equal.

C. For No. 8 AWG and Larger: T&B "Locktite" connectors; Burndy "Versitap" connectors, or OZ-Gedney solder less connector; with insulating covers, tape or heat shrink insulation system. Terminations and splices in feeders may be made with solder less pressure type connectors complete with composition insulating covers, field insulating tape, or heat shrink insulation system. Connectors and lugs for 250 mcm cable and larger shall be of the two-hole type and for compression type shall have at least 2 in dents. Compression lugs and connectors shall be tin plated wrought copper, of size to match the cable.

D. Splices in underground exterior wiring shall be made fully waterproof by potting or encapsulating.

E. Insulating tapes shall be of a type approved for the application and shall be flame retardant. Tapes shall be as manufactured by 3M, Bishop Electric or equivalent.

F. Cable Ties: T&B "Ty-Rap", Burndy "Unirap" or equivalent.

G Cable identification: Branch circuits wire markers 3M "Scotch Code" or equivalent. For feeder sizes, non-ferrous metal stencil tags.

PART 3 -EXECUTION

3.01 WIRE AND CABLE INSTALLATION:

A. Wire and cable shall be suitably protected from weather or damage during storage and handling and shall be in first-class condition when installed.
B. Conductors shall not be pulled into conduit until raceway system is substantially complete. All wiring shall be continuous within conduit runs. Splices will be permitted only at outlet and junction boxes. Joints must be mechanically and electrically secure. No wire shall be installed until conduit is free of moisture.
C. Pulling lubricants, if used, shall conform to UL requirements for the type of conduit material and cable insulation being used.
D. Care shall be taken to prevent cutting and abrasion of cable insulation during the pulling of feeders. Ropes used for pulling of feeders shall be made of polyethylene or other suitable nonmetallic material. Pulling lines shall be attached to conductor cables by means of either woven basket grips or pulling eyes attached directly to the conductors. Rope hitches shall not be used. All cables to be installed in a single conduit shall be pulled in together. Where polyethylene insulation is used and a pulling lubricant is required, the lubricant shall be certified by the manufacturer to be non-injurious to such insulation.
E. 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 permitted by the NEC and NEMA Standards.
F. Neatly and securely bundle conductors located in branch circuit panelboards, cabinets and control boards. Use nylon bundling straps.
G. Provide suitable installation equipment to prevent or cutting 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.
H. Control wiring color-codes, to be of type as required by its equipment manufacturer. Interconnections of control wiring to be on numbered terminal strips.
I. Where two neutrals are installed in same conduit, their sets of wiring shall be grouped and clearly identified by permanent tags or other means.
J. At each outlet, a loop or end of wires not less than 9 inches long shall be left for connection to lead.
K. 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.
L. Cables in junction, and pull boxes shall be properly trained and racked.
M. Branch circuit wiring in panelboard gutters shall be installed vertically in the gutter with a ninety-degree bend at the supply circuit breaker; wire shall enter the circuit breaker lug horizontally.
N. Cable supports and boxes shall be installed for all vertical feeders in accordance with the schedule in the NEC. Boxes shall be built of heavy steel plates not less than No. 10 U.S.S. 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, which clamps each conductor firmly and tightens due to the weight of the conductor.

3.02 WIRE AND CABLE SPLICING AND TERMINATING:

A. Splices and terminations of conductors shall be made utilizing specified materials and methods installed in accordance with the manufacturer's recommendations.
B. 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. No splices will be allowed within panelboards.

C. 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 installed that the conductor is fully insulated by a skirt of such design, or taped in such a manner that cold flow of the conductor insulation will not be induced when the conductor is positioned in its final operating posi tion.

D. 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.

E. 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 permitted by the Underwriters' Laboratories, Inc. as listed on manufacturers' packaging of connector shall be strictly complied with.

F. Terminations at equipment terminal blocks shall be made utilizing compression type connectors suitable to match terminal type. Neutral continuity shall not be made at terminal blocks. Provide a neutral splice with tap to terminal where two neutral wires terminate at a terminal block or lug.

G. 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.

H. Branch circuit conductors shall be identified at supply circuit breakers, with the circuit number using pressure sensitive adhesive wire markers.

I. 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.

   Ensure that circuiting work fulfills the following conditions:

   1. Loads on panel busses shall be balanced on phases as evenly as possible.
   2. No neutral conductor shall be common to more than one circuit conductor connected to the same phase leg of the supply system.
   3. Circuiting of panelboards to be such that breakers are grouped logically by functions.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16131

OUTLET, PULL, AND JUNCTION BOXES

PART 1 -GENERAL

1.01 RELATED SECTIONS:
A. 09900 - Painting.
B. 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.
2. Fixture studs shall be securely fastened in an acceptable manner.
3. Plaster covers shall have depths suitable to the finish being applied to the walls.
4. Sheet steel boxes shall be properly drilled and tapped.
5. There shall be not more holes in any of the outlet boxes than are required for the entering conduits.
6. Depth of boxes shall allow for easy wire pulling and proper installation of wiring devices.
7. Outlet boxes shall be galvanized steel or rust resistant malleable iron alloy and comply with Fed.Spec.WC-583 and ANSI-C33.65.
8. Outlet Boxes shall be as follows:
    1. For Recessed Ceiling Fixtures:
    2. 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.
9. 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.
10. For Ceiling and Wall Bracket Outlets on Exposed Conduit in Dry Locations:
    1. 4-inch octagon sheet steel box with 3/8" fixture stud.
11. 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.
12. 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.
13. For Ceiling and Wall Bracket Outlets on Exposed Conduit at Damp or Wet Locations:
    1. 4 inch cast iron.
14. 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.
2. Two gangs may be provided by means of a 4-inch square box with two-gang plaster cover.

15. 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.
16. For Switches and Receptacles on Exposed Exterior Conduit Work:
    1. Type FS or FD conduit.
17. Wet/Damp Locations:
    1. Provide gasketed, weather tight, screw covers, code gage galvanized steel pull boxes with weatherproof conduit hubs equivalent to Myers Scru-Hub for pull boxes with multiple conduit entries.
    2. Provide cast metal hub type, dipped in rust inhibitor and with gaskets for individual conduit runs.
    3. Extension Rings: Do not use to increase the volume of boxes, except where necessary due to multiple conduit run conflicts.
    4. Where such conflicts occur, an extension ring may be allowed for changes in direction of conduit to make necessary clearances.
    5. Not more than one extension ring may be used for each box where necessary.
18. 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:

        1. 100 cubic inches or less shall be of No.14 gage steel.
        2. Between 101 and 8500 cubic inches shall be No.12 gage steel.
        3. Larger boxes shall be No.10 gage steel.
        4. 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.
5. Determine the proper position of outlets and receptacles. Relocate any outlet or receptacle without additional cost to the Owner if improperly located.

6. 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.
7. 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.
8. 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.

B. 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.
C. Where shown together on the plans, switches shall be ganged in one box.
D. Switches and receptacles shall be ganged together only where plans specifically indicate such combinations.
E. Outlets for duplex receptacles shall be arranged for vertical mounting of the receptacles except as specifically indicated on plans.
F. Barriers shall be provided as necessary to isolate voltage classes.
G. 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.
H. Align rows of outlet boxes for ceiling lights.
I. 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. Outlets ..... 18 inches to bottom of box.

Refer to Architectural drawings for additional mounting heights.

J. Pull and junction boxes shall be provided at locations required to reduce length of cable pull or reduce number of elbows between outlets.
K. Provide blank covers for outlet boxes when devices or wiring has been removed or not installed.
L. Paint exposed boxes to match the color of the wall or ceiling to which they are mounted.
M. Where several feeders pass through a common pull box, tag each feeder to clearly indicate electrical characteristics, circuit number, and panel designation.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Wiring devices for electrical work.

1.02 RELATED SECTIONS:

A. Electrical General Provisions - Section 16010.

1.03 SUBMITTALS:

A. Submit for review, properly identified product data giving material, finishes, accessories and installation directions where required.

1.04 LABELING:

A. Materials to bear Underwriters' Laboratories labels.

PART 2 - PRODUCTS

2.01 WIRING DEVICES:

A. All wiring devices furnished under this section of specifications shall conform to NEMA WD-1 heavy duty.
B. Switches shall conform to Fed. Spec. W-S-896, be of specification grade, quiet type. Switches shall be rated at 20 amps, 277 volts AC in single pole, double pole, 3 ways or 4 ways as indicated. Provide for back or side wiring.
C. Duplex convenience receptacles shall conform to ANSI C73.12 and shall be specification grade, back and side wired, grounding type, 3-wire, rated 20 amps, 125 volts AC. Receptacles shall be Hubbell 5362I or equivalent.
D. Ground Fault Receptacles shall be NEMA 5-20R type, rated at 20 amps, 120 volts with 5 $\pm$ 1 Ma trip threshold, and UL nominal trip time 0.025 sec. Receptacle shall be P&S 2091-FI feed thru type or equivalent.
E. Special purposes receptacles shall conform to ANSI C73, of specification grade, back or side wired. Ratings and type as indicated on drawings.
F. Wiring devices shall be as manufactured by Hubbell, Eagle, Leviton, Pass and Seymour or equivalent.
G. All wiring devices shall be ivory unless noted other wise.

2.02 COVER PLATES:

A. Cover plates shall conform to Fed. Spec. W-P-455, and shall be .040 inch "ivory white" polycarbonate in finished areas. Plate design shall be smooth without ornamentation.

B. Ganged switches shall be provided to a maximum of three, if more are required on drawings, provide in multiples of two and/or three.
C. Weatherproof receptacles shall be provided with cast aluminum, spring loaded, gasketed with location cover. Hubbell No. 5205W0 or accepted equivalent.

PART 3 -EXECUTION

3.01 GENERAL:

A. All wiring devices shall be installed in strict accordance with manufacturer's recommendations.
   1. Wiring devices location shall be checked prior to rough in of outlet boxes and conduit with architectural drawings for door swings and furniture details. Duplex receptacles in finished areas shall be mounted vertically.
   2. Boxes mounted back-to-back shall not be permitted.

3.02 MOUNTING HEIGHTS:

A. Duplex receptacles 18 inches, unless otherwise indicated.
B. Lighting switches 4 feet 0 inch AFF to centerline unless otherwise indicated.
C. Special purpose receptacles 18 inches AFF to center line, unless otherwise noted.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 - Electrical.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Disconnect switches.

1.02 RELATED SECTIONS:

A. Electrical General Provisions - Section 16010.

B. Overcurrent Protection Devices - Section 16475.

1.03 SUBMITTALS:

A. Submit for review, properly identified product data giving materials, finishes, accessories and installation directions where required.

1.04 LABELING:

A. Materials to bear Underwriters' Laboratories labels. Label for "SERVICE ENTRANCE" where so applied.

PART 2 -PRODUCTS

2.01 DISCONNECT SWITCHES:

A. Disconnect switches shall conform to Fed. Spec. W-S-865 and 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. All switches shall be horsepower rated, Underwriters' Laboratories listed and so labeled.

B. Disconnect switch enclosure shall be NEMA 1 for indoor and NEMA 3R for outdoor use or as indicated in plans on each case.

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. Disconnect switches shall be as manufactured by G.E., Siemens, Square "D", Westinghous

F. Provide each motor with a disconnect means, when required by NEC, and where shown on the drawings.

2.03 FUSES:

A. Provide fuses for all disconnect switches so indicated. Fuses shall be dual element type as specified in Section 16475 Overcurrent Protective Devices.

PART 3 -EXECUTION

3.01 INSTALLATION:

A. Individually mounted circuit breakers shall be installed vertically with top no more than 6 feet above the floor, and shall be rigidly and securely attached to building and shall not depend upon conduit for support.

B. Where used as service entrance main disconnectors, circuit breakers shall be permanently labeled "main 1 of 4"; "main switch 2 of 4" etc.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Grounding for electrical work.

1.02 SUBMITTALS:

A. Submit for review, properly identified manufacturer's literature giving materials, finishes, accessories and installation where required.
B. Ground resistance tests.

1.03 RELATED SECTIONS:

A. Electrical General Provisions - Section 16010.
B. Raceways and Conduits - Section 16112
C. Wire And Cable - Section 16120.

1.04 LABELING:

A. Materials shall bear Underwriters' Laboratories Labels.

PART 2 -PRODUCTS

2.01 GROUNDING SYSTEM:

A. Grounding system shall conform to ANSI C33.8, IEEE. The electrical system and equipment shall be grounded in accordance with the requirements of the National Electrical Code and as specified. The grounding conductor shall be an insulated copper wire of size indicated. Where not indicated, the conductor shall be in accordance with the requirements of the National Electrical Code except that minimum size shall be No. 12. Inaccessible connections shall be made with the exothermic welding process using equipment manufactured by Burndy or Erico Products. Accessible connections shall be made with multiple bolt silicon bronze connectors specifically designed and accepted for the connection to be made. Connectors shall be as manufactured by Burndy or O.Z. Electric. Grounding jumpers shall be provided across metal parts, which are separated by non-conducting materials or joined so that there is a high resistance at the joints.
B. Grounding cable shall not be buried directly in concrete, but a conduit sleeve shall be provided where cable passes through concrete. Grounding cable buried in earth shall be tinned.

2.02 GROUNDING SOURCE:

A. All devices shall be grounded to building steel, according with NEC requirements and as per current local codes.
B. Maximum resistance to ground shall be limited to 5 ohms. Additional ground rods shall be driven if required to maintain this level. Maximum ground resistance to each of individual rods shall be 25 ohms. 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.

2.03 GROUND RODS:

A. Ground rods shall be of copper clad steel not less than 3/4 inch in diameter, 10 feet long, driven full length into the earth.

2.04 PARTS TO BE GROUNDED:

A. Switchgear frame, panelboard frames, fittings, fixtures and devices, cable sheaths, neutral of transformers, boxes and raceways, motor frames, outdoor lighting poles, non-current 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.

2.05 CONDUCTOR:

A. All grounding cable shall be green insulated copper stranded cable, soft drawn or annealed. Sized as indicated on drawings.

PART 3 -EXECUTION

3.01 GENERAL:

A. Grounding system installation shall conform to Article 250 NFPA 70 National Electrical Code, latest edition.
B. Grounding system shall be installed as shown on drawings.

3.02 INSTALLATION:

A. All connections to equipment, bus or conduit shall be made with accepted type of solderless connector and shall be thoroughly cleaned and made bright before connections is made to insure a good metal contact.
B. All connections which will be inaccessible after completion of project shall be made by exothermic weld process.
C. The grounding medium for all lighting branch circuits shall be the conduit system. The lighting fixture shall be grounded by means of a conductor between the outlet box and the fixture. All locknut connections to cabinets, pull boxes, 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. Where GFCI type receptacles are indicated; provide a separate ground conductor from the panelboard.
D. Bond all conduits stubbing under switchboard and similar locations using bonding bushings.
E. Flexible conduit shall not be used as a grounding medium. Provide a bonding wire in all flexible conduits and connect to the boxes at each end in an approved manner.

F. Unless otherwise indicated, provide in each feeder conduit an equipment-grounding conductor rated at l/3, the ampacity of the circuit conductors specified. For parallel runs, provide a ground conductor in each conduit.
G 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 non-metallic feed conduit is used.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Overcurrent protective devices.

1.02 RELATED SECTIONS:

A. Distribution Switchboard - Section 16425.
B. Disconnect Switches - Section 16440.
C. Panelboards - Section 16470.

1.03 SUBMITTALS:

A. Submit for review properly identified manufacturer's literature giving materials, finishes, accessories and installation directions where required.

1.04 LABELING:

A. Materials to bear Underwriters Laboratories labels. List for "Service Entrance" where so applied.

PART 2 -PRODUCTS

2.01 CIRCUIT BREAKERS:

A. GENERAL:
1. Circuit breakers shall conform to Fed. Spec. W-C-375, and shall be a circuit interrupting device which shall operate both manually for normal switching functions and automatically under overload and short circuit conditions. It is to provide 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 that 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. These breakers shall meet applicable NEMA AB-l and U/L Laboratories, Inc., specifications. Each circuit breaker shall have a trip unit to provide overload and short circuit protection. Trip element shall operate a common trip bar which shall open all poles in case of an overload or short circuit through any one 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 panel boards, distribution panelboards and individually enclosed shall be l, 2, or 3 poles as indicated on drawings.
5. Breakers shall have ground fault protection where indicated.
6. Acceptable manufacturers: GE, Square D, Westinghouse.

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 ampere interrupting capacities (RMS):
      a. 120 volts - 10,000 AIC power panelboards
      b. 277 volts - 14,000 AIC lighting panelboards
      c. 277/480 volts - up to 25,000 AIC distribution panelboards.
   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 all 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.

2.02 SEPARATELY ENCLOSED CIRCUIT BREAKERS:

A. Separately enclosed circuit breakers shall have NEMA 1 enclosures for indoor use and NEMA 12 stainless steel enclosures for outdoor use.

2.03 FUSES:

A. Fuses shall conform to Fed. Spec. W-F-791, NEMA FUI, ANSI C33.42.
B. Provide fuses for all fusible equipment regardless of which trade has furnished such equipment.
C. The time-current characteristic and ratings shall be such that positive selective coordination is assured.
D. Fuses, 601 amperes and larger, shall conform to U.L. Class L standard and be Shawmut Form 480 "Amp-Trap" or Bussman "Hi Cap".
E. Fuses, 600 amperes and lower, where applied to general feeder and branch circuit protection, shall conform to UL Class RK1 standards and be Shawmut dual element "Amp-Trap" or Bussman "Low Peak" Limitron.
F. 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% load for a minimum of ten seconds.
G. 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.
H. Individual motor circuit fuses shall be sized at approximately 150% of motor full load current. Fuses, below 600 amperes shall conform to UL Class RK5 standards and be Shawmut dual element "Amp-Trap" or Bussman Fusetron, Fuses 601 amperes and larger, shall conform to UL Class L standards and be Shawmut Form 480 "Amp-Trap" or Bussman "Hi Cap" KTU.
I. Fuses, where required for circuit breaker back-up protection shall conform to UL Class RK1 standards and be Chase-Shawmut Class RK1 "Amp-Trap" or Bussman "Limitron."

J. Provide 10% spares (minimum of three) of each size and type of fuses furnished. Spare fuses shall be placed in a wall-mounted cabinet, which shall be located in the main electric room.
K. Fuses shall be manufactured by Bussman, Cefco, or approved equal.

PART 3 -EXECUTION

3.01 BREAKERS AND FUSES:

A. Install breakers and fuses in strict accordance with manufacturer's recommendations, and accepted submittals.
B. Two and three pole breakers must be true two and three pole breakers. Do not combine single pole breakers with common handle connection to meet multiple pole breaker requirements.

3.02 LABELS:

A. Label circuit breaker enclosures with one-inch high-stenciled letters showing equipment served.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16530

EXTERIOR LIGHTING

PART 1 -GENERAL

1.01 RELATED SECTIONS:

A. 16112 - Raceways and Conduits.
B. 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
C. Wind load certification, by a Florida registered structural engineer, for exterior lighting poles.

PART 2 -PRODUCTS

2.01 MANUFACTURER:

A. Light fixtures shall be vandalproof types.

2.02 EQUIPMENT:

A. Exterior Lighting Fixtures:
   1. Exterior fixtures shall be vandal resistant.
   2. Provide required exterior lighting fixtures and components with NEMA LE2 HID lighting systems noise ratings.
   3. Exterior lighting fixtures shall be furnished as indicated on drawings and fixture schedule. Fixtures shall be complete with necessary wiring, amps, reflectors, glassware, and mounting accessories.
   4. Components of the same type, size, rating, functional characteristic, and make of similar exterior lighting fixtures shall be interchangeable.
   5. Fixture bases shall be metal and fastened to mounting locations with metal components.

2.03 LAMPS:

A. Provide lamps for exterior lighting fixtures.
B. Lamps shall be as indicated on the lighting fixture schedule.

C. Is preferable the use of LED light fixtures.

2.04 LIGHTING POLES:

A. Lighting Poles: Shall comply with standards and specifications and the following:
   1. Luminaries, pole, base, and sub-base of exterior lighting shall be capable of withstanding wind velocity pressures determined by American Society of Civil Engineers (ASCE) 7-93. Supplier shall provide Shop Drawings and calculations, signed and sealed by a Florida registered engineer, as proof of compliance with this requirement.
   2. Poles shall be of material, shape, finish, and height as indicated on the drawings. Provide a reinforced handhold and grounding lug on poles.

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 has 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.

3.03 LIGHTING POLES:

A. Lighting poles shall be installed according to manufacturer's instructions and according to details shown on electrical drawings. Adjust poles to be set plumb and make final adjustments as required.
B. Build concrete bases for lighting poles to the most stringent requirements as indicated on Construction Documents or submittal based on wind velocity pressures. Bases shall be complete with reinforcing anchor bolts, ground rod, and conduit entry.
C. Exterior light poles shall be solidly grounded to the conduit or to the circuit ground conductor in the case of nonmetallic conduit and to a local ground rod installed at the fixture base.
D. Provide weatherproof fuse holders in each ungrounded conductor within each lighting pole. Splices between circuit feed conductors and fixture conductors shall be made using molded waterproof connectors equivalent to Buss Tron type.
E. Luminaries shall be oriented and aimed to provide the illumination patterns desired. Adjust fixtures, reflectors, or lamps as required to obtain desired results.
F. Exterior lighting shall be controlled using a combination of photocell control with the programmable timed lighting control system.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

SECTION 16535

EMERGENCY LIGHTING UNITS

PART 1 -GENERAL

1.01 SECTION INCLUDES:

A. Emergency lighting and necessary accessories as indicated on the drawings and specified in this section.

1.02 RELATED SECTIONS:

A. Electrical General Provisions - 16010.
B. Lighting Fixtures and Lamps – Section 16510.

1.03 SUBMITTALS:

A. Submit identified manufacturer's literature and technical data including printed installation instructions and recommendations.

1.04 WARRANTY:

A. One year unconditional guarantee, five years pro-rata against defective parts and improper workmanship under normal operating conditions.

1.05 QUALITY ASSURANCE:

A. Emergency lighting units shall be UL listed.

PART 2 -PRODUCTS

2.01 UNIT EQUIPMENT:

A. Acceptable Manufacturers: Dual Lite, Day Brite Light or accepted equivalent to be submitted for approval.
B. Unit equipment shall consist of the following:
   1. Battery: Three-cell, six-volt, maintenance free, rechargeable, sealed lead calcium plastic battery having a 15-20 year life rating and operating capacity to power the connected lamps for 1-1/2 hours to 87.5 percent of initial nominal voltage of 1.75 volts per cell.
   2. Case: House battery in a compact heavy gage steel cabinet, in beige color finish, with front section hinged for easy access to battery, battery charger, fuses and wiring compartment and with provisions for wall mounting.
   3. Charger: Solid state, multi-rate, fully automatic with sensing device to determine charging rate and to charge battery to 100 percent of battery capacity within twelve hours following a full rated load discharge to 87-1/2 percent nominal voltage to 1.75 volt per cell.
   4. Transfer Relay: Solid state transfer relay for immediate transfer.
   5. Head Lamps: Two 25-watt Par 36 heads, mounted on the case as part of the unit.
   6. Input Voltage: Operate on 120 Volt, 60 cycle-input voltage.

7. Accessories:
   a. Tests switch – locate at one side of the housing.
   b. Charge monitoring light – locate at one side of the housing.
   c. AC Pilot light.
   d. Cell vents as required by NEC 480-9.

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 has been corrected in an appropriate manner.

3.02 INSTALLATION:

A. Install in accordance with manufacturer's recommendation and with applicable codes and regulations.
B. Securely mount unit equipment on the wall on brackets, two feet below ceiling or 7'-6" above finished floor, whichever is lower, exact location to be determined on the field.
C. Electrical connections to either a unit equipment or emergency lighting unit shall be permanent and connected to the circuit supplying power to other lights in that particular area, ahead of any switch controlling those lights.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT:

A. Work under this Section will not be separately measured for payment.

4.02 PAYMENT:

A. Work under this Section will be paid for as part of the Contract lump sum price for Division 16 – Electrical.

END OF SECTION

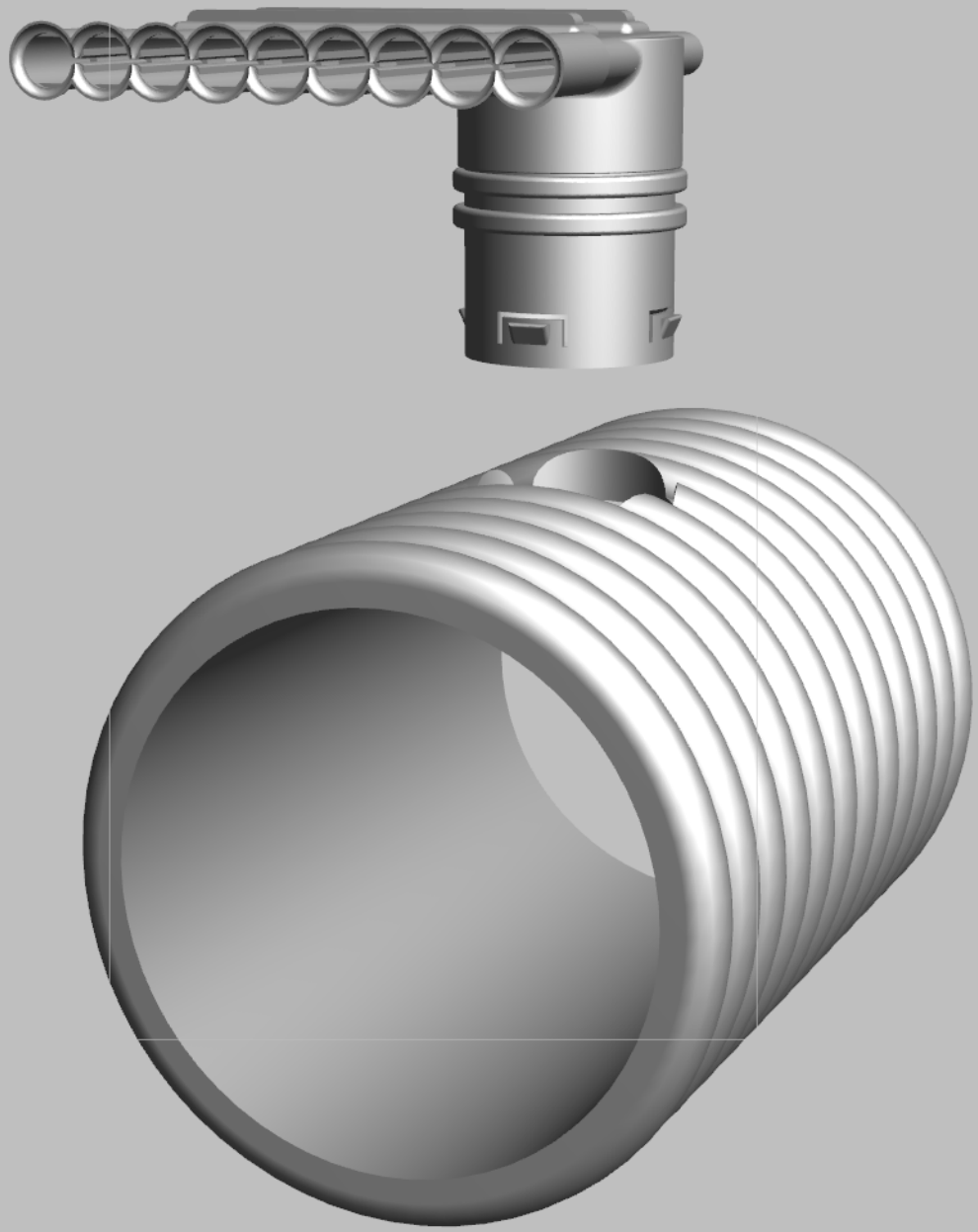
Multi-Flow Technical Properties

Property	Test Method	Value
Core		
Flow Rate, gpm/ft**	ASTM D-4716	29*
Compressive Strength, psf (sand method)	ASTM D-1621	6000
Thickness, inches	ASTM D-1777	1.0
Perforations/sq ft	----------	>300
Geotextile		
Weight (oz/yd^2)	ASTM D-3776	4.0
Tensile Strength, lb.	ASTM D-4632	100
Elongation, %	ASTM D-4632	50
Puncture, lb.	ASTM D-4833	50
Mullen Burst, psi	ASTM D-3786	200
Trapezoidal Tear, lb.	ASTM D-4533	42
Coefficient of Perm, cm/sec.	ASTM D-4491	0.1
Flow Rate, gpm/ft^2	ASTM D-4491	100
Permittivity, 1/sec.	ASTM D-4491	1.8
A.O.S. Max US Std Sieve	ASTM D-4751	70
UV Stability, 500 hrs., %	ASTM D-4355	70
Seam Strength, lb./ft.	ASTM D-4595	100
Fungus	ASTM G-21	No Growth

Values represent minimum average roll values.
* Horizontal installation.
** At gradient = 0.1, compressive force = 10psi for 100 hours.

Multi-Flow is available in three sizes: 6 inch, 12 inch, and 18 inch. Standard 150-foot lengths are shipped in fifty-five inch diameter rolls.

www.varicore.com 800-978-8007



Pre-Engineered Frame-Supported Shade Products

Part 1 – General

1.1 Related Documents

Drawings and general provisions of the Contract, including General Conditions and Division 1 Specifications Sections, apply to this section.

1.2 Summary

The shade structure contractor shall be responsible for design, engineering, fabrication and supply of the work specified herein. The intent of this specification is to have only one manufacturer be responsible for the aforementioned functions.

1.3 Submittals

1.3.1 Pre-Bid Submittals

A. Provide proof of installed reference sites with structures for similar scope of project and installation that are engineered to International Building Code (IBC) specifications. Include in reference list of structure dimensions with install dates and project locations.

B. Provide information to establish desired fabric color and power coat color.

C. Provide proof of all quality assurance items including:

1. A list of at least six (6) public municipal installations where manufacturer's product as proposed pursuant to this bid has been installed and has been in continuous use for a minimum of five (5) years each.

2. Proof of Liability and Umbrella Insurance.

1.3.2 Award of Contract Submittals

A. Make available wet-sealed structural engineering drawings and calculations

B. Provide fabric color and powder coat color selections for final order.

1.4 Project Conditions

A. Field Measurements: verify layout information for shade structures shown on the drawings in relation to the property survey and existing structures. Verify locations by field measurements prior to construction.

1.5 Warranty

A. The successful bidder shall provide a one (1) year warranty on all labor and materials.

B. A supplemental non-prorated warranty from the manufacturer shall be provided for a period of ten (10) years on fabric including stitching and twenty (20) years on the structural integrity of the steel, from date of substantial completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents, and will be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contractor documents.

D. Because of surety requirements, any performance and payment bond that might be required will cover only the first year of the warranty. The manufacturer's warranty will be a separate document and will be executed at the time of completion of the work.

Part 2 – Products

2.1 General

The shade products shall be designed and manufactured to the most exacting specifications by skilled craftsmen, and certified by Professional Engineers for structural soundness of designs. All shade products are shipped knocked-down, with complete assembly instructions, and ready for easy in-field installation.

Bidder's products must be completely manufactured entirely in its own factory by its own employees, including powder-coating, thereby ensuring complete quality control. Bidder must certify that no aspect of its production – including powder-coating – is contracted out to third parties.

The proposed structure(s) manufactured by Shade Systems, Inc. or approved equal, shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables and all fasteners.

A. **Manufactured by: Shade Systems, Inc.**
4150 SW 19th Street Ocala, FL 34474
(800) 609-6066
(352) 237-2256 Fax
Jeremy Purkis
jeremy@shadesystemsinc.com
www.shadesystemsinc.com

B. Or Equal: Standard for approved equal. Ten (10) day prior approval required for substitution of product design, materials and features specified above. Submittals must include plans, drawings, cut sheets, material data sheets, testing results and samples. Bids failing to meet this requirement will be deemed non-responsive.

C. Structures are engineered to meet or exceed the requirements of International Building Code (IBC), and the following standard specifications:

Wind Speed (Frame only): 150 M.P.H.

Wind Speed (Frame w/canopy): 90 M.P.H.

Live Load: None

Snow Load: None

Optional designs with greater wind speeds, live loads, and snow loads are available.

D. Material: All materials shall be structurally sound and appropriate for safe use. Product durability shall be ensured by the use of corrosion-resistant metals such as stainless steel, and coatings such as zinc-plating, galvanizing, and powder-coating on steel parts, subject to the Product-Specific requirements. Fabrics used shall include UV-stabilizers and fire retardants for longevity and safety.

E. Packaging: All metal posts, rafters and beams shall be wrapped in plastic and cardboard to protect the powder coat finish during shipping.

F. Weldments: All tubing members are factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship. Weldments are finished with a zinc-rich galvanized coating. No field welding is required in the assembly of the shade products.

G. Posts, Structural Frame Tubing, and Hardware: All tubing used shall be cold-formed and milled per ASTM A-135 and ASTM A-500. Material testing is in accordance with ASTM E-8. Minimum yield is 40,000 psi with a minimum tensile strength of 45,000 psi on all posts. All tubing shall be pre-cut to appropriate lengths, and all outside surfaces shall be galvanized, with an interior corrosion-resistant zinc-rich coating. Where required, support pipes shall be schedule 40 hot-dip galvanized or powder-coated black steel. All fastening hardware shall be stainless steel.

H. Polyester Powder-coating Process: All powder-coated parts are completely cleaned and a hot zinc phosphate pretreatment with non-chromic sealer is applied. Powder-coating is then electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance. Colors shall be specified.

I. Standard Footings: Footings shall be designed per stringent International Building Code (IBC) for the specified structure. Columns will be provided as standard direct embedment. Other footing designs are available.

J. Roofing: Structural frames are designed by Shade Systems only for use with Coolnet™ polyethylene shade fabric. Fabric is attached to frame using a vinyl covered minimum ¼" diameter stainless steel and clear vinyl coated cable. Cable fasteners are zinc-plated copper for maximum corrosion resistance.

2.2 Fastening System

A. Coolnet™ Shade Fabric shall be delivered complete with independent cables pre-inserted in fabric hems. Each cable shall be looped and clamped at each end. Fastening System to consist of the Turn-N-Slide™ fastening device which is factory installed at each roof rafter corner. The Turn-N-Slide features a concealed mechanism which allows the attachment hook and sleeve at each rafter corner to move along a track in the rafter. Cables are attached to hook which is welded to the moving sleeve, thereby distributing tension evenly over rafters and not directly onto the mechanism. Rafters are sealed with no penetrations on the top side, thereby preventing water from entering. Such moving sleeve with hook allows the looped ends of each cable to slide over the hook when the sleeve is at its upper position, and then by turning the concealed fastener within the rafter, moves the sleeve with hook outward (toward end of rafter), thereby tensioning the cables and securing the fabric at the proper tautness. A locking cap is secured at the end of each rafter with a vandal-resistant bolt (special wrench provided by the manufacturer) to prevent unauthorized access to the Turn-N-Slide mechanism. To remove the canopy, the cap is removed, and the mechanism rotated counter- clockwise. The sleeve with hook moves inward (toward peak of roof), thereby de-tensioning the cables, and allows fast removal of the canopy. Continuous one-piece cables, cables which are not independent per side and pre-looped and clamped at the factory, and/or cables which must be tensioned with the use of turnbuckles or tools not provided by the manufacturer are not acceptable. Structures which do not feature the Fastening Mechanism on each and every rafter, or fastening mechanisms which do not feature a sealed top rafter and moving outer sleeve such as the Turn-N-Slide, are not acceptable.

B. Fastening System Instructional Video: Product must be delivered complete with a minimum 5-minute instructional video on DVD media. Video must show the viewer the exact procedure for removing and re-attaching canopy using an actual shade structure in the field. Submittals which do not include the video on DVD media are not acceptable.

2.3 Fabric

A. Shade Fabric: Knitted of monofilament and tape construction high density polyethylene with Ultra-Violent (U.V.) stabilizers and flame retardant. UV- Block Factor varies by standard color offered from 91% to 99%.

Normal Thickness: 0.057 inches

Fabric Mass: Min 340 g/m²

Light Fastness: 7-8 (Blue Wool Scale)

Weather Fastness: 4-5 (Grey Scale Test)

Tear Resistance: Warp 210N Weft 276N

Breaking Force: Warp 786N Weft 2494N

Bursting Pressure: Mean 3500kPa

Bursting Force: Mean 2146N

All hems and seams are double row lock stitched using exterior grade UV- stabilized polyethylene GORE™ TENARA™ sewing thread (GORE and TENARA are trademarks of W.L. Gore & Associates).

A. Flammability: Shade Fabric is treated with fire retardants and passes requirements established under the NFPA 701 Test Method 2 test standards for flammability, including the accelerated water leaching protocol. Written evidence of compliance with this standard, including with accelerated water leaching protocol, must be furnished with bid proposal.

Color	Weight (g/m²)	Shade Factor %	UVR Block %
Canary Yellow	340	77	93
Eggshell White	340	79	95
Lime Green	400	87	94
Fire Orange	400	82	94
Onyx Black	340	97	97
Grape Purple	400	82	90
Desert Sand	340	84	95
Rivergum Green	340	86	93
Bright Red	340	81	91
Brick Red	340	95	94
Silver Grey	340	92	97
Light Blue	340	95	97
Navy Blue	340	96	99
Aquatic Blue	340	88	94
Forest Green	340	96	97

Part 3 – Execution

3.1 Installation

Installations of shade structure(s) shall be performed by an installer who shall comply with the manufacturer's instructions for assembly, installation, and erection, per approved drawings.

A. Concrete

1 Concrete work shall be executed in accordance with the latest edition of the American Concrete Building Code, ACI 318.

2 All reinforcement shall confirm to ASTM A-615, Grade 60.

3 Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual, and Manual of Standard Practice.

6’ PRO HINGED FOOTBALL GOALS

PART 1 GENERAL

1.1 SUMMARY

A. Provide all equipment and materials, and do all work necessary to furnish and install the Football Equipment, as indicated on the drawings and as specified herein.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:

1. Section 02200 - Earthwork; Excavation and Backfill and establishment of subgrade elevations.
2. Section 03300 - Cast-in-Place Concrete; Concrete foundations and bases for goals.
3. Section 321216 - Asphalt Paving
4. Section 321823.29 - Synthetic Field Surfacing

1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. U.S. Tennis Court and Track Builders Association
2. National Federation of State High School Associations (NFSHSA)
3. National Collegiate Athletic Association (NCAA)
4. International Amateur Athletic Foundation (I.A.A.F.)
5. Manufacturers Data and Recommended Installation Requirements.

1.4 SUBMITTALS

A. Manufacturers Product Data

1. Provide manufacturer’s product literature, technical specifications and other data prior to actual field installation work for Architect or Owner’s Representative review.

B. Shop Drawings

1. Provide drawings of manufacturers recommended installation and foundation requirements prior to actual field installation work for Architect or Owner’s Representative review.

1.5 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials delivered to the site shall be examined for concealed damage or defects in shipping. Any defects shall be noted and reported to the Owner’s Representative.

B. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule.

C. Sound materials shall be stored above the ground under protective cover or indoors so as to provide proper protection.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers and product selections named are provided to establish the minimum standard.

1. Football Equipment - As manufactured by AAE (Aluminum Athletic Equipment Co.); 1000 Enterprise Drive, Royersford, PA 19468; Toll Free (800) 523-5471.

2.2 FOOTBALL EQUIPMENT

A. 6’ Offset Professional Football Goals - Shall be as manufactured by AAE:

1. Model # HSG-NFL-35:
   a. Gooseneck Assembly: Components are completely welded, materials: Baseplate 15" sq. x 3/4" thick HRS, Gooseneck Post (1) 5-9/16" o.d. x .258" wall structural steel tubing, 5’ radius bend, 6’ offset, Baseplate Ribs (4) 4-1/2" x 3" x 1/4" thick HRS, C-Channel 5-9/16" x 2-1/8" legs x 1/4" wall, 42" lg., HRS, C-Channel Rib 12" x 15" x 1/4"steel reinforcing plate, HRS, w/ welded end cap,

b. Crossbar Assembly: Components are completely welded, materials: Crossbar 5" Sch. 40 aluminum pipe 5-9/16" o.d. x .258" wall x 19'-2" lg. (18'-6" distance between uprights) 6061T6, Outer Sleeve 4" dia. x .125" wall 6061T6 aluminum tube, Sleeve Insert 3-3/4" dia. x .375" wall 6061T6 aluminum tube.

c. Upright Assembly: Components are completely welded, materials: Upright 4" o.d. x .125" wall x 35'-0" lg. 6061T6 aluminum tube, 4"dia. x 1/8" thick welded cap with eyebolt 5/16" stainless steel, Streamer 4" x 42" x two-ply red nylon streamer.

d. Foundation Template with J-Bolts: 15" x 21" x 11 gauge HRS galvanized, J-Bolt 1"-8 x 30"lg. ‘L’ bend j-bolt anchor HDG A449 rolled thread, 2H leveling nuts, dock washers grade5 galvanized steel, Vinyl Cap 1" dia. x 8" lg. red vinyl cap protector.

e. Hardware: 5/8"-11 x 7" grade 5 HDG bolts, washers, loc-washers, nuts for crossbar; 1/2"-13 x 5" grade 5 HDG bolts, washers, nuts for uprights.

f. Five Step Paint/Coat Process: 1) Acid wash. 2) Zinc primer (Gooseneck Only). 3) White primer 4) NFL specified Day-Glo™ Saturn Yellow 5) Baked UV protective clear coat

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where equipment and systems are to be installed and notify the contractor of conditions detrimental to the proper and timely installation and completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable and to the satisfaction of the Architect/Engineer or Owner's Representative.

3.2 INSTALLATION

A. All athletic equipment shall be installed as indicated on approved submittals as recommended and in strict accordance with manufacturer's written directions and as indicated on the drawings and specified herein.

B. All concrete footings for athletic equipment shall be installed as indicated on the drawings and in accordance with Section 03300, Cast-in-Place Concrete.

C. All sleeves required for athletic equipment installation shall be set plumb and true to line and grade in concrete as indicated on the drawings and per manufacturer's recommendation.

D. All athletic equipment shall be installed in strict accordance with the latest rules, regulations and specifications governing that sport or event for which it is being installed.

3.3 TESTING, ADJUSTMENT AND OPERATION

A. All athletic equipment requiring testing, adjustments and operation shall be tested for proper operation and adjusted to conform to specified standards.

B. Provide certifications as required, indicating that equipment has been tested and adjusted to conform to specified standards.

C. Provide operating and maintenance instructions and manuals to Owner - designated personnel for the proper operation and care of equipment after equipment has been tested and adjusted to conform to specified standards.

3.4 CLEANING

A. Upon completion of work in any given area, remove all trash and debris from the work area and leave in clean condition.

- END OF SECTION -

DAKTRONICS FB-2021 PRODUCT SPECIFICATIONS

(BID ALTERNATE)

Optional Team Name Message Centers (TNMCs)

Optional Backlit Captions
Or
Optional Electronic Captions

This outdoor LED football scoreboard displays period time to 99:59, HOME and GUEST scores to 99 and DOWN/TO GO/ BALL ON/QTR (quarter) information. T.O.L. (time outs left) to nine are optional. Arrows indicate possession. When period time is less than one minute, the scoreboard displays time to 1/10 of a second. Scoreboard shown with optional striping and amber PanaView® digits.

DIMENSIONS	# OF SECTIONS
8'-0" H x 25'-0" W x 8" D (2.44 m, 7.62 m, 203 mm)	Two Total
4'-0" H x 25'-0" W x 8" D (1.22 m, 7.62 m, 203 mm)	One Top & One Bottom

Note: *Models with 240 VAC power at half the indicated amperage are also offered (International Use Only).*

CAPTION OPTIONS	UNCRATED WEIGHT		POWER (120 VAC)
Vinyl Captions (Standard)	Top & Bottom: 410 lb (186 kg)	Total: 820 lb (372 kg)	600 Watts, 5 Amps
8x48 TNMCs	Top: 530 lb (240 kg) Bottom: 410 lb (186 kg)	Total: 940 lb (426 kg)	900 Watts, 7.5 Amps
8x48 TNMCs & 8x32 Electronic Captions	Top: 530 lb (240 kg) Bottom: 570 lb (259 kg)	Total: 1100 lb (499 kg)	1500 Watts, 12.5 Amps
Backlit Captions	Top: 474 lb (215 kg) Bottom: 490 lb (222 kg)	Total: 964 lb (437 kg)	1620 Watts, 13.5 Amps

DIGITS & INDICATORS

- Clock digits are 30" (762 mm) high. Optional T.O.L. digits are 18" (457 mm) high. All other digits are 24" (610 mm high.
- Select all red or all amber LED digits and indicators. Scoreboard may instead have mixed LED digit colors (see DD1965467).
- Scoreboard features robust weather-sealed digits (see DD2495646).
- Digits may be dimmed for night viewing.

DISPLAY COLOR

Choose from 150+ colors (from Martin Senour® paint book) at no additional cost.

CONSTRUCTION

Alcoa aluminum alloy 5052 for excellent corrosion resistance

CAPTIONS

- HOME and GUEST captions are 15" (381 mm) high. All other captions are 12" (305 mm) high.
- Standard captions are vinyl, applied directly to the display face.
- Optional backlit captions consist of white letters on a black background. Team name captions are 14" (356 mm) high. All other captions are 12" (305 mm) high.
- Optional electronic captions automatically change according to the sport mode, eliminating the need for caption panels. Electronic captions and TNMCs are 10.6" (269 mm) high.

WWW.DAKTRONICS.COM E-MAIL: SALES@DAKTRONICS.COM

201 Daktronics Drive, PO Box 5128, Brookings, SD 57006
Phone: 1-800-325-8766 or 605-692-0200 Fax: 605-697-4746

DAKTRONICS®

DAKTRONICS FB-2021 PRODUCT SPECIFICATIONS

PRODUCT SAFETY APPROVAL
ETL listed to UL Standards 48 and 1433; tested to CSA standards and CE labeled for outdoor use

OPERATING TEMPERATURES
- Display: -22 to 122° Fahrenheit (-30 to 50° Celsius)
- Console: 32 to 130° Fahrenheit (0 to 54° Celsius)

CONTROL CONSOLE	CONTROL OPTIONS
All Sport® 5000 (see SL-03991)	***Wired (standard):*** One-pair shielded cable of 22 AWG minimum is required. A cover plate with mounted connector and standard 2" x 4" x 2" (51 mm x 102 mm x 51 mm) outlet box is provided. Connector mates with signal cable from control console.
	Wireless (optional): 2.4 GHz spread spectrum radio features 64 non-interfering channels and 8 broadcast groups (see SL-04370).

SEGMENT TIMER MODE
The segment timer mode is ideal for keeping practices on schedule. The horn at the end of a segment allows coaches and athletes to focus on the practice and to listen for the horn when it is time to change drills (see SL-04004).

MOUNTING
Scoreboard is typically mounted on two or three vertical beams or poles. Hardware to mount scoreboard on three beams is included; hardware for more beams is at additional cost. Standard mounting uses I-beam clamps. Optional mounting method using angle brackets is also offered; maximum beam width is 12" (305 mm) and maximum beam depth is 22" (559 mm). Refer to attached drawings for more information on mounting methods.

SERVICE ACCESS
Digit panels and electronics are serviced from the front of the scoreboard.

GENERAL INFORMATION
Scoreboard provides scoring capabilities for two teams. 100% solid state electronics are housed in an all aluminum cabinet. Scoreboard is shipped in two sections. Specifications and pricing are subject to change without notice.

OPTIONS & ACCESSORIES
- Scoreboard border striping
- Multiple caption and striping colors (see DD2101644)
- Team name caption in place of HOME *
- Team names on changeable panels *
- Programmable Team Name Message Centers (see DD1696958)
- T.O.L. digits with captions
- Two 3'-7" (1.09 m) tall x 2'-7.125" (791 mm) wide logo/sponsor panels (not available with T.O.L. digits). Copy is applied to removable panels.
- Backlit or electronic captions
- Baseball, lacrosse/field hockey, and soccer captions on changeable panels
- LED colon
- Horn
- Standalone Time of Day – scoreboard acts as a clock when control console is unplugged/off
- Individual digit protective screens (see SL-04939)
- Protective netting
- Optional angle bracket mounting method
- Advertising/identification panels
- Decorative accents
- Electronic message centers and video displays in multiple sizes

** Only for scoreboard without Team Name Message Centers*

ADVERTISING/IDENTIFICATION PANELS

Backlit & Non-Backlit:

1'-6" H x 25'-0" W (457 mm, 7.62 m)
2'-0" H x 25'-0" W (610 mm, 7.62 m)
2'-6" H x 25'-0" W (762 mm, 7.62 m)
3'-0" H x 25'-0" W (914 mm, 7.62 m)
4'-0" H x 25'-0" W (1.22 m, 7.62 m)

For additional non-backlit panel sizes, see SL-03761.

FOR ADDITIONAL INFORMATION
- Installation Specifications: DWG-1183308 (attached)
- Standard I-beam Mounting: DWG-1052565 (attached)
- Optional Pole Mounting: DWG-1048184 (attached)
- Component Locations: DWG-1072175 (attached)
- Architectural Specifications: See SL-10092
- Installation Manual: See DD1969938
- Service Manual: See DD2124597

ALTERNATE CAPTIONS & SCORING MODES

Segment Timer Mode –
Standard vinyl captions shown

Football Mode –
Optional TNMCs shown

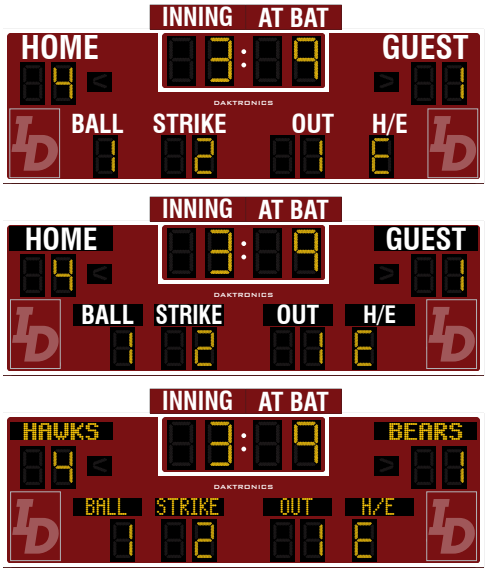
Football Mode with T.O.L. Option –
vinyl, backlit & electronic captions shown
(vinyl or backlit T.O.L. captions only)

Soccer Mode –
vinyl, backlit & electronic captions shown
(SHOTS displayed with electronic captions)

Lacrosse/Field Hockey Mode –
vinyl, backlit & electronic captions shown
(SHOTS & PER displayed with electronic captions)

201 Daktronics Drive, PO Box 5128, Brookings, SD 57006
Phone: 1-800-325-8766 or 605-692-0200 Fax: 605-697-4746

DAKTRONICS



Baseball Mode, without Clock –
vinyl, backlit & electronic captions shown
(12" vinyl INNING/AT BAT captions only)

Baseball Mode, with Clock –
vinyl, backlit & electronic captions shown
(6" vinyl H/E captions only)

DAKTRONICS

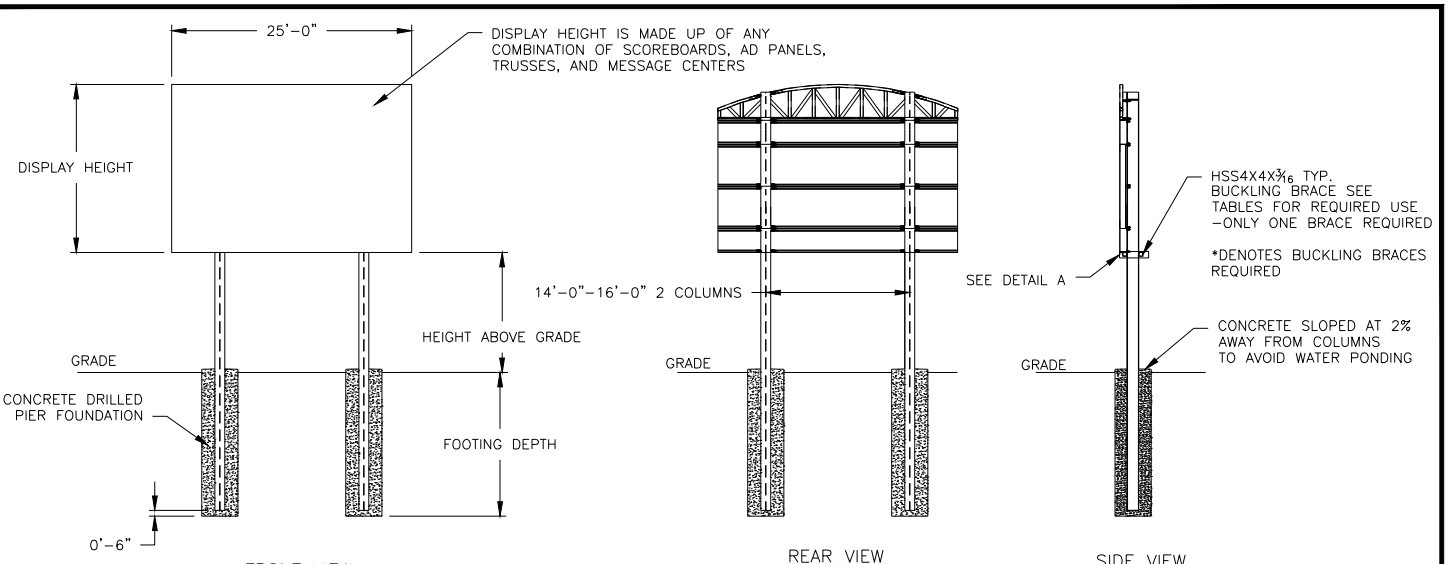


TABLE A – MOUNTING

EXPOSURE B

HEIGHT ABOVE GRADE = 10'						HEIGHT ABOVE GRADE = 15'					
DISPLAY HEIGHT (FT)		DESIGN WIND VELOCITY				DISPLAY HEIGHT (FT)		DESIGN WIND VELOCITY			
		115 MPH	130 MPH	150 MPH	170 MPH			115 MPH	130 MPH	150 MPH	170 MPH
8	COLUMN	W8X28	W8X31	W14X38	W12X40	8	COLUMN	W10X39	W14X43	W10X49	W12X58
	FOOTING	3.0'X8.0'	3.0'X9.0'	3.0'X10.0'	3.0'X11.0'		FOOTING	3.0'X9.0'	3.0'X10.0'	3.0'X11.0'	3.0'X12.0'
10	COLUMN	W10X33	W10X39	W14X43	W12X53	10	COLUMN	W10X45	W12X53	W12X58	W16X67
	FOOTING	3.0'X9.0'	3.0'X10.0'	3.0'X11.0'	3.0'X12.0'		FOOTING	3.0'X10.0'	3.0'X11.0'	4.0'X11.0'	4.0'X13.5'
12	COLUMN	W10X39	W14X43	W12X53	W14X61	12	COLUMN	W12X53	W12X58	W12X72	W18X76
	FOOTING	3.0'X10.0'	3.0'X10.5'	3.0'X12.0'	4.0'X12.0'		FOOTING	3.0'X11.0'	3.0'X12.0'	3.0'X13.5'	3.0'X13.5'
14	COLUMN	W14X43	W12X53	W12X58	W16X67	14*	COLUMN	W14X48	W18X55	W21X62	W24X68
	FOOTING	3.0'X10.5'	3.0'X11.5'	4.0'X11.5'	4.0'X13.0'		FOOTING	3.0'X11.5'	3.0'X13.0'	4.0'X13.0'	4.0'X15.0'
16	COLUMN	W12X53	W14X61	W12X72	W18X86	16*	COLUMN	W21X48	W21X62	W21X68	W24X76
	FOOTING	3.0'X11.5'	4.0'X11.0'	4.0'X12.5'	4.0'X14.5'		FOOTING	4.0'X11.0'	4.0'X12.0'	4.0'X14.5'	4.0'X17.0'
18*	COLUMN	W16X40	W21X48	W21X55	W21X68	18*	COLUMN	W21X55	W16X67	W18X76	W27X84
	FOOTING	3.0'X12.0'	4.0'X12.0'	4.0'X14.0'	4.0'X16.0'		FOOTING	4.0'X12.0'	3.0'X16.0'	4.0'X16.0'	4.0'X18.5'
20*	COLUMN	W14X48	W18X55	W21X62	W24X68	20*	COLUMN	W21X62	W24X68	W24X84	W30X90
	FOOTING	3.0'X13.0'	3.0'X15.0'	4.0'X15.0'	4.0'X18.0'		FOOTING	4.0'X12.5'	4.0'X14.5'	4.0'X17.5'	5.0'X17.5'

FOOTING DIMENSIONS = DIAMETER X DEPTH
* DENOTES ADDITIONAL BRACES REQUIRED AT THE MID HEIGHT OF DISPLAY

EXPOSURE C

HEIGHT ABOVE GRADE = 10'				HEIGHT ABOVE GRADE = 15'			
DISPLAY HEIGHT (FT)		DESIGN WIND VELOCITY		DISPLAY HEIGHT (FT)		DESIGN WIND VELOCITY	
		115 MPH	140 MPH			115 MPH	140 MPH
8	COLUMN	W10X33	W12X40	8	COLUMN	W14X43	W12X58
	FOOTING	3.0'X9.5'	3.0'X10.5'		FOOTING	3.0'X10.0'	3.0'X12.0'
10	COLUMN	W14X43	W12X53	10	COLUMN	W12X53	W12X65
	FOOTING	3.0'X10.5'	3.0'X11.5'		FOOTING	3.0'X11.5'	3.0'X13.5'
12	COLUMN	W14X48	W12X58	12	COLUMN	W14X61	W18X76
	FOOTING	3.0'X11.5'	4.0'X11.5'		FOOTING	4.0'X12.0'	4.0'X13.0'
14	COLUMN	W12X53	W16X67	14*	COLUMN	W21X48	W21X68
	FOOTING	4.0'X11.0'	4.0'X13.0'		FOOTING	4.0'X12.0'	4.0'X14.5'
16	COLUMN	W12X65	W18X76	16*	COLUMN	W21X62	W18X76
	FOOTING	4.0'X11.5'	4.0'X14.0'		FOOTING	4.0'X13.0'	4.0'X16.0'
18*	COLUMN	W21X48	W21X62	18*	COLUMN	W21X68	W24X84
	FOOTING	4.0'X12.5'	4.0'X15.5'		FOOTING	4.0'X14.0'	4.0'X18.0'
20*	COLUMN	W21X55	W21X68	20*	COLUMN	W18X76	W30X90
	FOOTING	4.0'X13.5'	4.0'X17.0'		FOOTING	4.0'X15.5'	5.0'X17.0'

FOOTING DIMENSIONS = DIAMETER X DEPTH
* DENOTES ADDITIONAL BRACES REQUIRED AT THE MID HEIGHT OF DISPLAY

NOTES:

1. FOOTING AND COLUMN SIZES ARE SUGGESTIONS ONLY, PROVIDED TO ASSIST WITH ESTIMATING INSTALLATION COSTS AND ARE NOT INTENDED FOR CONSTRUCTION PURPOSES. THE DESIGN MUST BE CERTIFIED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF THE INSTALLATION BEFORE THEY CAN BE USED FOR FABRICATION Or ERECTION.

2. INTERNATIONAL BUILDING CODE 2012 USED IN DESIGN OF COLUMNS AND FOOTINGS WITH, IMPORTANCE FACTOR=1, Kzt=1.0, Kd=0.85, G=0.85. SEISMIC DESIGN WAS NOT CONSIDERED.

3. FOOTING DIMENSIONS ARE BASED ON ASSUMED SOIL CLASS 4 (ALLOWABLE LATERAL BEARING PRESSURE OF 150 psf).

4. STRUCTURAL STEEL IS GRADE A992 (50 ksi) STEEL. CONCRETE SHALL HAVE A MINNIMUM 28 DAY COMPRESSIVE STRENGTH OF 2500 psi.

5. THE AVERAGE DISPLAY WEIGHT FOR A LAYOUT CAN NOT EXCEED 8 PSF.

6. DAKTRONICS INC. IS NOT RESPONSIBLE FOR STRUCTURES DESIGNED AND INSTALLED BY OTHERS.

7. LOCAL BUILDING OFFICIALS SHOULD BE CONTACTED TO DETERMINE THE WIND SPEED AND EXPOSURE CATEGORY FOR THE PROPOSED SIGN LOCATION. THE EXPOSURE CATEGORY C IS DEFINED AS:

EXPOSURE B – URBAN AND SUBURBAN AREAS, OR OTHER TERRAIN WITH NUMEROUS SPACED OBSTRUCTIONS HAVING THE SIZE OF SINGLE-FAMILY DWELLINGS OR LARGER. THESE CONDITIONS MUST PREVAIL FOR A DISTANCE FROM THE SIGN OF AT LEAST 2,600 ft OR 20 TIMES THE SIGN HEIGHT, WHICHEVER IS GREATER

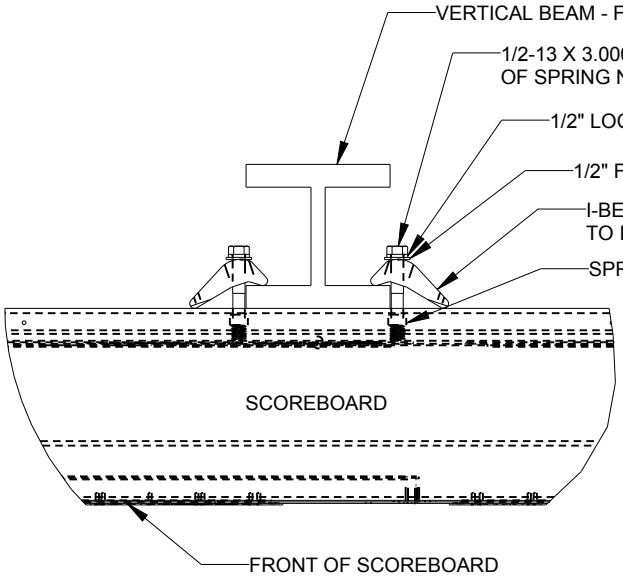
EXPOSURE C – OPEN TERRAIN WITH SCATTERED OBSTRUCTIONS HAVING HEIGHTS GENERALLY LESS THAN 30 FT. THIS CATEGORY INCLUDES FLAT OPEN COUNTRY, GRASSLANDS, AND ALL WATER SURFACES IN HURRICANE PRONE REGIONS.

8. FOR SPECIFIC PRODUCT DETAILS ON WEIGHT, MOUNTING, ETC. REFER TO THE INDIVIDUAL PRODUCT SPECIFICATION SHEETS.

DAKTRONICS, INC.
BROOKINGS, SD 57006

DO NOT SCALE DRAWING

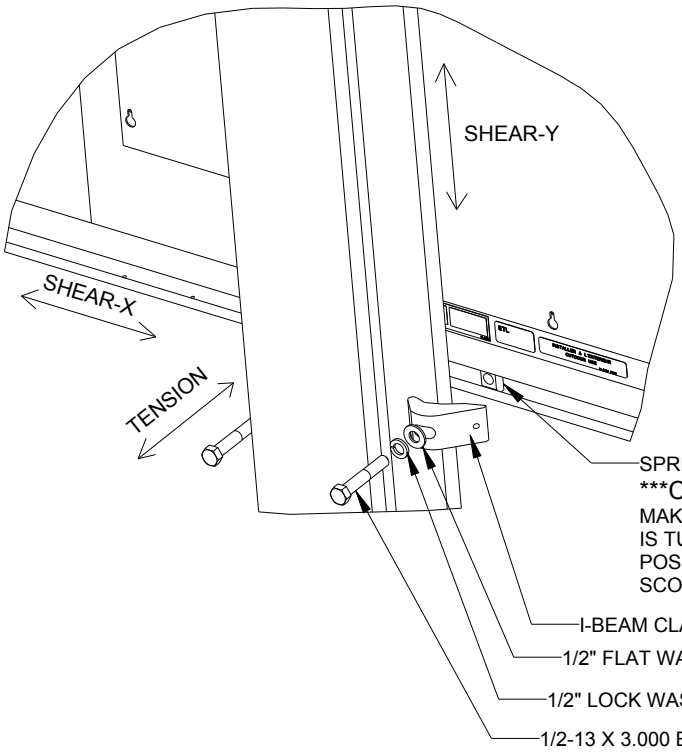
PROJ: OUTDOOR SCOREBOARD INSTALLATION				
TITLE: 25' WIDTH SCOREBOARD INSTALLATION SPECS.				
DESIGN: TTASCHN	DRAWN: TTASCHN		DATE: 22JUL14	
SCALE: 1/16"=1'				
SHEET	REV	JOB NO:	FUNC-TYPE-SIZE	1183308
	00	P1538	E-10-A	



STANDARD MOUNTING METHOD

TOP VIEW

MOUNTING INSTRUCTIONS:
1. PLACE SPRING NUTS INTO SCOREBOARD CHANNEL IN APPROXIMATE LOCATION OF VERTICAL BEAMS
2. LIFT SCOREBOARD INTO POSITION
3. MAKE SURE THE 1/2-13 BOLTS ARE AS CLOSE TO THE I-BEAM FLANGES AS POSSIBLE
4. WHEN SCOREBOARD IS ADJUSTED TO FINAL DESIRED POSITION, TIGHTEN BOLTS FIRMLY
5. IF FLANGE THICKNESS IS MORE THAN 3/4" THICK LONGER BOLTS WILL BE REQUIRED AT THE CUSTOMER'S EXPENSE.



ALLOWABLE CAPACITY PER EACH CLAMP:
SHEAR = 160 LBS
TENSION = 2300 LBS

SHEAR AND TENSION LOAD DIRECTION ARE AS INDICATED ON REAR ISOMETRIC VIEW

EXPLODED REAR ISOMETRIC VIEW

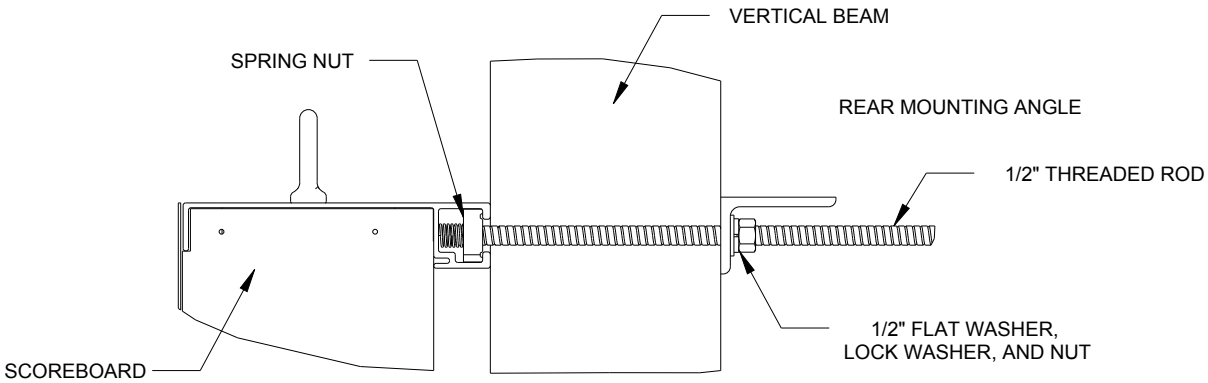
REV	DATE:		BY:	
REV 04	DATE: 6 JAN 14	ADDED ALLOWABLE TENSION AND SHEAR CAPACITY DETAILS	BY: JAVA	
REV 03	DATE: 23 OCT 13	CHANGED BOLT TORQUE FROM 30 FT-LB TO 40 FT-LB PER EC-12382	BY: NJM	
REV 02	DATE: 07 MAR 12	ADDED STADNARD MOUNTING METHOD NOTES	BY: KDD	
REV 01	DATE: 21 FEB 12	CHANGED ROCKER TO I-BEAM	BY: KDD	

DAKTRONICS, INC.
BROOKINGS, SD 57006

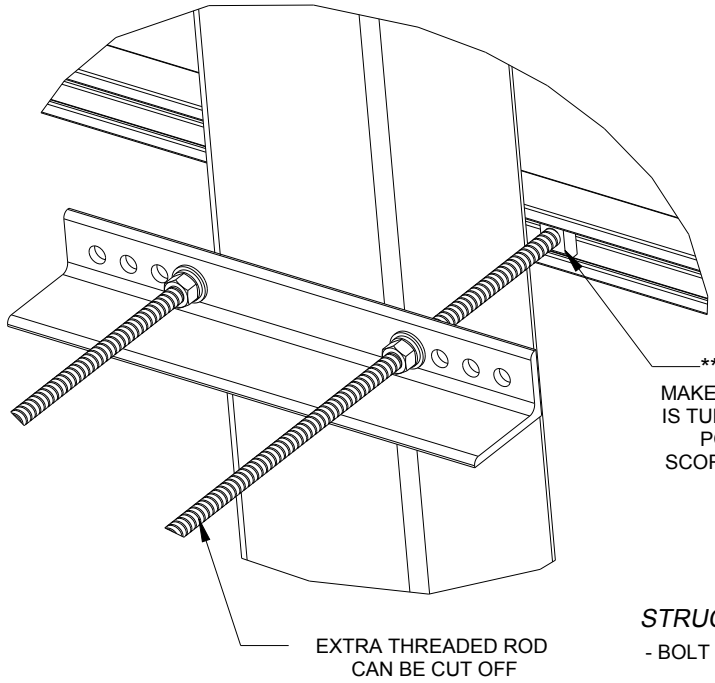
DO NOT SCALE DRAWING

PROJ: OUTDOOR SCOREBOARD
TITLE: P1647; I-BEAM CLAMP MOUNTING
DESIGN: MCARSRU | DRAWN: MCARSRU | DATE: 06-JAN-14
SCALE: 1/8

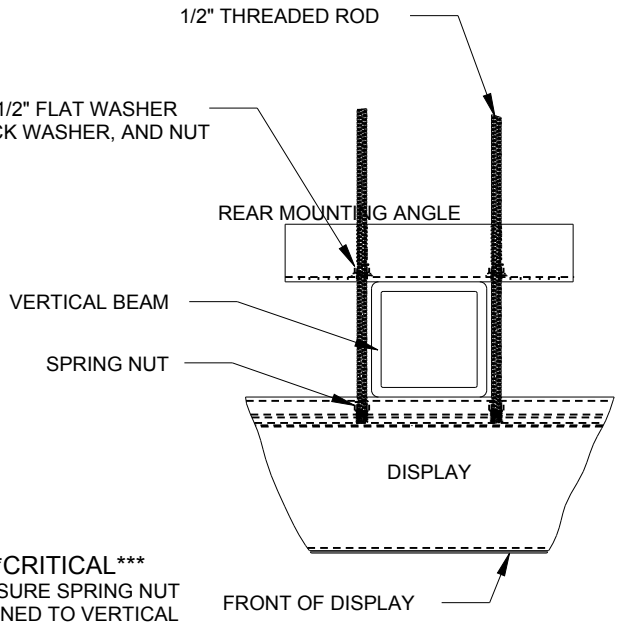
SHEET:	REV	JOB NO:	FUNC-TYPE-SIZE	
1 OF 1	04	P 1647	E – 07 – A	1052565



SIDE VIEW



REAR ISOMETRIC VIEW



CRITICAL
MAKE SURE SPRING NUT IS TURNED TO VERTICAL POSITION INSIDE SCOREBOARD CHANNEL

TOP VIEW
SCALE 1/10

STRUCTURAL NOTES:

- BOLT TORQUE: 30 FT-LB

NOTES:

- THREADED RODS RUN ALONG BOTH SIDES OF BEAM
- RODS DO NOT PASS THROUGH THE FLANGES OF THE BEAM
- NO DRILLING NECESSARY
- MAKE SURE SPRING NUT IS PERPENDICULAR TO CHANNEL OPENING ON SCOREBOARD

REV	DATE:		BY:	
03	3 JULY 13	ADDED STRUCTURAL NOTE	TTF	
02	20 SEP 12	REMOVED CHAMFER FROM 0M-133259 PER EC-7114	LMG	
01	06 OCT 11	REPLACED VERTICAL I-BEAM WITH 6" X 6" SQUARE TUBE	JAVA	

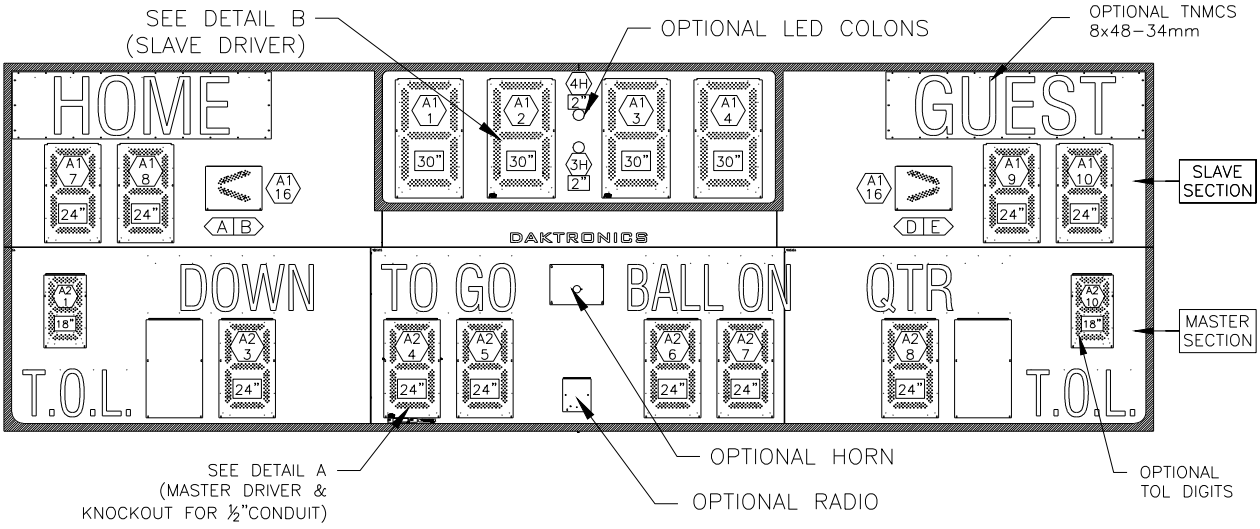
DAKTRONICS, INC.
BROOKINGS, SD 57006

DO NOT SCALE DRAWING

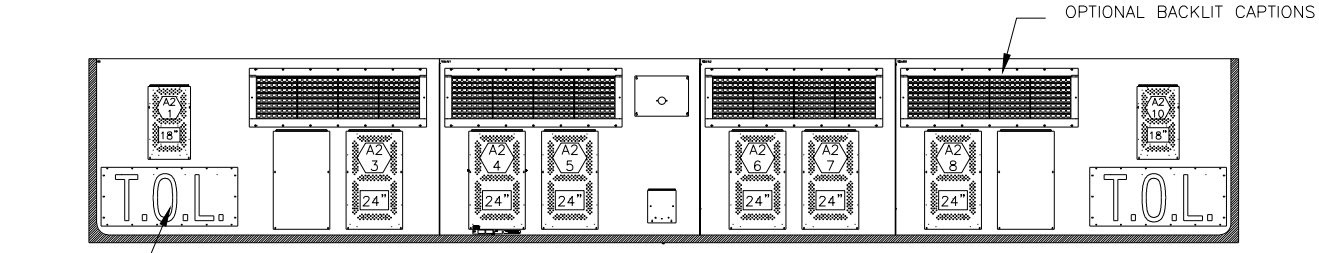
PROJ: OUTDOOR SCOREBOARDS
TITLE: P1647; POLE MOUNTING OPTIONS
DESIGN: DOPPELT | DRAWN: DOPPELT | DATE: 22 MAR 11
SCALE: 1/5

SHEET:	REV	JOB NO:	FUNC-TYPE-SIZE	
1 OF 1	03	P1647	E - 10 - A	1048184

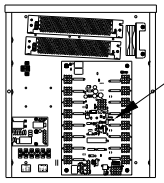
FB-2021-R/-A



FRONT VIEW
TOP/BTM SHOWN WITH VINYL CAPTIONS

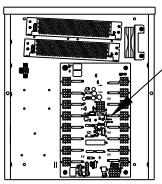


FRONT VIEW
BTM SHOWN WITH 8X32-34mm
ELECTRONIC CAPTIONS AND VINYL TOL



ENCLOSED 16 COLUMN MASTER LED DRIVER AND SIGNAL ENCLOSURE @1.
(THE COVER HAS BEEN REMOVED TO SHOW THE ENCLOSURE COMPONENT DETAIL.)

DETAIL: A
x2 SCALE



ENCLOSED 16 COLUMN SLAVE LED DRIVER AND SIGNAL ENCLOSURE @1.
(THE COVER HAS BEEN REMOVED TO SHOW THE ENCLOSURE COMPONENT DETAIL.)

DETAIL: B
x2 SCALE

NOTES:

A1 / 1 = LED DRIVER NUMBER & LED DRIVER CONNECTOR WIRED TO THAT DIGIT.

24" = DIGIT SIZE

A | B | C = SEGMENT DESIGNATIONS

REV	DATE:		BY:
02	05 MAY 14	PER EC-14303, UPDATED LABELS	KDD
01	24 APR 13	PER EC-9747, UPDAETD FB INDICATORS	KDD

DAKTRONICS, INC.
BROOKINGS, SD 57006
DO NOT SCALE DRAWING

PROJ: OUTDOOR SCOREBOARDS
TITLE: COMPONENT LOCATION; FB-2021-R/-A
DESIGN: DOPPELT | DRAWN: JVANAAR | DATE: 13 OCT 11
SCALE: 1/50

SHEET	REV	JOB NO:	FUNC-TYPE-SIZE
	02	P1647	R-08-A

1072175