October 14, 2014
BOARD OF COUNTY COMMISSIONERS
ORANGE COUNTY, FLORIDA
Addendum No. 1, IFB Y15-719-SB

JOHN YOUNG COMMUNITY PARK

Bid Opening Date: November 13, 2014 at 2:00 P.M.

This addendum is hereby incorporated into the bid documents of the project referenced above. The following items are clarifications, corrections, additions, deletions and/or revisions to, and shall take precedence over, the original documents. Underlining indicates additions, deletions are indicated by ~~strikethrough~~.

A. The bid opening date remains November 13, 2014 at 2:00 P.M.

B. Additions, Deletions and Clarifications:

1. **Revision:** Table of Contents (dated 10/8/14) has been revised to include the attached Section 02010 Geotechnical Report and Recommendations.

2. **Addition:** The following specification has been added - Section 02010 Geotechnical Report and Recommendations (dated 10/10/14)

3. **The following specifications have been revised in their entirety.**
   - Specification Section 03900 Skate Park Specialist (dated 10/8/14)
   - Specification Section 16530 Exterior Luminaries (dated 10/8/14)

4. **Clarification:** Project has been submitted for permitting. There is a separate permit for the site and a separate permit for the restroom/storage building. The contractor shall include the cost of **all** permit fees in the bid. Contractor shall contact Orange County Building Department for permit fees as well as Orange County Utilities for separate utilities permit fees. Permit numbers are as follows:
   - B14902961 (Site)
   - B14902960 (Restroom/Storage Building)

C. ACKNOWLEDGEMENT OF ADDENDA

a. The Bidder/Proposer shall acknowledge receipt of this addendum by completing the applicable section in the solicitation or by completion of the acknowledgement information on the addendum. Either form of acknowledgement must be completed and returned not later that the date and time for receipt of the bid or proposal.

b. **Receipt acknowledged by:**

c. All other terms and conditions of the IFB remain the same.

_____ _____

Authorized Signature Date Signed

_____

Title

_____

Name of Firm

JOHN YOUNG COMMUNITY PARK
SPECIFICATIONS
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SECTION 02010

GEOTECHINICAL REPORT AND RECOMMENDATIONS

Geotechnical Engineering Report

Deerfield/SR 417 Community Park

Orange County, Florida

September 19, 2013

P.O. No. C11903A026

Nodarse/Page One Project No. AK135004; It follows and is herewith made part of the specifications for the project

Geotechnical Engineering Report

Deerfield/SR 417 Community Park
Orange County, Florida

September 19, 2013
PO No. C11903A026
Nodarse / Page One Project No. AK135004

Prepared for:
Orange County Capital Projects Division
Orlando, Florida

Prepared by:
Nodarse / Page One Joint Venture, LLC
Winter Park, Florida

1675 Lee Road, Winter Park, Fl 32789, (407) 740-6110, (407) 740-6112 [fax]

September 19, 2013

Orange County Capital Projects Division
400 East South Street, 5th Floor
Orlando, Florida 32801

Attn: Mr. Guysen Bohler
P: [407] 836 0044
E: guysen.bohler@occc.net

Re: Geotechnical Engineering Report
Deerfield/SR 417 Community Park
Orange County, Florida
PO No. C11903A026
Nodarse / Page One Project Number: AK135004

Dear Mr. Bohler:

Nodarse/Page One Joint Venture, LLC (Nodarse/Page One) has completed the geotechnical engineering services for the above-referenced project. This study was performed in general accordance with our proposal number PH1130366.2 dated June 6, 2013, authorized by Purchase Order C11903A026.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning geotechnical earthwork and the design and construction of pavements, stormwater management facilities, and foundations for small structures at the subject site.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Nodarse / Page One Joint Venture, LLC

SHENNA LUU McMASTER
LICENSE
No 57537
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

Shenna McMaster, P.E. 9/19/13
Senior Geotechnical Engineer
Florida PE #57537

Bruce H. Woloshin

Bruce H. Woloshin, P.E.
Principal

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EXECUTIVE SUMMARY

A geotechnical investigation has been performed for the approximate 30-acre site located immediately north of State Road 417, between John Young Parkway and US Hwy 441 in Orange County, Florida. Twenty-seven (27) borings, designated as B-1 through B-29 (Borings B-9 and B-14 were not performed due to excessive standing water at the time of exploration prohibiting access to our ATV drill rig), were performed to depths between 10 and 15 feet below the existing ground surface throughout the site. This report provides geotechnical engineering recommendations regarding development of the site into a community park.

Based on the information obtained from our geotechnical exploration, it appears that the site can be developed for the proposed project. The following geotechnical considerations were identified:

- Soil conditions observed generally consisted of sands with varying amounts of silt. Clayey sands were observed in a few borings performed in the east-central and western portions of the site. Lenses of very dense sands were also observed in some locations.

- Groundwater levels found during the field exploration ranged from about 4 to 7 feet below existing grade. Standing water was observed in the central portion of the site during the field exploration (August of 2013). Seasonal high groundwater levels above existing grade to a few feet below existing grade are expected.

- The proposed structures may be supported on shallow footings bearing on the existing site soil or on newly placed engineered fill.

- Site grading should consider relatively high seasonal high groundwater conditions on the site. In addition, the presence of standing water on site following periods of heavy rainfall should be considered.

- Due to relatively high groundwater levels at the site, the use of wet bottom stormwater ponds for treatment of stormwater runoff appears most feasible at this site.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
DEERFIELD/SR 417 COMMUNITY PARK
ORANGE COUNTY, FLORIDA

Nodarse / Page One Project No. AK135004
September 19, 2013

1.0 INTRODUCTION

A geotechnical investigation has been performed for the approximate 30-acre site located immediately north of State Road 417, between John Young Parkway and US Hwy 441 in Orange County, Florida as shown on the Topographic Vicinity Map included as Exhibit A-1 in Appendix A. A total of twenty-seven (27) borings, designated as B-1 through B-29 (Borings B-9 and B-14 were not performed due to excessive standing water at the time of exploration prohibiting access to our ATV drill rig), were performed to depths between 10 and 15 feet below the existing ground surface throughout the site. Logs of the borings along with a site location plan, geologic map and boring location plans are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design
- stormwater pond design
- pavement design

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Proposed Improvements	A conceptual site plan was provided to us. Based on this plan, we understand a driveway is planned along the entire northern portion of the site. On the eastern-most portion of the site, a skate park and possibly a concession area are planned. In the wider portion of the site (east-central portion), multi-use open fields are planned, with parking areas on the east and west side of the fields. Playgrounds, picnic pavilions, exercise course, and volleyball court are planned to the west of the multi-purpose fields. The western portion of the site will include walking paths.

2.2 Site Location and Description

Item	Description
Location	Immediately north of SR 417 in the Deerfield area of South Orange County between SR 441 and John Young Parkway
Current Ground Cover	The area is currently undeveloped with grasses and limited trees.
Existing Topography	The USGS topographic quadrangle maps "Lake Jessamine and Kissimmee, Florida" depicts the site and surrounding area as relatively flat with a ground surface elevation near +90 feet referencing the National Geodetic Vertical Datum of 1929 (NGVD29).
Surface Water	The quadrangle map indicates multiple wetland features in the vicinity of the site at ground surface elevations at or just below +85 feet NGVD29.

3.0 SUBSURFACE CONDITIONS

3.1 Soil Survey

The Soil Survey of Orange County, Florida, as prepared by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS; later renamed the Natural Resource Conservation Service - NRCS), dated August 1989, identifies the soil type at the subject site as *Basinger fine sand, depressional (3), Pomello fine sand, 0 to 5 percent slopes (34), St. Johns fine sand (37), and Smyrna fine sand (44).* It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. Boundaries between adjacent soil types on the Soil Survey maps are approximate (included in Appendix as Exhibit A-2). Descriptions of the mapped soil units are included in Appendix A as Exhibit A-3.

3.2 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/ Density
1	10 to 15	Fine sand (SP), fine sand with silt (SP-SM), and silty fine sand (SM)[1]	Loose to medium dense[2,3]

1. Silty fine sand with clay and/or clayey fine sand (SC) was found in many borings performed in the east-central and western portions of the site.
2. Very dense sands were observed in Boring B-2, performed in the eastern portion of the site at a depth of about 6 to 8 feet below existing grade.
3. Lenses of very loose sands were observed in Borings B-4, B-18, B-22, and B-23 at depths of 4 to 10 feet below existing grade.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in Appendix A of this report. Descriptions of our field exploration are included as Exhibit A-5 in Appendix A. A description of our laboratory testing procedures is included as Exhibit B-1 in Appendix B.

3.3 Groundwater

The boreholes were observed during drilling for the presence and level of groundwater. Groundwater was observed in all of the borings, between depths of 4 to 7 feet below existing grade. Longer term monitoring in cased holes or piezometers, possibly installed to greater depths than explored under this project scope, would be required to better define groundwater conditions at the site.

Standing water in excess in a foot or so was observed in the east-central portion of the site during the field exploration (August of 2012). Borings B-9 and B-14 could not be performed due to the depth of the standing water limiting access to our ATV mounted drill rig. During our site reconnaissance in late July, much of the central portion of the site had standing water present.

It should be recognized that fluctuations of the groundwater table will occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the boring was performed. In addition, perched water can develop within higher permeability soils overlying less permeable soils. Therefore, groundwater levels during construction or at other times in the future may be higher or lower than the levels indicated on the boring logs.

We estimate that during the June through October wet season, with rainfall and recharge at a maximum, groundwater levels will be above existing grade to about 4 feet below existing grade throughout most of the site. Our estimates of the normal seasonal groundwater conditions are based on the USDA Soil Survey, the encountered soil types, and the encountered water levels. The estimated normal seasonal high groundwater tables are included in the following table and on the boring logs.

Boring #	Approximate depth to encountered water table (feet)	Approximate depth to estimated normal seasonal high groundwater table (feet)
B-1	6.0	4.0
B-2	5.0	4.0
B-3	6.0	4.0
B-4	5.0	4.0
B-5	5.0	4.0
B-6	6.0	4.0
B-7	5.0	4.0
B-8	5.0	4.0
B-9	Above the Ground Surface	0+
B-10	4.0	0+
B-11	0.0	0+
B-12	5.0	3.0
B-13	4.0	3.0
B-14	Above the Ground Surface	0+
B-15	4.0	3.0
B-16	4.0	3.0
B-17	5.0	4.0
B-18	6.0	4.0
B-19	6.0	4.0
B-20	5.0	4.0
B-21	5.0	4.0
B-22	7.0	4.0
B-23	4.0	3.0
B-24	4.0	3.0

Boring #	Approximate depth to encountered water table (feet)	Approximate depth to estimated normal seasonal high groundwater table (feet)
B-25	4.0	3.0
B-26	4.0	3.0
B-27	5.0	4.0
B-28	5.0	4.0
B-29	4.0	3.0

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the information available to date, it is our opinion that the site is suitable for supporting small structures on shallow spread footings if the recommended site preparation procedures are implemented at the site. Normal site preparation and conventional shallow foundation systems are appropriate for support of structures and pavements.

The cleaner sands observed (SP, SP-SM) are generally suitable for reuse as structural fill. Due to the higher fines (silt) content in the silty sands (SM), extended drying times and greater moisture control may be necessary when reusing these excavated soils as new fill. Also, due to their higher fines content, these soils have lower permeability and should not be used where drainage is a concern, i.e. in the vicinity of stormwater management systems, beneath concrete pavements, beneath floor slabs, etc.

We anticipate stabilizing material or off-site borrow fill may be necessary for the construction of stabilized pavement subbase/subgrade courses where asphalt sections are used. Based on the relatively shallow groundwater levels, we anticipate up to a few feet of fill may be added to portions of the site.

Potential limitations to be considered during stormwater management design are the relatively shallow groundwater levels and the relatively shallow semi-confining soils (silty and clayey sands) over many areas of the site.

Our geotechnical recommendations regarding design and construction of foundations, pavements, and stormwater management are provided in the following sections.

4.2 Earthwork

4.2.1 Site Preparation

Prior to placing any fill, all vegetation, topsoil, and any otherwise unsuitable material should be removed from the construction areas. Wet or dry material should either be removed or moisture conditioned and re-compacted. After stripping and grubbing and achieving cut grades, the exposed surface should be proofrolled where possible to aid in locating loose or soft areas. Proof-rolling can be performed with appropriate heavy equipment to obtain a minimum compaction as defined in Section 4.2.3. Unstable soil (pumping) should be removed or moisture conditioned and compacted in place prior to placing fill.

Where fill is placed on existing slopes, we recommend that fill slopes be over filled and then cut back to develop an adequately compacted slope face. Slopes should be provided with appropriate erosion protection.

4.2.2 Material Requirements

Compacted structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement	Maximum Lift Thickness (in.)
General [1]	SP (fines content < 5%)	All locations and elevations	12[3]
	SP-SM (fines content between 5 and 12%)[2]	All locations and elevations, except strict moisture control will be required during placement, particularly during the rainy season.	8 to 12[3]
Limited	SM, SC (fines content >12%)	Limited to mass fill greater than 2 feet below final grade; strict moisture control will be required during placement.	6 to 8[4]

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris.
2. If fines contents are greater than 12 percent, special design and construction procedures may be necessary.
3. Loose thickness when heavy compaction equipment is used in vibratory mode. Lift thickness should be decreased if static compaction is being used, typically to no more than 8 inches, and the required compaction must still be achieved. Use 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is required.
4. Static equipment should be used.

4.2.3 Compaction Requirements-Mass Fill Areas

Item	Description
Minimum Compaction Requirements [1]	95 percent of the material's maximum modified Proctor dry density (ASTM D 1557).
Moisture Content [2]	Within ±2 percent of optimum moisture content as determined by the Modified Proctor test, at the time of placement and compaction.
Minimum Testing Frequency	One field density test per 20,000 square feet or fraction thereof per 1-foot lift.

1. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

4.2.4 Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the building should be backfilled with native soils to avoid creating a preferred flow path through the trenches.

4.2.5 Grading and Drainage

Final surrounding grades should be sloped away from the structure on all sides to prevent ponding of water. Gutters, downspouts, or other appropriate methods that direct water a minimum of 10 feet beyond the footprint of the proposed structures are recommended. Site grades should be set considering the estimated seasonal high groundwater presented in Section 3.4.

4.2.6 Earthwork Construction Considerations

After initial proofrolling and compaction, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and re-compacted prior to floor slab and pavement construction.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. Trees and shrubbery should be kept away from the exterior edges of the foundation element a distance at least equal to 1.5 times their expected mature height.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Nodarse/Page One should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of building floor slabs.

4.3 Foundations

In our opinion, the proposed structures (restrooms, concession building, etc.) can be supported by shallow foundation systems bearing on native soil or newly placed fill extending to native soil. Design recommendations for shallow foundations for the proposed structure are presented in the following sections.

4.3.1 Foundation Design Recommendations

Description	Column Footing	Wall Footing	Monolithic Slab Foundation [4]
Net Allowable Bearing Pressure [1]	2,000 psf	2,000 psf	2,000 psf
Minimum Width	30 inches	18 inches	12 inches
Minimum Embedment Below Finished Grade [2]	18 inches	18 inches	12 inches
Compaction Requirements	95 percent of the materials maximum Modified Proctor dry density for a depth of 12 inches below footing.		
Minimum Testing Frequency	One field density test per footing for a minimum depth of 1 foot below the footing subgrade.	One field density test per 50 linear feet for a minimum depth of 1 foot below the footing subgrade.	One field density test per 50 linear feet for a minimum depth of 1 foot below the footing subgrade.
Approximate Total Settlement [3]	<1 inch	<1 inch	<1 inch
Estimated Differential Settlement [3]	<¾ inch between columns	<¾ inch over 40 feet	<¾ inch over 40 feet

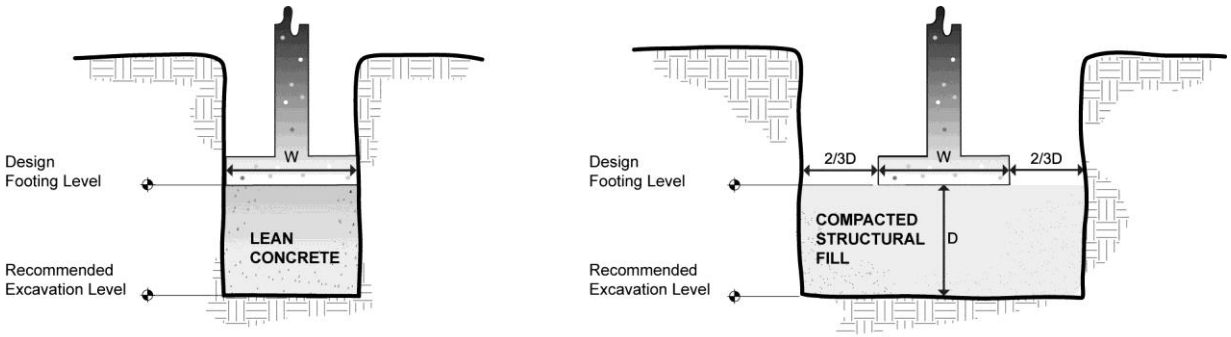
1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes any unsuitable fill or soft soils, if encountered, will be undercut and replaced with engineered fill.
2. For erosion protection and to reduce effects of seasonal moisture variations in subgrade soils.
3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. The above settlement estimates have assumed that the maximum footing width is 5 feet for column footings and 1.5 feet for continuous footings.
4. Turned-down portion of slab. For slab requirements see Section 4.5.1.

4.3.2 Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose soil and debris prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, the affected soil should be removed or moisture conditioned and re-compacted prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with granular material placed in lifts of 6 inches or less in loose thickness and compacted to at least 95 percent of the material's modified effort maximum dry density (ASTM D-1557). The overexcavation and backfill procedures are described in the figures below. Compaction tests should be performed at a frequency of 1 test per footing per 1-foot lift for square footings, and 1 test per 50 linear feet per 1-foot lift for wall or continuous footings.

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, the affected soil should be removed prior to placing concrete. It is recommended that Nodarse/Page One be retained to observe and test the soil foundation bearing materials.



Lean Concrete Backfill **Overexcavation / Backfill**

NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

4.4 Floor Slabs

4.4.1 Floor Slab Design Recommendations

Item	Description
Floor Slab Support	Free draining granular material meeting the general fill specification [1]
Modulus of Subgrade Reaction	100 pounds per square inch per inch (psi/in) for point loading conditions
Compaction Requirements	95 percent of the materials maximum Modified Proctor dry density
Minimum Testing Frequency	One field density test per 2,500 square feet or fraction thereof for a depth of 12 inches. [2]

1. We recommend subgrades be maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become desiccated prior to construction of floor slabs, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations in the building areas, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slabs.
2. Density should be re-checked after utility construction.

Where appropriate, saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual.

The use of a vapor retarder should be considered beneath concrete slabs-on-grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer and slab contractor should refer to ACI and Florida Building Code (FBC) regarding moisture and radon for procedures and cautions regarding the use and placement of a vapor retarder. We note that FBC requires a minimum of 6-mil polyethylene, which is typically used in Florida. However, local requirements that might affect what moisture barrier may use should also be consulted.

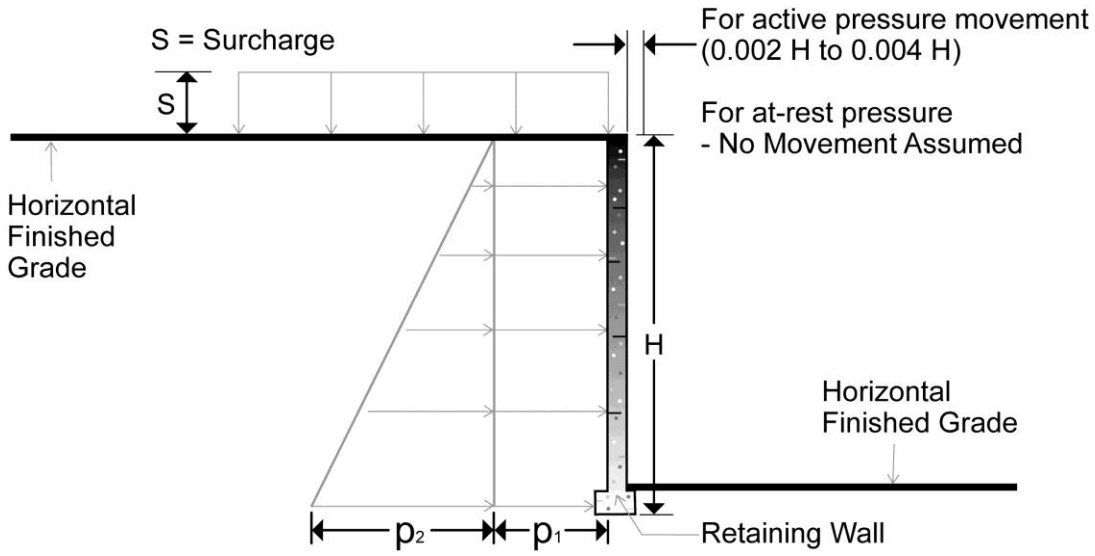
4.4.2 Floor Slab Construction Considerations

On most project sites, the site grading is generally accomplished early in the construction phase. We recommend the area underlying the floor slab be rough graded and then thoroughly proofrolled prior to final grading. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of concrete and corrective action will be required.

Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of concrete.

4.5 Lateral Earth Pressures

Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement, such as a basement wall that is structurally confined at both the top and bottom of the wall. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Earth Pressure Coefficients

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (Ka)	Granular - 0.33	40	(0.33)S	(40)H
At-Rest (Ko)	Granular - 0.46	55	(0.46)S	(55)H
Passive (Kp)	Granular - 3.0	360	---	---

Applicable conditions to the above include:

- Uniform surcharge, where S is surcharge pressure.
- In-situ soil backfill weight a maximum of 120 pcf.
- Horizontal backfill, compacted between 95 and 98 percent of modified Proctor maximum dry density.
- Loading from heavy compaction equipment not included.
- No hydrostatic pressures acting on wall.
- No dynamic loading.
- No safety factor included in soil parameters.

Backfill placed against structures should consist of granular soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.32 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

To control hydrostatic pressure behind the wall we recommend that a drain be installed at the foundation wall with a collection pipe leading to a reliable discharge. If this is not possible, then combined hydrostatic and lateral earth pressures should be calculated for lean clay backfill using an equivalent fluid weighing 90 and 100 pcf for active and at-rest conditions, respectively. For granular backfill, an equivalent fluid weighing 85 and 90 pcf should be used for active and at-rest, respectively. These pressures do not include the influence of surcharge, equipment or floor loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

4.6 Pavements

4.6.1 Subgrade Preparation

Site grading is typically accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to temporarily improve ride comfort. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled and tested within two days prior to commencement of actual paving operations. Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are found should be repaired by removing and replacing the materials with properly compacted fills.

After proofrolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and prepared as recommended in Section **4.2** of the **Earthwork** section this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

4.6.2 Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Pavement thickness can be determined using AASHTO, Asphalt Institute, PCA, and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Nodarse/Page One can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided. However, absent that data, we recommend the following minimum typical sections.

4.6.3 Estimates of Minimum Pavement Thickness

Typical Pavement Section (inches)						
Traffic Area	**Alternative**	**Asphalt Concrete Surface Course**	**Limerock, Soil-Cement or Crushed Concrete Base Course**	**Stabilized Subbase Course[2,3,4]**	**Portland Cement Concrete**	**Free Draining Subgrade**
Car Parking	PCC	--	--		5.0	18.0
	AC	1.5	6.0	12.0	--	--
Truck and Drive Areas	PCC	--	--		6.0	18.0
	AC	2.5	8.0	12.0	--	--
Trash Container Pad [1]	PCC	--	--		6.0	18.0

1. The trash container pad should be large enough to support the container and the tipping axle of the collection truck.
2. Often referred to as Stabilized Subgrade.
3. Use coarse granular materials such as recycled crushed concrete, shell, or gravel when seasonal high groundwater is within 4 feet of the profile grade. Clay stabilization is acceptable with deeper seasonal high groundwater.
4. Some municipalities do not require stabilized subbase beneath soil-cement base.

4.6.4 Asphalt Concrete Design Recommendations

The following items are applicable to asphalt concrete pavement sections.

- Nodarse/Page One recommends a minimum separation of 12 inches between the bottom of the base course and the seasonal high water table.
- Natural or fill subgrade soils to a depth of 18 inches below the base should be clean, free draining sands with a fines content passing a No. 200 sieve of 7 percent or less.
- Stabilized subgrade soils (also identified as stabilized subbase) should be stabilized to a minimum Limerock Bearing Ratio (LBR; Florida Method of Test Designation FM 5-515) value of 40 if they do not already meet this criterion, or modified/replaced with new compacted fill that meets the minimum LBR value. Although LBR testing has not been performed, our experience with similar soils indicates that the near surficial sands encountered in the soil borings are unlikely to meet this requirement.

- The stabilized subgrade course should be compacted to at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180 or ASTM D-1557). Any underlying, newly-placed subgrade fill need only be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density. Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof.

- Limerock base courses from an approved FDOT source should have a minimum LBR value of 100, and be compacted to a minimum of 98 percent of the maximum dry density as determined by the Modified Proctor test. Limerock should be placed in uniform lifts not to exceed 6 inches loose thickness. Recycled limerock is not a suitable substitute for virgin limerock for base courses but may be used as a granular stabilizing admixture.

- Soil cement base courses typically experience shrinkage cracking due to hydration curing of the cement. This shrinkage cracking typically propagates through the overlying asphalt course and reflects in the pavement surface. This reflective cracking is not necessarily indicative of a pavement structural failure, though it is sometimes considered to be aesthetically undesirable.

- Soil cement bases should have 7-day design strength of 300 psi. Soil cement base should be compacted to a minimum of 95 percent of the material's maximum dry density as determined by the Modified Proctor Test (AASHTO T-134). Higher design strengths may result in increased cracking.

- Crushed (recycled) concrete base should meet the current FDOT specification 204 for recycled materials.

- Asphalt should be compacted to a minimum of 95 percent of the design mix density. Asphalt surface courses should be Type SP, Type S, or other suitable mix design according to FDOT and local requirements.

- To verify thicknesses, after placement and compaction of the pavement courses, core the wearing surface to evaluate material thickness and composition at a minimum frequency of 5,000 square feet or two locations per day's production.

- Underdrains or strip drains should be considered along all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils. Underdrains will also be required below pavement if the separation between the bottom of the base course and the seasonal high groundwater table is less than 1 foot

- All curbing should be full depth. Use of extruded curb sections which lie on top of asphalt surface courses can allow migration of water between the surface and base courses, leading to rippling and pavement deterioration.

4.6.5 Portland Cement Concrete Design Recommendations

The following items are applicable to rigid concrete pavement sections.

- At least 18 inches of free-draining material should be included directly beneath rigid concrete pavement. Fill meeting the requirements presented in Section 4.2 (Earthwork) of this report may be considered free-draining for this purpose. Limerock should not be considered free draining for this purpose.

- The PCC should be a minimum of 4,000 psi at 28 days. PCC pavements are recommended for trash container pads and in any other areas subjected to heavy wheel loads and/or turning traffic.

- The upper 1 foot of rigid pavement subgrade soils should be compacted to at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180 or ASTM D-1557). Compaction tests should be performed at a frequency of 1 test per 10,000 square feet or fraction thereof.

- Rigid PCC pavements will perform better than ACC in areas where short-radii turning and braking are expected (i.e. entrance/exit aprons) due to better resistance to rutting and shoving. In addition, PCC pavement will perform better in areas subject to large or sustained loads. An adequate number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI and/or AASHTO requirements. Expansion (isolation) joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

- Adequate separation should be provided between the bottom of the concrete and the seasonal high water table. Nodarse/Page One recommends that in no case should less than 1 foot of separation be provided.

- Sawcut patterns should generally be square or rectangular but nearly square, and extend to a depth equal to a quarter of the slab thickness. If the bottom of the concrete pavement is separated from the seasonal high water table by at least 1 foot, filter fabric will not be necessary beneath the expansion joints.

4.6.6 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote drainage. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the base layer.

4.6.7 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

4.7 Stormwater Management

Based on the conceptual site plan provided, it is anticipated that four (4) stormwater ponds will be constructed as part of this project. One (1) pond will be constructed in the far eastern portion of the site. Three (3) ponds are planned in the southern portion of the site. Borings could not be performed in the two western most pond areas due to significant standing water on the site prohibiting access to our ATV drill rig. Design of the stormwater ponds has not been finalized yet.

Seasonal high groundwater levels at the boring locations are presented above in Section 3.3. Average wet season groundwater levels are expected to be near those observed during the field exploration. Seasonal low groundwater levels are expected to be 1 to 2 feet below observed levels. Standing water was present over much of the central portion of the site in late summer of 2013 (July and August of 2013). Much of this standing water is believed to be perched water over lower permeable silty and clayey soils. However, once topographic information is available, Nodarse/Page One should be provided an opportunity to re-evaluate seasonal high groundwater conditions at the site.

Composite samples of anticipated pond subgrade soils from Borings B-1 and B-6, performed in the two eastern most pond locations were testing for permeability in our laboratory. The measured permeability rate for the relatively clean fine sands with silt (SP-SM) tested were 9 to 13 feet per day. We consider this permeability rate to be indicative of a saturated vertical permeability. Experience with the observed soil types has shown that horizontal permeability may be on the order of 1.5 to 2 times the saturated vertical permeability in undisturbed materials. We recommend using an unsaturated vertical infiltration rate, k_V, of 5 feet/day and a horizontal saturated hydraulic conductivity rate, k_H, of 10 feet/day for the purpose of designing the proposed underground exfiltration system.

Due to relatively high groundwater levels at the site, the use of wet bottom ponds appears most feasible. Use of shallow dry-bottom swales may also be feasible if the site is adequately filled.

5.0 GENERAL COMMENTS

Nodarse/Page One should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Nodarse/Page One also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Nodarse/Page One reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

Soil Survey Descriptions

3 – Basinger fine sand, depressional. This soil type is nearly level and poorly drained. It is typically found in shallow depressions and sloughs along edges of freshwater marshes and swamps. In its natural state, water stands on the surface of this soil type for 6 to 9 months during most years and is within 12 inches of the surface for the rest of the year. This soil type is sometimes associated with a surficial organic layer, typical thickness of 7 inches, typical organic contents of between 1 and 8 percent.

37 – St. Johns fine sand. This soil type is nearly level and poorly drained. It is typically found on broad flats on the flatwoods. In its natural state and during years of normal rainfall, this soil type has a seasonal high water table within 10 inches (0.8 feet) of the surface for 6 to 12 months, receding to a depth of 10 to 40 inches (0.8 to 3.3 feet) for more than six months. This soil type is predominantly sandy from the surface to a depth of 24 inches (2.0 feet), and again from a depth of 44 inches (3.7 feet) to the maximum defined depth of 80 inches (6.7 feet). Between depths of 24 and 44 inches (2.0 and 3.7 feet), this soil type exists as fine sand with silt to silty sand.

42 –Sanibel muck. This soil type is nearly level and very poorly drained. It is typically found in depressions, freshwater swamps and marshes, and poorly defined drainageways. In its natural state, groundwater is ponded atop this soil type for 6 to 9 months of years with normal rainfall; the groundwater table fluctuates between the surface and a depth of 10 inches (0.8 feet) for 2 to 6 months. A surficial organic layer is normally associated with this soil type, approximately 11 inches (0.9 feet) thick. Typical organic contents of the organic layer range from 20 to 50 percent. Beneath the surficial organic layer, Sanibel soils are predominantly sandy to the maximum defined depth of 80 inches (6.7 feet).

44 – Smyrna fine sand. This soil type is nearly level and poorly drained. It is typically found on broad flatwoods. In its natural state and during years of normal rainfall, this soil type has a seasonal high water table within 10 inches (0.8 feet) of the surface, receding to a depth of 10 to 40 inches (0.8 to 3.3 feet) for more than six months.

Field Exploration Description

The boring locations were laid out at the project site by Nodarse/Page One personnel. The borings were located with a hand held GPS device using longitude and latitude coordinates obtained from on-line Google Earth imagery. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The SPT soil borings were drilled with a truck-mounted, rotary drilling rig equipped with a rope and cathead manual hammer. The boreholes were advanced with a cutting head and stabilized with the use of bentonite (drillers' mud). Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure. In the split spoon sampling procedure, the number of blows required to advance the sampling spoon the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs.

Portions of the samples from the borings were sealed in glass jars to reduce moisture loss, and then the jars were taken to our laboratory for further observation and classification. Upon completion, the boreholes were backfilled with the site soil.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation of the samples.

APPENDIX B

LABORATORY TESTING

Laboratory Testing

During the field exploration, a portion of each recovered sample was sealed in a glass jar and transported to our laboratory for further visual observation and laboratory testing. Selected samples retrieved from the borings were tested for moisture (water) content, fines content (soil passing a US standard #200 sieve), and Atterberg Limits. Those results are included in this report on the respective boring logs. The visual-manual classifications were modified as appropriate based upon the laboratory testing results.

The soil samples were classified in general accordance with the appended General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in Appendix C. The results of our laboratory testing are presented on the corresponding borings logs.

APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-$^3/_8$" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube – 2" O.D., 3" O.D., unless otherwise noted	PA:	Power Auger (Solid Stem)
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB	Wash Boring or Mud Rotary

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling	ESH:	Estimated Seasonal High Groundwater
DCI:	Dry Cave in	BCR:	Before Casing Removal	ESL:	Estimated Seasonal Low Groundwater
AB:	After Boring	ACR:	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	0 – 1	Very Soft
500 – 1,000	2 – 3	Soft
1,000 – 2,000	4 – 6	Medium Stiff
2,000 – 4,000	7 – 12	Stiff
4,000 – 8,000	13 – 26	Very Stiff
8,000+	> 26	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 50	Dense
> 50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	≥ 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 – 10
Medium	11 – 30
High	> 30

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

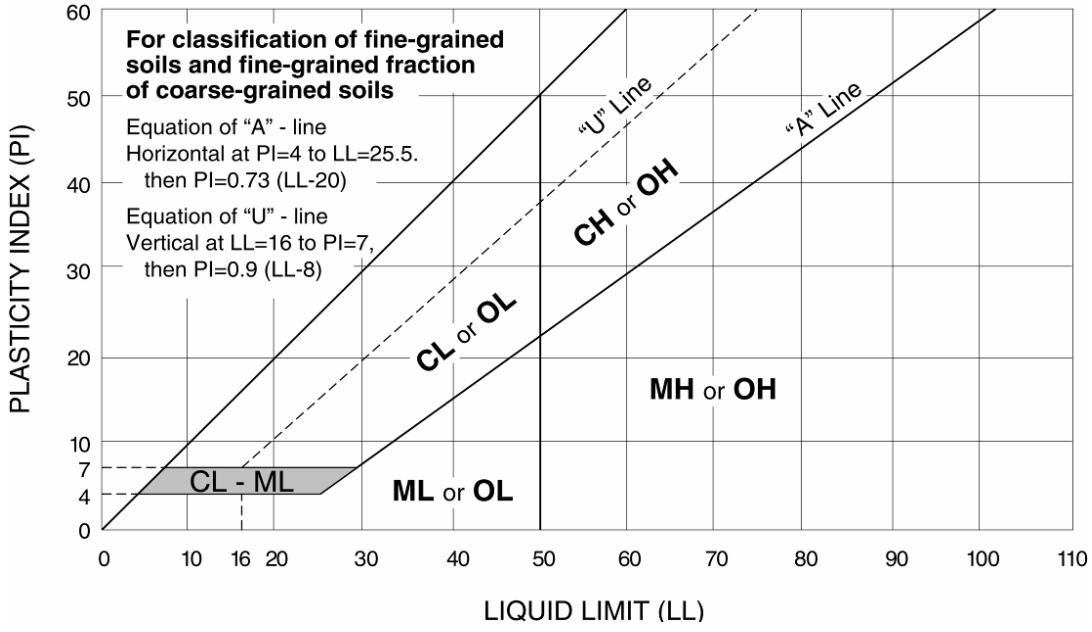
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



SECTION 03900
SECTION 1

SKATEPARK SPECIALIST CONSTRUCTION
SUMMARY OF SCOPE

SECTION 1 - SUMMARY OF SCOPE

These specifications present the skatepark specialist's scope of construction. The skatepark specialist's scope of services is summarized in the list below. A summary of the General Contractor's scope of services is also summarized. The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience. Coping and rail fabrication is also a specialty work item within the contract documents to be performed by contractor with skate park experience.

1.10 - SKATEPARK SPECIALIST'S SCOPE OF SERVICES

- Provide labor for specialty crew to execute the following:
  - Layout and stake out perimeter of entire skate area
  - Produce master transition templates
  - Set forms for entire skate area
  - Fine grade and compact entire skate area
  - Install and weld metal coping/railings for entire skate area
  - Rebar placement of entire skate area
  - Pour shotcrete & concrete for entire skate area
  - Finish all concrete to a smooth steel trowel finish for entire skate area
  - Apply curing sealer to entire skate area
  - Saw cut joints in skate area
  - Attach drain fixtures to existing drain lines in skate area
  - Remove forms & clean up
  - Apply caulking & joint fillers for entire skate area

- Provide entire material package for the entire skate area
- Provide all skating accessories for the entire skate area
- Provide all tools
- Provide entire machinery package
- Provide job site storage
- Provide refuse dumpster
- Provide portable restroom, if necessary
- Provide temporary fencing around working perimeter, if necessary

1.12 - OUTSIDE SERVICES PROVIDED BY SKATEPARK SPECIALIST

- Provide concrete testing (per 50 yards)
- Provide concrete pumping services

1.20 - GENERAL CONTRACTOR'S SCOPE OF SERVICES

This outline summarizes the general contractor's scope of work necessary to prepare the site for the skatepark specialist. The scope listed is only relevant to the immediate skatepark area only.

- Obtain all permits

- Provide temporary power/water to site & storage facility
- Provide erosion control for job site
- Provide site surveying, elevations and grade stakes for entire skate park
- Provide clearing, grubbing, rough grading and excavation of entire skate park
- Provide soil remediation, if necessary
- Provide sub-base, fine grading and course aggregate base
- Backfill (import/export as required)and compact subgrade (per specs)
- Provide soil borings/compaction testing (provide copies to skatepark)
- Provide/Install all drain lines into the skatepark
- Install rebar and forms, pour and finish concrete for all retaining walls, planters, curbing, footers, and turndowns outside of the immediate skatepark surface
- Install any amenities outside of the skate park
- Provide storm water engineering and work, if applicable
- Install sod

SECTION 03900
SECTION 2

SPECIALTY SKATEPARK CONSTRUCTION SPECIFICATIONS

2.1 – CONCRETE FORMWORK

PART 1 – GENERAL

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience.

2.100 – DESCRIPTION

Provide formwork and accessories for construction of cast in place concrete work.

2.101 – RELATED WORK

- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.102 –STORAGE OF MATERIALS

Store materials on and under protective sheeting.

2.103 –COORDINATION

Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

PART 2 – PRODUCTS

2.104 –MATERIALS

A. Flatwork, Vertical and Custom work- Exterior grade standard plywood, Minimum three ply, one smooth side sufficiently thick to sustain loads, or steel forms.
B. Forms Form Oil: Non Staining, Paraffin-base oil intended for coating forms.
C. Form Ties: Bolts, rods or patented devises having tensile strength of 3000lbs., adjustable length, free of lugs which would leave a hole larger than 5/8” diameter and having a full one inch depth of break-back.

PART 3 – EXECUTION

2.105 –CONSTRUCTION AND ERECTION

A. Build forms to shapes, lines and dimensions of detailed components of concrete construction. Set to line and grade, brace and secure to withstand placing of concrete and maintain their shape and position.
B. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marks in exposed concrete.
C. Thoroughly clean surfaces of materials and remove nails before reuse. Do not reuse damaged or worn forms. Use non-staining Form Oil (if required) prior to placing metal reinforcement.
D. Immediately before placing concrete, clean forms of chips, sawdust and debris. Immediately after removal of forms, remove form ties, wires and defects and patch.

2.106 –INSERTS AND ACCESSORIES

Make provisions for required installation for accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete. Obtain suitable templates or instructions for installation of items. Place expansion joints where details indicate.

2.107 –REMOVAL OF FORMS AND SHORING

Remove forms and shoring after proper curing time

2.108 –CLEANUP

Remove Debris and trash

2.2 – CONCRETE REINFORCEMENT

PART 1 – GENERAL

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience.

2.200 – DESCRIPTION

Provide steel reinforcement for all cast in place concrete and shotcrete inside the skatepark.

2.201 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.202 – DELIVERY AND STORAGE

Stack all reinforcing steel in tiers. Reinforcements that differ in gauge and size must be separated and labeled. Maintain reinforcement free of dirt, mud, paint or rust.

2.204 – SUBMITTALS

Indicate materials being used, and complete reinforcing method for each concrete member, including materials, sizes, bends, dimensions, stirrup spacing and placing details not shown on drawings.

PART 2 – PRODUCTS

2.205 – MATERIALS

A. Steel reinforcement (rebar): Standard Deformed steel bar, 3/8” (#3), 1/2” (#4), 5/8” (#5), Grade 60
B. Welded steel reinforcement: Deformed Low alloy steel, carbon content not exceeding 0.30% and manganese content no exceeding 0.60%. Identify and tag with manufacturer’s heat identification number.

2.206 – FABRICATION

Fabricate rebar to sizes, shapes and lengths detailed in plan,

PART 3 – EXECUTION

2.207 – INSTALLATION

A. Accurately place reinforcing steel in accordance with drawings. Thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without the Engineer's approval. Do not splice reinforcement at points of maximum stress. Stagger splices in adjacent bars and provide a minimum overlap of 30-bar diameters at splices unless specifically noted otherwise on drawings.
B. Securely saddle tie intersections with No. 18 ga. Black annealed wire. Rigidly secure reinforcement in place. Provide concrete coverage as shown on drawings.

2.208 – WELDING REINFORCEMENT

A. Weld deformed steel reinforcement bars using recommended pre-heat temperature and electrode for type of steel being welded.
B. Do not weld steel reinforcement bars without proper heat identification.

2.209 – CLEANUP

Remove all debris and trash resulting from specified work.

2.3 – CAST IN PLACE CONCRETE/SHOTCRETE

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience.

PART 1 – GENERAL

2.300 – DESCRIPTION

Provide cast in place concrete and Shotcrete for all skatepark area's designated in the construction documents. Refer to drawings for specific locations of cast in place concrete and shotcrete.

2.301 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.4 – CURING & SEALING
- 2.5 – COPING AND RAIL FABRICATION

2.302 – SUBMITTALS

A. The Concrete mixes shall be designed in accordance with industry standards to account for temperature, humidity, required strength, and curing time.

B. Check mix design and revise, if necessary, whenever changes are made in aggregate or in surface water content of aggregate or workability of concrete. Slump shall be the minimum to produce a workable mix.
C. Forward two copies of design mix to owner's Engineer for approval.

2.303 – COORDINATION

Notify responsible trades of schedules of concrete pours so as to allow adequate time for installation of work and inspection prior to pour. Obtain all materials and other miscellaneous steel items to be cast into concrete. Verify all measurements and layout to avoid any delay.

2.305 –JOB CONDITIONS

A. Environmental conditions: Monitor wind velocity, relative humidity, temperature and concrete temperature in order to maintain specified maximum rate of evaporation.
B. Coordination:
    1. Coordinate schedules of concrete pours to allow adequate time for installation of other related work.
    2. Verify the placement of all steel items to be cast into concrete are properly placed.
    3. Coordinate size and location of mechanical and electrical equipment concrete pads.
    4. Coordinate earthwork and soils report requirements with placement requirements.
    5. Coordinate with form-work and finishes sections to provide finish floor levelness and flatness as specified herein. Slope to drains at grades and percent slope shown on contract documents.

2.306 – DELIVERY, STORAGE AND HANDLING

A. Properly deliver and handle materials to prevent contamination, segregation or damage to materials
B. Store cement in weather tight enclosures to protect against dampness and contamination.
C. Prevent segregation and contamination of aggregates by proper arrangements and use of stockpiles.
D. Store admixtures properly to prevent contamination, evaporation or other damage.

2.307 –QUALITY ASSURANCE

A. Use independent party to conduct concrete density tests
B. Test concrete as work progresses at 50 yard increments
C. Coordinate with testing company to provide results to owner's Engineer.

2.308 - SUBMITTALS

A. Manufacturer's data: Current printed specifications with application and installation instruction for proprietary materials including concrete admixtures
B. Mix Design: Concrete Mix Proportions
C. Maintenance: Provide a Maintenance plan
D. Warrantee: Provide a minimum of one year warrantee covering work deficiencies

PART 2 – PRODUCTS

2.309 – MATERIALS

A. Portland cement: Meets ASTM C150, Type 1 or 2, one brand only from qualified local supplier
B. Fly ash: Meets ASTM C618 from qualified local supplier.
C. Fine aggregate: Clean, hard, durable, uncoated natural silica-based sand, free from silt, loam or clay
D. Coarse aggregate: Clean hard durable, un-coated crushed limestone, crushed concrete, or granite. Unless otherwise noted in aggregate size 3/8" maximum, No. 5, 56 or 57. Base rock shall conform to local code.
E. Water: Fresh, clean, potable and free of deleterious acids, mixing and curing water, as available from owner. Transport as required.
F. Admixtures: Use only accepted admixtures meeting the following requirements:
    1. Chemical Admixtures: Meets ASTM C494/C494M
    2. Water reducing, retarding or acceleration admixtures shall conform to ASTM C494.
    3. Air entraining Admixtures: Meets ASTM C260. Air entraining prior to shooting shall be 1.5%-3%
    4. The use of calcium chloride shall not be permitted. The contractor shall submit details of proposed admixtures with the concrete mix design.

2.310 – PROPORTIONS AND MIXING

A. Portland cement: 600 lbs minimum per 27 cubic foot design.
B. Fly ash: Maximum 20% by weight of the combined total weight of the cement and fly ash.
C. Compression strength: 4000 P.S.I.
D. Slump: 4 inch
E. Admixture: No admixtures without approval. Introduce admixtures in quantities and according to methods recommended my admixture manufacturer.
F. Mixing: Ready mixed concrete from certified local supplier. Do not transport or use concrete after 1-1/2 hours have elapsed from time of initial mixing. Supplier of transit-mixed concrete shall have a plant of sufficient capacity and adequate transportation facilities to assure continuous delivery at required rate, to provide continuous concrete placement throughout a pour.
G. Grout and dry pack: non shrink, non metallic: U.S. Grout Corp. "Five Star Grout" , 5,000PSI, or approved equivalent.
H. Review: Mix Design shall be reviewed for acceptance by owner's Engineer.

2.311 – WET MIX SHOTCRETE CONCRETE APPLICATION EQUIPMENT

A. Mixing equipment: Capable of thoroughly mixing aggregate, cement and water in sufficient quantity to maintain continuous placement.
B. Ready Mixed Concrete: May be delivered to the site in the dry state if the equipment is capable of adding the water and mixing it satisfactorily with the dry ingredients.
C. Air Supply: Clean air adequate for maintaining sufficient nozzle velocity for parts of work and for simultaneous operation of blow pipe for cleaning away rebound.

D. Delivery equipment: Capable of discharging aggregate cement water mixture accurately, uniformly and continuously though delivery hose.

2.312 - CURING MATERIALS

A. Water: Domestic quality, clear and potable with no chemical content.
B. Sheet material: Color, white.
C. Curing compound/sealer: Evercrete DPS or equal.

2.313 –MIXES

Do not retemper mix by adding water in field

PART 3 – EXECUTION

2.314 –INSPECTION

A. Examination: Examine concrete formwork and verify that it is true to line and dimension, adequately braced against vibration and constructed to permit escape of air and rebound but to prevent leakage during shotcreting. Correct deficiencies.
B. Inspection: Inspect reinforcement steel and items to be embedded in concrete. Correct any deviations from the accepted shop drawings.
C. Notification: Notify any other trades involved in ample time to permit the proper installation of their work. Cooperate in setting such work.
D. Existing surfaces: Examine existing concrete surfaces for unsound material. Correct deficiencies.

2.315- CONCRETE BATCHING AND MIXING

Proportions: Mix proportions shall be controlled by weight batching. Contractor's testing laboratory shall maintain quality control records during shotcrete production and make those records available to Owner's Engineer.

2.316- CONCRETE PLACEMENT

A. Placement: Use suitable delivery equipment and procedures that will result in shotcrete in place meeting the requirements of this specification. Determine operating procedures for placement in, extended distances, and around any obstructions where placement velocities and mix consistency must be adjusted.
B. Placement techniques: Do not place shotcrete if drying or stiffening of the mix takes place at any time prior to delivery to nozzle.
    1. Control thickness, method of support, air pressure, and or water content of shotcrete to preclude sagging or sloughing off. Discontinue shotcreting or provide suitable means to screen the nozzle stream if wind or air currents cause separations of the nozzle stream during placement.
    2. Hold nozzle as perpendicular to surface as work will permit, to secure maximum compaction with minimum rebound.
    3. In shotcreting walls, begin application at the bottom. Ensure work does not sag.
    4. Layering:
        a. Build up layers by making several passes of nozzle over work area.

b. Broom or scarify the surface of freshly placed shotcrete to which, after hardening, additional layers of shotcrete are to be bonded. Dampen surface just prior to application of succeeding layers.
c. Allow each layer of shotcrete to take initial set before applying succeeding layers.
d. Use radial templates to insure exact radii form flat bottom of skatepark to face coping. Template shall be fabricated from steel or ¾" plywood. Check every horizontal foot when applying shotcrete for conformance of intended wall radii. Brace template and place levels at arc to tangent connections to insure no kinks will be formed. Kinks at the bottom of bowls will not be acceptable. Slumping of the shotcrete causing coping setback will not be acceptable.

5. Placement around reinforcement:
   e. Hold nozzle at such distance and angle to place materials behind reinforcement before any material is allowed to accumulate on its face. In the dry-mix process, additional water may be added to the mix when encasing reinforcement to facilitate a smooth flow of materials behind the bars.
   f. Test to ascertain of any void or sand pockets have developed around or behind reinforcement by probing with an awl or other pointed tool after the shotcrete has achieved its initial set, by removal of randomly selected bars, or coring or other suitable standards.

C. Access: Allow easy access to shotcrete surfaces for screeding and finishing, to permit uninterrupted application.

2.317- REMOVAL OF SURFACE DEFECTS IN CONCRETE

A. General: remove and replace shotcrete which lacks uniformity, exhibits segregation honeycombing or lamination or which contains any dry patches, slugs, voids or pockets. Remove defective areas.
B. Sound work with hammer for voids. Remove and replace damaged in-place shotcrete.

2.318- CONCRETE FINISH

A. Finish-General: Smooth form finish consists of a smooth, hard, uniform texture with a minimum of seams.
B. Radial/Banked Wall finish: Float finish on radial banked face of wall shall consist of a smooth, hard, uniform surface of smooth steel trowel. Level to a tolerance of ¼ inch in 10 feet when tested with a 10 foot steel straight edge placed on the surface horizontally and vertically with radial/bank template with the appropriate radii/angle. Grinding the surfaces will not be an acceptable means of achieving the intended radii/angle.

2.319- CONCRETE JOINTS

A. Cleaning: The entire joint shall be thoroughly cleaned and wetted prior to the application of additional shotcrete.
B. Reinforcement: Make joints perpendicular to the main reinforcement. Continue reinforcement across joints.

2.320 –CLEANUP

A. Efflorescence: Remove efflorescence as soon as it appears.
B. Use the least aggressive cleaning techniques possible.
C. Wear protective eye wear, gloves and clothing suitable to work and as required by cleaner manufacturer.
D. If proprietary cleaning agents are used, pre wet wall, test cleaning agent on a small inconspicuous area and check effects prior to proceeding. Begin cleaning at the top and work down. Thoroughly rinse wall afterwards with clean water. Follow cleaner manufacturer's instructions.
E. Cleanup all debris, excess concrete and miscellaneous material associated with work.

2.321 –TOLERANCES

Minor variances in color and appearance of concrete are acceptable.

2.4 – CURING & SEALING

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience.

PART 1 – GENERAL

2.400 – DESCRIPTION

Provide curing/sealer material for cast in place flatwork and shotcrete walls (radial and angled).

2.401 – RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.5 – COPING AND RAIL FABRICATION

2.402 – SUBMITTALS

Submit detailed technical data of products proposed for curing use for owner's representative for approval.

2.403 – DELIVERY AND STORAGE

Deliver materials in original sealed containers with seals and labels intact. Use materials out of original containers only and store in a dry place.

PART 2 – PRODUCTS

2.404 – MATERIALS

A. CURING AGENT: EVERCRETE Deep Penetrating Sealer (or equal). Spray on cure agent. Apply immediately to final finished concrete. Use recommended amount per the manufacturer's specifications. If other material is used, submit product information to Owner's Engineer for approval prior to starting concrete work.

PART 3 – EXECUTION

2.405 – CURING

A. Protect concrete surfaces against rapid drying. Keep sealed with cure agent for necessary amount of time to reach concrete strength and inhibit moisture loss after placing per manufacturer's recommendation.
B. Curing Method: Spray entire surface immediately after final finish work. Protect surface from water, adjacent shotcrete work and debris.

2.405 – CLEANUP

Specialty Contractor is to remove all debris and trash resulting form specified work. Use power washing and soft brush not causing abrasion to finish work surface prior to final inspection.

2.5 – COPING AND RAIL FABRICATION

The application, forming, reinforcing, cutting, sculpting and finish work of all concrete inside the skatepark area is a specialty work item within the contract documents to be performed by contractor with skate park experience. Coping and rail fabrication has been deemed as a specialty work item within the contract documents to be performed by contractor with skate park experience.

PART 1 – GENERAL

2.500 – COPING AND RAIL FABRICATION

Coping and rail fabrication consisting of rolling to specified radii, cutting, piecing, sleeves, anchors, welding and setting to horizontal and vertical elevations.

2.502- RELATED WORK

- 2.1 – CONCRETE FORMWORK
- 2.2 – CONCRETE REINFORCEMENT
- 2.3 – CAST-IN-PLACE CONCRETE/SHOTCRETE
- 2.4 – CURING & SEALING

2.503 –VERIFICATION

A. Verify all measurements at the job. Show dimensions, sizes, and thicknesses, gauges, finishes, joining, attachments and relationship of work to adjoining construction. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at the site and not from drawings.
B. Provide Owner with the name and address of coping supplier.

2.504 – DELIVERY STORAGE AND HANDLING

A. Storage of materials:
    a. Materials which are stored at the project site shall be above ground and on platforms, skids or other supports. Protect steel from corrosion. Store other materials in a weather tight and dry place until ready for use.
B. Protection:
    b. Use all means necessary to protect miscellaneous metals before during and after installation and to protect the installed work and materials of all other trades.

c. Protect any adjacent materials or areas below from damage due to weld splatter or sparks during field welding

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of owner's representative and at no additional cost to the owner.

2.505 – JOB CONDITIONS

A. Examine existing conditions in which work is to be installed. Notify owner's representative if conditions are unacceptable to begin work.
B. Do not proceed with the work until unsatisfactory conditions have been corrected.

2.506 – COORDINATION

A. Templates and Built-ins: Furnish all anchors, fastenings, sleeves, setting templates and layouts affecting or installed in the work of other trades.
B. Delivery: Where items must be incorporated or built into adjacent work, deliver to trade responsible for such work in sufficient time that progress of work is not delayed. Be responsible for proper location of such items.

PART 2 – PRODUCTS

2.507 – STEEL PIPE COPING (ASTM A500 GRADE B)

A. STEEL PIPE COPING
- 2" ID round hot-dipped galvanized pipe
- 2"x3" square tube hot-dipped galvanized
- 2"x4" square tube hot-dipped galvanized
- Penrose BRAND Pool Block

B. WELDING RODS: E series Low Hydrogen unless otherwise noted on drawings.
C. GROUT
- U.S. Grout Corp. "Five Star Grout"
- Non shrinking Master Builder's "Embedco"
- Conrad Sovig's "Metel-MXS Grout"
- Sonneborn's "Ferrolith G Redi-Mixed Grout"
- Approved equal

D. OTHER MATERIALS: All other materials, not specifically described but required for a complete and proper installation of miscellaneous metals, shall be new, first quality of their respective kinds and subject to the approval of the owner's representative.

PART 3 – EXECUTION

2.508 – EXISTING CONDITIONS

A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete and to the point where this installation may properly commence.
B. In the event of discrepancy, immediately notify the owner's representative.

2.509 – INSTALLATION

A. Install metal fabrication in strict accordance with the drawings, the approved shop drawings and all pertinent codes, regulations and standards.
B. Obtain Owner's Representatives review prior to making major changes that is not part of the scheduled work.
C. Install items square and level, accurately fitted and free from distortion or defects.
D. Align all metal fabrications as shown on the drawings, and where vertical or horizontal members are shown, align them straight, plumb and level within a tolerance of one in 500.
E. Make provisions for erection stresses by temporary bracing. Keep work in alignment.
F. Replace items damaged in course of installation.
G. After installation, grind and touch up field welds.
H. Apply galvanized spray over all field welds.

2.510 – WORKMANSHIP

A. Layout: Set all work plumb, true, rigid and neatly trimmed out. Miter Corners and angles of exposed molding and frames unless otherwise noted.
B. Fitting: Fit exposed connections accurately together to from tight hairline joints.
C. Labor: Employ Workmen Skilled in such work.

2.511 – FABRICATION

A. Shop assemble in largest practicable dimensions, making members true to length so assembling may be done with out fillers
B. Provide all surfaces free of file marks dents; hammer marks, wire edges or any unsightly surface defects.
C. STEEL PIPE COPING: Roll pipe to conform to the top radius curve of each bowl and ledge as shown on drawings.

2.512 – ATTACHMENTS AND REINFORCEMENTS

Do all cutting, shearing, drilling, punching, threading, tapping, etc., required for site metalwork or for attachment of adjacent work. If applicable drill or punch holes; do not use cutting torch.

2.513 – OTHER CONNECTORS

Make all permanent connections in ferrous metal surfaces using welds where at all possible: do not use bolts or screws.

2.514 – WELDING

A. Preparation: Remove all rust, paint, scale and other foreign matter. Wire brush all flame cut edges. Clamp members as required and alternate welds, all as necessary to prevent warping or miss alignment.
B. Exposed Welds: uniformly grind smooth (no tolerance) all welds normally exposed to view and feel in the finished work.
C. Faulty or defective welding: chip out and replace all welding showing cracks, slag inclusion, lack of fusion, bad undercut or other defects ascertained by visual or other means of inspection. Replace and re-weld at no cost to the owner.
D. Field welding:
    1. Procedure: Comply with AWS code manual shielded metal-arc welding, appearance and quality of welds made and methods used in correction welding work.

2. Protection: Protect all adjacent surfaces from damage due to weld sparks spatter or tramp metal.

2.515 – SURFACE TREATMENT AND PROTECTIVE COATINGS

A. Cleaning:
   1. Thoroughly clean all mill scale, rust, dirt, grease and other foreign matter form ferrous metal prior to any galvanizing or painting.
   2. Conditions in which are too severe to be removed by hand cleaning, shall be cleaned using appropriate methods for solvent cleaning, power tool cleaning and brush-off blast cleaning.
B. Exterior Ferrous Metal:
   1. Grind smooth all welds, burrs, and rough surfaces. Clean all coping from grease.
   2. Shop coat iron metal items; using anti-rust primer (red Color)
   3. All welds to be painted with primer after appropriate connections and grinding has taken place. Touch up all scratched primer prior to shotcrete application.

2.516 – CLEAN UP

A. Keep all areas of work clean, neat and orderly at all times. Keep paved areas clean during installation.
B. Clean up and remove all debris from the entire work area prior to final acceptance to satisfaction of owner's representative.

END OF SECTION

SECTION 16530
EXTERIOR LUMINARIES

PART 1 - GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the performance and design standards for JYP Park Soccer field lighting. The manufacturer has been designated by Orange County to be Musco Lighting. Contact Bob DeCouto at 407-421-5660 or email at bob.decouto@musco.com for pricing.

C. The sports lighting will be for the following fields:

1. 2 – 345' x 225' Soccer Fields

D. The primary goals of this sports lighting project are:

1. Provide long term I.E.S. Class III soccer field lighting on the field
2. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore the lighting system shall be designed such that the light levels are guaranteed to remain at or above target light values throughout the 25 years of the contract by the manufacturer.
3. Life Cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated, and the field(s) should be proactively monitored to detect fixture outages over a 25 year life cycle. To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system.
4. Environmental Light Control: It is the primary goal of this project to minimize spill light and glare to the players, spectators and adjoining properties

E. Design and Permitting
1. Contractor shall be responsible for securing necessary permits.

1.2 PERFORMANCE REQUIREMENTS –

A. **Timed Power Adjustment System** – Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Measured average illumination level shall be at or above predicted mean in accordance with IESNA RP-6-01, and measured upon lighting system ignition.

Lighting system to provide light levels as described below

Area of Lighting	Average Maintained Light Levels or Constant Light Level	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Soccer 1	30 fc	2.0:1.0	88	30' x 30'
Soccer 2	30 fc	2.0:1.0	88	30' x 30'

Based on anticipated hours of usage (500 hours per year), METHOD #1 systems would require a minimum of **2** group lamp replacements over the 25 years.

1. METHOD #1 uses I.E.S. Lumen maintenance control strategy: Automatic power adjustments to achieve a lumen maintenance control strategy as described in the IESNA Lighting Handbook 9th Edition Lighting Controls Section pages 27-2 and 27-3: "Lumen maintenance control strategy calls for reducing the initial illumination of a new system to the designed minimum level. As lumen depreciation occurs, more power is applied to the lamps in order to maintain constant output."

2. Independent Test Report: Musco Lighting has provided an independent test report verifying the field performance of the system for the duration of the life of the lamp, signed by a licensed professional engineer with outdoor lighting experience and no affiliation with the manufacturer.

1.3 ENVIRONMENTAL LIGHT CONTROL

A. ENVIRONMENTAL LIGHT CONTROL

Glare Control - The installed lighting system must provide light control in order to be environmentally responsible, provide good playability, and ensure the facility is aesthetically pleasing to the community.

Fixtures must have an external visor to reduce glare as well as spill light. Horizontal optic fixtures are not allowed. High output lamps (over 162,000 lumens) are not allowed.

1. Musco's photometric spill scans have been be submitted indicating the amount of horizontal spill on the property lines (see scans). These numbers average below -.1275fc. 405 target points were used for these calculations using a 30' grid pattern.

2. Luminaire Mounting Height – Proper mounting heights allow for sufficient vertical aiming angles which reduce glare and help ensure the illumination on the playing field is balanced, providing adequate modeling of the ball for optimal playability. The basis of design for this project would require mounting heights as indicated in the chart below

Field	Poles
Soccer Field 1	70’ mh
Soccer Field 2	70’ mh

4. Upper Beam Definition

No fixture shall exceed the candlepower at the specified degrees above the center of the beam in the vertical plane as specified in the following table.

NEMA Classification of Vertical Beam	Candela	Degrees Above the Center of the Beam in the Vertical Plane
4	10,000	15.0 degrees

1.4 LIFE CYCLE COSTS

A. Energy Consumption: The average kWh consumption for the field lighting system is designed to be 125.12 kW or less.

B. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 500 usage hours per year.

C. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual lamp outages shall be repaired when the usage of any field is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

D. Remote Monitoring System: See Section 2.1

QUALITY ASSURANCE

Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.5 WARRANTY AND GUARANTEE

A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1) Musco maintains specifically-funded financial reserves to assure fulfillment of the warranty for the full term.

2) Musco has employees/technicians to service the equipment located within a 60 mile radius. This is in addition to a network of contractors used to service the system.

3) Musco manufactures the Control Link system. Musco has employees/technicians to service the equipment located within a 60 mile radius. This is in addition to a network of contractors used to service the system.

1.6 DELIVERY TIMING

A. Equipment On-Site: The equipment must be on-site 4-6 weeks from receipt of approved submittals and receipt of complete order information.

PART 2 – PRODUCT

2.1 LIGHTING SYSTEM CONSTRUCTION

A. System Description: Lighting system shall consist of the following:

1. Fixtures to illuminate the fields to the aforementioned light levels. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.
2. Galvanized steel poles.
3. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied.
4. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10’ above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
5. Tubular galvanized steel crossarms only – Angle iron crossarms are not acceptable.
6. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
7. No exposed wiring allowed; SO cords or exposed gasketing are allowed.

8. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.
9. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed steel shall be hot dip galvanized per ASTM A123. All exposed hardware and fasteners shall be stainless steel of at least 18-8 grade, passivated and polymer coated to prevent possible galvanic corrosion to adjoining metals. Pole mounting hardware to attach crossarms shall be hot-dip galvanized per ASTM 153. All exposed aluminum shall be powder coated with high performance polyester. All exterior reflective inserts shall be anodized, coated with a clear, high gloss, durable fluorocarbon, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All wiring shall be enclosed within the crossarms, pole, conduit or electrical components enclosure.
10. Lightning Protection: Manufacturer shall supply and equip all structures with lightning protection meeting NFPA 780 standards. Manufacturer shall integrate the required grounding electrode into the structure. If grounding is *NOT* integrated into the structure, the manufacturer shall supply an electrode of not less than 5/8-inch diameter and 8-foot length, installed with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode with a minimum size of 2 AWG for poles with less than 75' mounting height and 2/0 AWG for poles with more than 75' mounting height.
11. Safety: All system components shall be UL Listed for the appropriate application.
12. Surge Protection: Appropriate surge protection for the line and load side of the sports lighting
    I. Surge protection must be provided in the ballast enclosure of each pole
    II. Surge protection must be provided inside the contactor cabinet on both the pole side and the line side for protection
13. Electrical:
    i. Install New Contactor Cabinets as described earlier in this section.
    ii. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
14. An hour meter must be provided for each field to record hours of usage. This must operate independently of the control and monitoring system.

2.2 CONTROLS

A. System Description: Controls shall consist of the following:

1. Controls and Monitoring Cabinet to provide on-off control and monitoring of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.

2. Contractor shall install control/contractor cabinet to be supplied by manufacturer to the existing service panel. Contactors/Controls require 120V feed. Contractor to verify availability. If not available, a step-down transformer shall be supplied by Contractor.
3. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain the communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.
4. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute “early off” commands by phone.
5. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.
6. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position and contactor status.
    i. Bidder shall provide 5 sports lighting references where lamp outage monitoring is being done.
7. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for the length of the warranty.

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-01, Appendix B.

B. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be liable to any or all of the following:

1. Manufacturer shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.

3.2 FIELD LIGHT LEVEL ACCOUNTABILITY

A. Light levels are guaranteed not to fall below the target maintained light levels for the entire warrantee period of 25 Years.

B. If the owner feels that light levels have fallen below the target maintained value identified in the specification at any time during the warrantee period, the Owner may request Manufacturer to conduct a full grid light test to verify compliance to specification. If results are found to meet specified levels, the Owner shall pay Manufacturer up to $100 for conducting the light test. If light levels do not meet the target maintained value identified in the specification, Manufacture shall be required to resolve the problem and bring light levels to the target maintained value identified in the specification within 2 weeks.