FRENCH LANDING – PHASE II
LANDSCAPE & IRRIGATION IMPROVEMENTS

Van Buren Township, Michigan

SPECIFICATIONS

Russell Design. Inc.
Landscape Architects
Site Planners

RD Job No.
V05-221

June 21, 2022

TABLE OF CONTENTS

Drawings: Dated: June 21, 2022

Specifications

SECTION 00 41 43 - PROPOSAL FORM

Name of Bidding Contractor _____

hereinafter referred to as Contractor, declares familiarity with location of proposed work and conditions under which it must be performed, that Drawing(s) and Documents under "Bid Package Table of Contents" have been carefully examined, are understood and accepted as adequate for the purpose, and agrees to Contract with the **Charter Township of Van Buren**, hereinafter referred to as Owner, to perform everything required to be performed and to furnish all labor, materials, tools, equipment, utility, transportation services and supervision necessary to perform and complete, in a satisfactory manner, all work required in conjunction with above named project, and to accept as full payment thereof, subject to additions and/or deletions required by Contract, the sum of Dollars.

TOTAL BASE BID $_____.

ANALYSIS OF BID:

Unit Costs submitted for Contract additions/deletions, inclusive of any maintenance and guarantee period not separately listed. Total must equal Base Bid above. Contractor responsible to verify estimated quantity material. All work to be installed complete, as detailed on Drawing(s), within quote Base Bid.

Quantity	Description and Size	Unit Cost	Total Cost
Lump Sum	Mobilization		$_____
Lump Sum	General Conditions (Building permit fees and inspection fees will be paid for by the Township)		$_____
Lump Sum	Soil Erosion and Sedimentation Control Measures (SESC permit and inspections fees shall be paid for by the contractor)		$_____
Lump Sum	Tree & Native Seeded Area Protection Measures, Complete		$_____
Lump Sum	Asphalt Drive Removal, Complete		$ _____
Lump Sum	Concrete Sidewalk Removal, Complete		$ _____
Lump Sum	Landscape Removal /Strip Sod, Complete		$_____
Lump Sum	Selective Site Demolition, Complete		$ _____
Lump Sum	Earthwork (incl.- excavation and export), Complete		$ _____
_____cy	Imported Sandy Loam Topsoil, (incl. Supply, Install and Shaping), Complete	$ _____	$_____

Quantity	Description and Size	Comments	Unit Cost	Total Cost
Lump Sum	Swing Barrier Gate with Latching Posts		$ _____	$ _____
Lump Sum	Parking Striping, Symbols, and Barrier Free Signage		$ _____	$ _____
Lump Sum	Bollard Restoration		$ _____	$ _____
_____sy.	Asphalt Drive and Cul-de-sac (include gravel edge restoration), Complete		$ _____	$ _____
_____ea.	Drain-Style Bumper Blocks		$ _____	$ _____
_____sf.	Integral Concrete Walk with Curb		$ _____	$ _____
_____sf.	4” Concrete Paving (incl. trash receptacle pad)		$ _____	$ _____
_____sf.	6” Concrete Paving (at ramp down to future kayak launch, incl. Thickened Edge at termination point), Complete		$ _____	$ _____
_____ff.	Retaining Wall (incl. cap, drain tile, geogrid, & Sleev-It system to receive fence), Complete		$ _____	$ _____
_____lf.	42” Ht. Fence (at retaining wall), Complete		$ _____	$ _____
_____lf.	Cedar Rail Fence, Complete		$ _____	$ _____
_____lf.	Pipe and Tube Handrails (at ramp), Complete		$ _____	$ _____
_____ea.	Masonry Piers, Complete		$ _____	$ _____
_____ lf.	Shovel Cut Bed Edge, Complete		$ _____	$ _____
3 ea.	Liriodendron tulipifera, 2.5” cal		$_____	$_____
17 ea.	Ceanothus americanus, 5 gal.		$_____	$_____
50 ea.	Diervilla lonicera ‘Michigan Sunset’, 5 gal.		$_____	$_____
15 ea.	Juniperus sabina ‘Broadmoor’, 5 gal.		$_____	$_____
37 ea.	Rhus aromatica ‘Gro-Low’, 5 gal.		$_____	$_____
72 ea.	Schizachyrium scoparium ‘Blue Heaven’, 1 gal.		$_____	$_____
30 ea.	Amsonia ‘Blue Ice’, 1 gal.		$_____	$_____
50 ea.	Aster oblongifolium ‘October Skies’, 1 gal.		$_____	$_____
34 ea.	Geranium ‘Rozanne’, 1 gal.		$_____	$_____
120 ea.	Rudbeckia fulgida ‘Goldsturm’, 1 gal.		$_____	$_____

_____sy.	Fine Grade and Sodded Lawn	$ _____	$ _____
_____cy.	Shredded Hardwood Bark Mulch	$ _____	$ _____
_____cy.	Planting Mix	$ _____	$ _____
1 ea.	Trash Receptacle (Install, surface mount ONLY)	$_____	$_____
Lump Sum	Automatic Irrigation System, Complete		$_____

TOTAL BASE BID $ _____

UNIT COSTS

Contractor shall submit **installed** unit prices for items of stated below. Prices shall include all material, equipment, labor, profit and overhead required for the complete installation of the work item. The owner reserves the right to increase or decrease the Total Base Bid on the basis of the unit prices stated. The owner reserves the right, prior to the bid award to negotiate with the bidder on any or all unit prices listed in this proposal. Contractor 'mark-up' will not be paid in addition to the provided unit prices.

1 cy. Undercutting and removal of unsuitable soils	$_____/CY
1 cy. 21AA Crushed Limestone, Install & Compacted	$_____/CY

REQUIRED ALTERNATES

Contractor shall submit **installed** prices for items of stated below. Prices shall include all material, equipment, labor, profit and overhead required for the complete installation of the work item. The owner reserves the right to increase or decrease the Total Base Bid on the basis of the alternate prices stated. The owner reserves the right, prior to the bid award to negotiate with the bidder on any or all alternate prices listed in this proposal. Contractor 'mark-up' will not be paid in addition to the provided prices.

1.	Seeded Lawn in lieu of Sodded Lawn	ADD / DEDUCT: $_____
2.	Milling Asphalt in lieu of Removing and Disposing	ADD / DEDUCT: $_____
3.	Composite Rail Fence in lieu of Cedar Rail Fence	ADD / DEDUCT: $_____

VOLUNTARY ALTERNATES

Contractor shall submit **installed** prices for items of stated below. Prices shall include all material, equipment, labor, profit and overhead required for the complete installation of the work item. The owner reserves the right to increase or decrease the Total Base Bid on the basis of the alternate prices stated. The owner reserves the right, prior to the bid award to negotiate with the bidder on any or all alternate prices listed in this proposal. Contractor 'mark-up' will not be paid in addition to the provided prices.

1. _____ADD / DEDUCT: $_____
2. _____ADD / DEDUCT: $_____

Contractor acknowledges following addenda covering revisions to Drawing(s) or Specifications; Cost of such revisions has been included in quoted base bid.

Addendum No. ____ Dated _____

Addendum No. ____ Dated _____

Our subcontractors will be:

Name:	**Address:**	**Specialty:**
_____	_____	_____
_____	_____	_____
_____	_____	_____

Bidding Contractor: _____

Complete Address: _____

County: Telephone: (_____) _____

By: _____Title:_____

Email: _____

Dated this _____ day of _____ 2022

Circle One: Corporation, Partnership, Individual

END OF SECTION 00 4143

SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work covered by the Contract Documents for the Charter Township of Van Buren, Owner. The project is located at 9401 Quirk Road, Charter Township of Van Buren Township, MI.

A. The Work includes the following major items (dimensions are approximate):

1. Tree Protection Measures
2. Soil Erosion and Sedimentation Control (including permit)
3. Demolition
4. Field Engineering and Layout
5. Earthwork
6. Concrete Paving and Ramps
7. Asphalt Paving
8. Landscape Plantings and Accessories
9. Fine Grading and Sodded Lawn
10. Irrigation System

1.3 TYPE OF CONTRACT

A. Construct the Work of this Contract under a single Unit Price Contract.

1.4 GENERAL

A. Imperative Language: These Specifications (Divisions 01 through 49) are written in the imperative and abbreviated form. This imperative language of the technical specifications is directed at Contractor unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "shall be" and similar mandatory phrases by inference in the same manner as they are applied to notes on Drawings. The words "shall", "shall be" and similar mandatory phrases shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated in the imperative or otherwise.

B. Related Sections: Some Sections of these Specifications (Divisions 01 through 49) may include a paragraph titled "Related Sections". This paragraph is an aid to the Project Manual user and is not intended to include all Sections which may be related. It is Contractor's obligation to coordinate all Sections whether indicated under "Related Sections" or not.

C. Reference to the General Conditions: In Divisions 01 through 49, a reference to the General Conditions includes by inference all amendments or supplements in the Supplementary Conditions.

1.5 OWNER FURNISHED MATERIAL

A. Products furnished by independent vendor and paid for by Owner:
   1. Site Furnishings
B. Owner's Responsibilities:
   1. Furnish Site Furniture
   2. Arrange for and deliver Shop Drawings, Product data and Samples to Architect.
   3. Arrange and pay for Product delivery to Site.
   4. On delivery, inspect Products jointly with Contractor.
   5. Submit claims for transportation damage.
   6. Arrange for replacement of damaged, defective, or missing items.
   7. Arrange for Manufacturer's warranties, inspections, and service.

C. Contractor's Responsibilities:
1. Coordinate delivery schedule of material to site with Owner and Supplier.
2. Receive and unload Products at Site (Site furniture only); inspect for completeness and damage jointly with Owner.
3. Handle, store, install (per manufacturer specifications) and protect installed components
4. Repair or replace items damaged by the Work of this Contract.

1.6 WORK BY OWNER

A. The following items will be furnished and installed by Owner:

Items identified on the drawings provided and installed by Owner contracted vendors.

B. Coordinate schedule and implementation of work by Owner contracted vendors to ensure seamless implementation.

C. Coordinate as necessary with Owner contracted vendors.

1.7 WORK UNDER OTHER CONTRACTS

1. Monument sign

2. Native seeding area

1.8 PROCUREMENT CONTRACTS

A. The Owner has executed a Procurement Contract for the following Equipment:

1. Site Furniture. Owner will furnish and deliver to site or coordinate same with selected contractor.

a. Contractor shall install site furniture per manufacturer’s specifications.

1.9 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow for public access, only upon substantial completion

B. Limit construction traffic access to Project site from access points as approved by Owner

C. Coordinate use of premises under direction of the Owner.

D. Where the Contract Documents identify certain site elements within the construction limits, such as sidewalks, drives, and streets, that must be kept open for public or the Owner’s use during construction, the Contractor shall be responsible for protection and maintenance of such elements as well.

E. Except in connection with the safety or protection of persons or the Work or property at the Site or adjacent thereto, all Work at the site shall be restricted to the following hours:

1. Monday through Friday (Except Legal Holidays): 8:00 a.m. to 5:00 p.m.
2. Saturday, Sundays or legal holidays with written approval of the Owner.

F. Work Within Rights-of-Way: In accordance with Division 01 Section “Regulatory Requirements.”

G. Private Easements:
1. The Owner will arrange for the necessary easements required for construction across privately-owned land. The Contractor shall carry on the construction in such a manner as to cause a minimum of inconvenience to the occupants of the properties.
2. Any agreement made by the Contractor with any property owner that extends the rights as granted under an easement obtained by the Owner or that provides for an additional easement shall be obtained by the Contractor at the Contractor's expense and shall in no way be binding upon the Owner. The Contractor shall defend and hold the Owner and the Engineer harmless against any action that may arise from activities conducted pursuant to such additional agreements or easements. Unless relieved of responsibility for surface

restoration in writing by property owner, the Contractor shall restore areas covered by separate agreements substantially the same as similar areas within the Project.

1.10 OCCUPANCY REQUIREMENTS

A. Owner Occupancy During Construction:
   1. The Owner will occupy or utilize premises during entire period of construction. Cooperate with the Owner to minimize conflict and to facilitate the Owner's operations.
   2. Access to Abutting Properties: Provide at all times.
   3. Access for Emergency Vehicles:
      a. Provide at all times.
      b. Provide at least one clear lane during non-work periods.
   4. Fire Hydrants: Provide access to at all times.
   5. Do not block fire access routes from buildings.
   6. Detours and Street Closure:
      a. When provided for in the Contract Documents or approved by the Engineer.
      b. Routes and barricades as indicated or as approved by road authority.
   7. Construct Work so as to not interfere with VBT Park Operations in accordance with this Section.
   8. Limit parking for construction vehicles to an area designated as indicated on the Drawings.

1.11 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner and Engineer.

B. Sequence Submittal:
   1. The sequence indicated below is offered as a suggestion to the Contractor.
   2. Submit a proposed sequence with appropriate times of starting and completion of tasks to Engineer for review.

C. The following sequence and intermediate dates are suggested to accommodate Owner's completion date. **The Contractor shall submit its own schedule indicating how it will achieve the required results.**

D. Owner Milestone Dates:

   1. August 5, 2022 : Recommendation of Contractor and Bid Tabulation to Township.

   2. August 16, 2022: Agreement brought before the Township Board for Approval

   3. August 22, 2022: Construction Begins

   4. November 11, 2022: Substantial Completion

   5. November 30, 2022: Project Completion

E. The above schedule milestones must be included in the overall construction schedule and shall also include coordination and installation of vendor supplied/installed materials.

   1. None

PART 2 - PRODUCTS

2.1 OTHER MATERIALS

A. General: All other materials which are not specified herein and are not indicated on the Drawings but are required for proper and complete performance of the Work.

B. Procedure:
   1. Select new, first quality material.
   2. Obtain Architect's review and approval.
   3. Provide and install.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 1100

SECTION 01 1813 – PROTECTION, RESTORATION AND NOTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes responsibilities for the protection, restoration and notification requirements for surface and subsurface structures, Underground Facilities, and surface improvements.

1.3 NOTIFICATION AND INTERRUPTIONS

A. Prior to Start of Construction:
   1. Notify MISS DIG at least 72 hours in advance at 1.800.482.7171.
   2. Arrange for the identification of the locations of existing Underground Facilities at or contiguous to the Site.
   3. Coordinate utility connection with each utility provider.

B. Utility Interruptions:
   1. Provide standby utility service for an interruption exceeding 2 hours or as approved by the Owner.
   2. Provide 48 hours' notice to the affected occupants of the time and duration of the anticipated shut off.
   3. Notify Fire Department 48 hours in advance if water main or fire supply line shut off is required.
   4. Pay all costs relating to utility interruptions.

1.4 PROTECTION AND RELOCATION

A. Be Responsible For:
   1. Protection of structures and utilities at or contiguous to the Site in accordance with the General Conditions.
   2. Cost of cleaning, repair, relocation, raising, lowering, or replacement of structures and utilities which are damaged as a result of Contractor's operations.
   3. Cost of cleaning, repair, relocation, raising, lowering, or replacement of structures and utilities which are identified on the Drawings for relocation.
   4. Temporary sheeting, bracing, poles, cables, sand fill or other means used to support a structure or utility exposed or endangered by Contractor's operations.
   5. Relocating, raising, or lowering of a structure or utility for Contractor's convenience.

B. Relocation of Poles and Structures:
   1. Be responsible for temporary and permanent relocation of power, light, telephone and other service poles and appurtenant structures that are identified on the Drawings for relocation.
   2. Make necessary arrangements with the owner of the pole or structure and pay all costs involved for items identified on the Drawings for temporary or permanent relocation.

1.5 RESTORATION

A. Acceptable Standards for Restoration:
   1. Restore to the better of:
      a. Original condition.
      b. Requirements of the Contract Documents.
      c. Current MDOT Standard Specifications for Construction.
      d. MDOT Standard Plans.

B. Property Corners, Government Survey Corners, and Plat Monuments:
   1. Protect from damage or disturbance.
   2. Protect discovered points until Engineer or Owner has witnessed or otherwise referenced their locations.
   3. Replace if disturbed or removed as a result of construction:

a. Arrange for replacement by a Licensed Land Surveyor.
b. Pay all costs.

C. Driving Surfaces and Similar Improvements:
1. Repair or replace damaged or removed surfaces as indicated on the Drawings and as specified herein.
2. Adjust to temporary or final grade all new and existing castings (water valve boxes, manholes, catch basins and similar structures) for all gravel, bituminous or concrete surfacing or resurfacing.

D. Landscaping and Miscellaneous Improvements:
1. Includes, but is not limited to, topsoil, seeded areas, shrubs, trees, decorative plantings, irrigation, and other similar items.
2. Protect from damage by construction operations. In event of damage, replace damaged item with one of equivalent type and size.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SURFACE RESTORATION

A. Unless otherwise specified or indicated on the Drawings, perform the following surface restorations:
1. System Descriptions:
a. Turf Establishment - Sodding:
1) Topsoil Thickness: 4 inches.
2) Perform final grading, watering, backfilling of washouts, and related work.
3) Sodded areas shall be weed free and established prior to acceptance.
b. Landscaping:
1) New, items shall be healthy and growing prior to acceptance.
2) Watering is Contractor's responsibility and an incidental expense.
2. Material requirements for surface restoration unless specified otherwise:
a. Turf Materials
b. Landscaping Materials
c. All Other Materials: Incidental and as required.
3. Construction Standards for Surface Restoration: Comply with requirements specified or indicated on the Drawings.

3.2 PAYMENT FOR UTILITIES AND ASSOCIATED STRUCTURES

A. Payment for Work on Utilities and Associated Structures:
1. If Work is by Utility Company: Pay costs.
2. If Work is by Contractor: Perform work in accordance with the requirements of utility company or authority having jurisdiction.

END OF SECTION 01 1813

SECTION 02 4113 – SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment and services to complete the site demolition work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Related work specified elsewhere:

1. Section 03 3300 Concrete Paving
2. Section 31 2200: Grading
3. Section 31 2500: Erosion and Sedimentation Control
4. Section 32 1216: Asphalt Paving

1.03 QUALITY ASSURANCE:

A. Contractor Qualifications: Minimum of five years experience in demolition of comparable nature.

B. Requirements of All Applicable Regulatory Agencies:

1. All applicable Building Codes and other Public Agencies having jurisdiction upon the work.

1.04 SUBMITTALS:

A. Permits and notices authorizing demolition if applicable.

B. Certificates of severance of utility services.

C. Permit of transport and disposal of debris.

D. Demolition procedures and operational sequence for review and acceptance by Landscape Architect.

1.05 JOB CONDITIONS:

A. Protection:

1. Erect barriers, fences, guard rails, enclosures and shoring to protect personnel, structures and utilities remaining intact.

2. Protect designated trees and plants from damages.

3. Use all means necessary to protect existing objects and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressing to damaged plants necessary to the approval of the Architect at no additional cost to the Owner.

B. Maintaining Traffic:

1. Ensure minimum interference with roads, streets, driveways, sidewalks and adjacent facilities.

2. Do not close or obstruct streets and sidewalks, and keep in operation throughout construction.

3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

C. Dust Control:

1. Use all means necessary for preventing dust from demolition operations from being nuisance to adjacent property owners. Methods used for dust control are subject to approval by the Architect prior to use.

D. Burning:

1. On-site burning will not be permitted.

PART 2 - PRODUCTS "NOT APPLICABLE"

PART 3 - EXECUTION

3.01 INSPECTION:

A. Before beginning work of this section, inspect areas in which work will be performed.

B. Photograph or video existing conditions, including surrounding property if necessary, which could be misconstrued as damage resulting from selective demolition. File copies of photographic documentation with the Architect before beginning work of this Section.

C. Do not commence work until all conditions and requirements of all applicable public agencies are complied with.

3.02 PREPARATION:

A. Arrange for and verify termination of utility services to include removing meters and capping lines as required to perform work described in the specification sections.

B. Notification:

1. Notify the Owner at least three full working days prior to commencing the work of this Section.

3.03 CLARIFICATION:

A. The drawings do not purport to show all objects existing on the site.

B. Before commencing the work of the Section, verify with the Owner all objects to be removed and all objects to be preserved.

3.04 SCHEDULING:

A. Schedule all work in a careful manner with all necessary consideration for the public and the Owner.

B. Avoid interference with the use of, and passage to and from, adjacent facilities.

3.05 DISCONNECTION OF UTILITIES:

A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company or agency involved.

3.06 PROTECTION OF UTILITIES:

A. Preserve in operating condition all active utilities adjacent to or traversing the site and/or designated to remain.

3.08 OTHER DEMOLITION (IF APPLICABLE):

A. Pull out any existing utility lines designated for abandonment, irrigation, electrical lines, pull boxes and splice boxes, man holes and catch basins to be removed and all other objects designated to be removed or interfering with the work. Contact the utility company or agency involved for their requirements for performing this work. All removed equipment and materials shall be removed from the work area the same day as removed.

B. Removal of Debris: Remove all debris from the site and leave the site in a neat, orderly condition to the full acceptance of the Landscape Architect, or the Owner. No debris shall be left on the site overnight.

END OF SECTION 02 4113

SECTION 03 3300 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements. Which are hereby made a part of this section.

1.02 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment, and services to complete the Fine Grading work, as indicated on the drawings, as specified herein or both

B. Related work specified elsewhere:

1. Section 05 5213: Pipe and Tube Railings
2. Section 31 2200: Grading
3. Section 32 0515: Soils for Exterior Improvements
4. Section 32 8423: Underground Sprinklers
5. Section 32 9219: Seeding (Alternate 1)
6. Section 32 9223: Sodding (Base Bid)

C. REFERENCES

D. American Concrete Institute (ACI)

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 302 - Guide for Concrete Floor and Slab Construction.
3. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
4. ACI 305R - Hot Weather Concreting.
5. ACI 306R - Cold Weather Concreting.
6. ACI 308 - Standard Specification for Curing Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete (ACI 318-05) and Commentary.

ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

1. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars
4. ASTM B221 - Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
5. ASTM C33 - Concrete Aggregates.
6. ASTM C94 - Ready-Mixed Concrete.
7. ASTM C150 - Portland Cement.

8. ASTM C260 - Air Entraining Admixtures for Concrete.
9. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
10. ASTM C494 - Chemicals Admixtures for Concrete.
11. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).
12. ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.
13. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

E. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice

F. Michigan Department of Transportation - MDOT

1. 2012 MDOT Standard Specifications for Construction, or current issue

G. Americans with Disabilities Act (ADA)

1.03 DESCRIPTION

A. Provide all materials, labor, equipment, and services necessary to complete the concrete improvements as indicated in the Construction Documents.

1.04 QUALITY ASSURANCE

A. Installer shall be qualified with at least 3 years in business and has completed pavement work similar in material, design, and extent to that indicated for this Project.

B. Manufacturer shall be certified in the production of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Submit concrete mix designs for proposed slabs on grade.

D. Submit shop drawings and certified copies of mill report of reinforcement materials analysis if specified.

E. Concrete quality assurance testing, as required, will be performed by the owner/construction engineer in accordance with Sections 604 and 605 of the 2012 MDOT Standard Specifications for Construction, or current issue.

F. Submit, to the Owner, two copies of materials certificates signed by Material Producer and Contractor. Certificates shall state that each material item meets specified requirements.

G. Submit, to the Owner, job-mix formulas for each required cement-aggregate mixture. Mix designs shall be within allowable tolerances as specified for the application.

1.05 TRAFFIC CONTROL

A. Maintain vehicle and pedestrian traffic during paving and repair operations in such a manner as to not disrupt normal traffic activities unless special notification has been distributed.

1.06 WEATHER LIMITATIONS

A. Construct pavement surface course only when ground temperature is above 40 degrees F. and base is dry. Base course may be laid when temperature is above 40 degrees F. and rising. Do not place pavement when base or surface is wet or frozen.

B. Cold Weather Protection: When the temperature of the atmosphere is 40-degrees F. and below, the concrete shall be protected by heating, insulation covering, housing or combination thereof as required to maintain the temperature of the concrete at or above 50-degrees F. and in a moist condition continuously for the concrete curing period. Cold weather protection shall meet the requirements of ACI 306R "Cold Weather Concreting."

C. Hot Weather Protection: When the temperature of the atmosphere is 90-degrees F. and above, or during other climatic conditions which will cause too rapid drying of the concrete, the concrete shall be protected by windbreaks, shading, fog spraying light-colored moisture-retaining covering, or a combination thereof as required to maintain the temperature of the concrete below 80-degrees F. and in a moist condition continuously for the concrete curing period. Hot weather protection shall meet the requirements of ACI 305R "Hot Weather Concreting."

1.07 SUBMITTALS

A. Concrete Mix Designs

1. Prior to any concrete pavement placement, the contractor shall submit a design mix for approval by the engineer for each pavement mix proposed. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

2. Proportion mixes to provide concrete for pavement and gutter and spillways with the following properties.

a. Compressive Strength (28 days): 3,500 psi, unless otherwise indicated
b. Maximum Aggregate Size: 1.5 inches
c. Slump: 3 inches
d. Total Air Content by Volume: 5%

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials used in concrete pavement shall be in accordance with Section 801.02 of the MDOT 2012 Standard Specifications for Construction.

B. The fine aggregate shall meet all requirements of the MDOT 2012 Standard Specification, or current issue for No. 2NS Natural Sand.

C. The coarse aggregate shall meet of requirements of the MDOT 2012 Standard Specification for No. 6AA Coarse Aggregate.

A. Water used in concrete shall be clean, free from oil, acids strong alkalies or vegetable matter and potable. If City water is used in the concrete, all necessary permits shall be obtained from the City Water Department.

B. Joint and waterproofing materials for use in concrete pavement shall conform to Section 904 of the MDOT 2003 Standard Specifications for Construction

C. The curing compound shall be white membrane type and conform with ASTM C-309, Type 2.

2.02 READY-MIXED CONCRETE MANUFACTURER'S QUALIFICATIONS

A. All ready-mixed concrete suppliers must be approved by the Owner. Concrete shall be manufactured and delivered to the job Site by a ready-mixed concrete manufacturer meeting the requirements of the National Ready Mixed Concrete Association (NRMCA) certification program.

2.03 READY-MIXED CONCRETE

A. All production, handling of materials, and distribution of ready-mixed concrete shall meet the requirements set forth in Section 601 of the MDOT 2003 Standard Specifications for Construction.

B. Ready-mixed concrete shall be mixed and delivered to the point of discharge at the job by means of a ready-mix concrete truck. Delivery tickets in accordance with Section 16 of ASTM C94 for each concrete load delivered to and used at the site shall be signed by the owner’s designated representative. The delivery tickets shall provide at minimum the following information:

1. Date
2. Name of ready-mix concrete plant
3. Contractor
4. Job location
5. Type (Standard or H.E.S.) and brand of cement
6. Cement content in bags per cubic yards of concrete
7. Truck number
8. Time dispatched and time unloaded
9. Amount of concrete in load in cubic yards
10. Admixtures in concrete
11. Maximum allowable slump in inches
12. Amount of water added at job in gallons if any

B. No water from the truck water system or elsewhere shall be added after the initial introduction of the mixing water for the batch. Under no circumstances shall the approved maximum water content be exceeded, nor shall the slump exceed the maximum specified.

C. Discharge of the concrete shall be completed in compliance with Table 601-1 of the MDOT 2012 Standard Specifications for Construction.

D. Concrete delivered in cold weather (air temperature 45-degrees F. and lower) shall have a temperature not less than 60-degrees F. at the point of discharge at job, and in compliance with ACI 306 R "Cold Weather Concreting". Concrete placing will not be permitted when the air temperature is 35-degrees F. or lower.

E. Concrete delivered under hot weather conditions contributing to quick stiffening of concrete, or in air temperature of 80-degrees F. and over, shall have a temperature between 60- and 80-degrees F. at the point of discharge at job, and in accordance with ACI 305 R "Hot Weather Concreting."

2.04 REINFORCEMENT MATERIALS

A. Reinforcing Bars: ASTM A615-84A, Grade 60 Deformed Billet-Steel Bars, if specified.

B. Epoxy-Coated Reinforcement Bars: ASTM A775 with ASTM A615, Grade 60, deformed bars, if specified.

C. Plain Steel Welded Wire Fabric: ASTM A185 plain type, flat sheet fabrication, if specified.

D. Reinforcing Steel Bar and Rod Mats: ASTM A704, ASTM A615, Grade 60, deformed bars, if specified.

E. Epoxy-Coated Joint Dowel Bars: ASTM A615 with ASTM A615, Grade 60, plain steel bars.

F. Hook Bolts per ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt, if specified.

G. Tie Wires to be black, annealed steel wire, not less than 16-gauge.

H. Supports for Reinforcements: Bar supports conforming to "Bar Support Specifications" contained in ACI "Manual of Standard Practice". Provide chairs, spacers, and other devices suitable for proper spacing, supporting and fastening reinforcing bars, if specified

I. Shop fabricate reinforcing bars to conform to the shapes and dimensions shown on the reviewed Shop Drawings and in accordance with ACI "Manual of Standard Practice," current edition.

2.06 FORMS

A. All forms shall extend 1” deeper than full depth of the proposed pavement section and cleaned before each use.

B. Fixed forms shall be of sufficient strength to resist springing during concrete-placing operations, and of an approved section with flat surface on top.

C. Flexible form materials may consist of plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

D. A commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces shall be applied to the forms before concrete installation.

PART 3- EXECUTION

3.01 GRADING

A. All new pavement shall be placed on a prepared subgrade, smoothed, and leveled to the grades indicated on the Plans.

B. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction and repair as required. In clay soils the subgrade shall be excavated 4 inches below the sidewalk base and filled with approved sand meeting MDOT Class II granular fill.

C. SETTING FORMS

A. Compact and cut-to-grade subgrade under forms so that forms when set will be uniformly supported for the entire length. Securely stake and brace or tie forms to prevent leakage of concrete. Bracing with piles of earth will not be permitted.

B. Coat surfaces of forms to be in contact with concrete with a light clear paraffin oil or parting compound which will not stain the concrete.

C. Before start of concrete placing, form Work shall be complete and approved by the Soils Engineer.

D. Hardened concrete, debris and foreign material shall be removed from interior of forms.

3.02 PLACING REINFORCEMENT

A. Provide reinforcement for concrete slabs on grade as shown on the Drawings. Reinforcement shall be kept clean and free from objectionable rust. Bends or kinks in reinforcing bars shall be corrected before placing. All reinforcement shall be accurately located in forms and securely held in place, before and during concrete placing, by supports adequate to prevent displacement during the course of construction.

B. Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

3.03 CONTRACTION JOINTS

A. Provide contraction joints in concrete sidewalk T/4 inch deep by 3/16 inches wide at 5 foot intervals, unless a more detailed jointing pattern is called for.

B. For other contraction joints form by tooling or sawing a ¼ inch wide joint T/4 inches deep. In no case shall the joints be greater than 10 feet in any direction. Joints shall be cut perpendicular to the surface and at right angles to the edge of pavement, unless a more detailed jointing pattern is called for.

3.04 EXPANSION (OR ISOLATION) JOINTS

A. Provide expansion joints for concrete sidewalks and ramps at tangent points, radius returns, at intersections, and in straight runs at uniform intervals not exceeding 25-30 linear feet.

B. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.

C. Provide expansion joints between concrete pavement and adjacent rigid structures not specified herein before.

3.05 CONCRETE PLACING

A. Thickness of concrete slabs very. See plans

B. Concrete shall be handled from the point of delivery and to concrete conveying equipment, and to the location of final deposit by methods, which will prevent segregation and loss of concrete mix materials and in a manner, which will assure that the required quality of concrete is maintained.

C. Before placing pavement, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

D. Cold-Weather concrete placement shall comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

E. Hot-Weather concrete placement shall be according to recommendations in ACI 305R when hot-weather conditions exist.

F. Equipment for Conveying Concrete:

1. Runways for wheeled concrete conveying equipment shall be provided for the ready-mix concrete delivery point to the locations of final deposit.

2. The interior surfaces of concrete conveying equipment shall be maintained free of hardened concrete, debris, water, snow, ice, and other deleterious materials.

A. When the temperature of steel forms is greater than 120-degrees F., the steel surfaces shall be sprayed with water just prior to placing the concrete.

B. Concrete shall be deposited continuously. Concrete which has partly hardened or has been contaminated by foreign materials shall not be placed; such concrete shall be properly disposed of in an approved manner.

C. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

3.06 CONCRETE FINISHING

A. Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float pavement surface by hand floating. Cut down high spots and fill low spots.

C. Apply a light broom finish perpendicular to direction of travel.

3.07 CURING CONCRETE

A. Apply curing compound uniformly in continuous operation by power spray.

B. Newly placed concrete shall be protected as required to maintain the temperature of the concrete at not less than 50 degrees F. nor more than 80 degrees F. and in a moist condition continuously for a period of time necessary for the concrete to cure. Changes in temperature of the concrete during curing shall be as uniform as possible and shall not exceed 5 degrees F. in any one hour, nor 50 degrees F. in any 24 hour period.

3.08 REMOVAL OF FORMS

A. All forms, rails and stakes shall be removed within 48-hours after placing the pavement.

B. Any and all “honey combing” noticed upon removal of the forms shall be hand grouted.

C. Upon removal of the forms, the remaining excavated area shall be backfilled with approved material, compacted thoroughly, and left in a neat condition.

3.09 CLEANUP

A. After completion of concrete curing in an area, remove all weather protection materials and rubbish and debris resulting from specified Work. Sweep concrete pavements clean.

B. In no case shall the mixer or truck be flushed out onto the street pavement, in a catch basin or sewer manhole, or in any public right-of-way.

END SECTION 03 3300

SECTION 05 5213– PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of handrails and railings is shown on drawings.

B. Types of handrails and railing systems required include:

1. Aluminum pipe and tube handrails

1.03 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.

1. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbs. applied at any point non-concurrently, vertically downward or horizontally.

b. Uniform load of 50 lbs. per linear ft. applied non-concurrently, vertically downward or horizontally.

c. Concentrated and uniform loads above need not be assumed to act concurrently.

1.04 SUBMITTALS:

A. Product Data: Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.

B. Shop Drawings: Show details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections and anchors.

1. Provide templates for anchor and bolt installation by others.

2. Include structural computations evidencing compliance of handrails and railing systems with design loadings indicated.

C. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations,

include sample sets composed of two or more units showing limits of such variations expected in completed work.

1. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts and balusters. Include samples of fittings and brackets.

2. Sample need not be full height.

1.05 QUALITY ASSURANCE:

A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Design Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

1. Engineer Qualifications: A professional engineer who is licensed to practice in jurisdiction where Project is located and who is experienced in providing structural engineering service of the kind required for work of this section.

1.06 STORAGE:

A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin or polyethylene sheeting; allow for air circulation inside the covering.

1.07 PORJECT CONDITIONS:

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.05 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide handrails and railing systems of one of the following:

1. Aluminum Pipe and Tube Railings:

a. Great Lakes Metal Fabrication
b. Casco & Sons LLC
c. R&B Wagner, Inc
d. Superior Aluminum Products, Inc.
or approved substitute

2.02 METALS:

A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing systems components.

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

1. Extruded Bar and Tube: ASTM B 221 (ASTM B 221M), alloy 6063-T5/T52.

2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.

3. Drawn Seamless Tube: ASTM B 210 (ASTM B 210M), alloy 6063-T832.

4. Plate and Sheet: ASTM B 209 (ASTM B 209M), alloy 6061-T6.

5. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), alloy 6061-T6.

6. Castings: ASTM B 26 (ASTM B 26M), alloy A356-T6.

2.04 MISCELLANEOUS MATERIALS:

A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, as required for color match, strength and compatibility in fabricated items.

C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.

2. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for handrails and railings indicated.

3. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.05 FABRICATION:

A. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance.

B. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Welded Connections: Fabricate handrails and railing systems for interconnections of members by welding. Use welding method which is appropriate for metal and finish indicated and develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces smooth, flush and blended to match adjoining surfaces.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of handrail and railing components.

E. Nonwelded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Brackets, Flanges and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.

G. Field measure and core drill existing installed concrete 4 inches deep x required diameter to accept handrails posts.

H . Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

I. Ease exposed edges to a radius of approximately $^{1}/_{32}$" (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

2.06 METAL FINISHES - GENERAL:

A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Provide any exposed fasteners with finish matching appearance, including color and texture, of handrails and railings.

2.08 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. Mechanical Finish: AA-M12 (Mechanical Finish: nonspecular as fabricated).

C. Class I, Clear Anodic Finish: AA-M12C22A41 Anodic Coating: Architectural Class I, clear anodized coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Installer must examine the areas and conditions under which handrails and railings are to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 PREPARATION:

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.

B. Field Measurements: Take field measurements prior to fabrication.

3.03 INSTALLATION, GENERAL:

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Perform cutting, drilling and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after fabrication and are intended for field connection by mechanical means without further cutting or fitting.

C. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.

D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

3.04 ANCHORING POSTS:

A. Concrete-Anchored Posts: Insert posts into cores in concrete and fill annular space between posts and sleeve solid with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions. Set posts plumb within a tolerance of 1/16” in 3 feet.

B. Cover anchorage joint with flange of same metal as post, attached to post as follows:

1. By set screws.

3.05 RAILING CONNECTIONS:

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

B. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed ¼” in 12’.

C. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint interval sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post.

3.07 ADJUSTING:

A.. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

B. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

3.08 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.09 PROTECTION:

A. Protect finishes of railing system and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore finished damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION 05 5200

SECTION 07 9200 - JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment and services to complete the Joint Sealants work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Related work specified elsewhere:

1. Section 03 3300: Cast-in-Place Concrete
2. Section 05 5213: Pipe and Tube Railings

1.03 SAMPLES AND CERTIFICATES:

A. Submit the following samples:

Quantity	Size	Description
3	6" long	Filler for polyurethane
3	Color sample charts	Polyurethane sealants

B. Submit the following Certificates for Compliance:

Description	Standards
Polyurethane (two components)	Per Specifications (TT-S-00227E, Type Class A ASTM C 920, TYPE M, Grade P, Class 25

1.04 COOPERATION:

A. Work of this section shall be provided and coordinated as required through procedures of construction that will insure safety.

1.05 GUARANTEE;

A. Furnish written guarantee for all sealant work stating that said work shall be free from any defects of material and/or workmanship for a period of five (5) years, commencing on the date of final completion and acceptance.

B. Said guarantee shall further state that sealants are guaranteed against:

1. Adhesive or cohesive failure of sealants in joints where movement is under maximum of ±25% extension or ±25% compression for two component polyurethane base sealant.

2. Any crazing greater than 3 mils in depth developing on the surface of the sealant material
3. Any staining of the surfaces adjacent to the joints, by the sealants, primers or joint filler materials, by migration through the adjacent materials in contact with them.

4. Any puncture, abrasion or tear failure due to pedestrian or vehicular traffic in self-leveling polyurethane base sealant installed at traffic surfaces.

5. Any visible chalking or color change on the cured surface of the sealant.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER'S AND MATERIALS:

A. Multi component chemically curing, polyurethane base sealant shall be manufactured to meet the specified requirements by the following manufacturer:

1. Tremco Corp., Contact: Construction Technical Services, telephone (216) 292-5000, Fax (216) 766-5535.

2. Sika Corporation, Telephone (201) 933-8800. Fax (201) 993-9379.

B. Manufacturer's label shall indicate the expiration date of use of sealants or manufacturer shall otherwise attest to the date of manufacture. The period of time lapsed shall be not loner than six (6) months for polyurethane from the date of manufacturer to the date of usage on the job.

C. Primers where required shall be as recommended by the sealant manufacturer.

D. The color of sealants shall be as selected by Architect or as called for on drawings.

E. Bond-breakers where required shall be as recommended by the sealant manufacturer.

2.02 FILLER MATERIAL FOR VERTICAL JOINTS:

A. Filler material shall be a non-impregnated closed-cell, supporting type, compressible resilient, free from tar, asphalt, oil and other foreign substances. Filler shall be a closed-cell polyethylene foam, or isomeric polymer foam, (polystyrene will not be allowed). Filler shape shall be such that sealant in joint is fully supported against puncture or pressure, but of design to prevent sealant from being forced out of joint by contraction. Filler shall have characteristics of not bonding with sealant, surface of filler. Filler shall be at least 25% wider than width of joint measured in field to which it is applied. Compression on such installed filler shall be sufficient so as to allow no displacement.

1. Closed-cell polyethylene joint filler foam backer rod material shall comply with ASTM D 1622.

2. Where joint design, or depth of joint will not permit the use of joint backing, a bondbreaker tape must be installed to prevent three-sided adhesion. An adhesive backed polyethylene tape should be used.

PART 3 - EXECUTION

3.01 JOINT DIMENSIONS:

A. The depth of a joint is defined as the distance from the outside face of the joint to closest point of joint filler, whether joint is rod shaped.

B. Minimum size of joint should be four times the anticipated movement. Minimum joint dimension is 3/8" (9.5mm) x 3/8" (9.5mm), to allow for adequate cleaning and priming.

C. For joints 1/2" (13mm) and wider, the depth of the sealant should be no more than 1/2" (13mm) deep.

D. Joints to receive sealants shall be never less than 1/4" depth by 1/4" width.

E. Joints larger than the above stated minimum dimensions, shall be provided in accordance with manufacturer's standard printed specifications and recommendations.

F. The General Contractor shall determine and provide joints of dimensions as specified herein before.

3.02 JOINT INSPECTION:

A. Inspect all joints which are to receive work of this section and notify Architect or dimensions and/or any existing conditions which will prevent satisfactory installation and performance of the sealants.

B. Commencement of work on any joint shall be considered full acceptance of dimensions and condition of said joint.

C. Joints to be sealed shall be thoroughly cleaned of mortar or any other foreign material in an approved manner before any sealant materials are applied. Any coating from metal surfaces shall be removed by use of solvent recommended by manufacturer of metal. Solvent shall not be allowed to air dry without wiping.

D. Concrete and masonry surfaces shall be fully cured, free of release agents, curing compounds, loose aggregate and other surface treatments. Treated surfaces shall be tested for adhesion before proceeding with sealant work.

E. Joint spaces and surfaces shall be thoroughly dry before installation of sealant materials. Unless approved means of drying joint is employed, do not install sealant material when temperature is below 40 degrees F or during and after rain and fog. To test for free moisture, run paper towel or paper napkin through joint. Paper shall be completely dry. Any alkaline seepage from fresh concrete shall be washed away, surface dried.

3.03 GENERAL WORKMANSHIP AND APPLICATION:

A. Use thoroughly experienced workmen in the application and as per manufacturer's recommendations.

B. Primer shall be used as it comes from can, unadulterated. Apply as per manufacturer's printed directions and/or recommendations. Prime joints before insertion of joint filler material.

C. Fill joint with filler material so that depth and width of joint have relationships as noted hereinafter under "Joint Dimensions".

D. When installing rod stock filler, roll filler into joint. Rod filler in final position shall not be twisted.

E. Bond-breaker strip shall be used in joints where sufficient room for back-up does not exist.

F. In mixing sealant compound components, do not whip excessive air into said materials. Mix strictly as recommended by manufacturer.

G. Sealant materials shall be applied within "application life" recommended by manufacturer for prevailing temperature and humidity conditions. Do not retemper.

H. Protect exposed surfaces adjacent to joints to prevent permanent staining or other damage to adjacent work. Be fully responsible for any staining and/or other damage caused under work of this section to any adjacent work.

I. If manufacturer indicates there is any possibility of color of sealant material being changed by use of wetting agents while tooling, Contractor shall dry tool.

J. Joints shall be lightly tooled into place immediately after application, when necessary to give concave shaped surface.

K. Immediately after application of sealants, thoroughly clean adjacent surfaces which may have been soiled, as per sealant manufacturer recommendations. Leave work in neat and clean conditions to full satisfaction of Architect.

3.04 GENERAL PERFORMANCE:

A. Sealants: Except as otherwise indicated, joints are required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application. Failures of installed sealants to comply with this requirements will be recognized as failures of materials and workmanship.

END OF SECTION 07 9200

SECTION 31 2200 - GRADING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplementary Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. Provide all materials, labor, equipment, and services necessary to complete all site grading as indicated in this Construction Documents. The work consists of, but is not limited to:

1. Stripping, stockpiling, and removal of Topsoil.

2. Earth moving and land balance required to meet proposed subgrades.

3. Subgrade preparation of building slabs, walks, and pavements.

4. Compaction of all areas in native soil, cut or fill.

5. Stockpiling and removal of suitable and unsuitable material other than Topsoil.

B. Related work specified elsewhere:

1. Section 03 3300: Cast-in-Place Concrete
2. Section 32 0515: Soils for Exterior Improvements
3. Section 32 1216: Asphalt Paving

1.03 QUALITY ASSURANCE

A. If required, the services of a Soils Engineer and Soils Laboratory will be retained by the Owner, to observe earthwork operations, analyze soil materials and perform applicable laboratory and field tests.

B. The Contractor shall arrange and pay for any other test or required inspections needed to meet the requirements set forth in these Construction Documents.

C. As a minimum the Soils Engineer shall perform the following tests:

1. The soils laboratory shall analyze all native or imported fill and backfill material and topsoil proposed for use to determine the suitability for use and compliance with the Contract Documents.

   a. Fill and backfill material shall be examined as to soil classification and tested to determine the plasticity index, optimum moisture content and dry density.
   b. After rough grading and prior to spreading of topsoil, the topsoil in lawn areas and the topsoil to be placed in and subgrade in planting beds shall be examined for organic content, acidity, and soil composition.

2. All natural grades to be retained, all areas of cut, and all areas of controlled fill shall be field tested by the Soils Engineer for moisture content and percent of compaction for compliance with specified values.

3. The number of tests performed shall be at the discretion of the Soils Engineer. Except that the number of field tests performed shall not be less than the minimum described below.

    a. Within the paved areas of the site, except trench excavations perform one (1) test for every 2000 cubic yards of fill or in areas of natural grade or cut one (1) test for every 40,000 square feet.

Emphasis should be given to the aesthetic appearance and functioning of berming and swales, as directed by the Landscape Architect or Owner's Representative. The Contractor shall employ skilled personnel and any necessary equipment to ensure that finish grading is smooth, aesthetically pleasing, drains well and is ideal for receiving sod and plant materials.

1.04 SUBMITTALS

A. The Soils Engineer shall submit the following reports directly to the Owner or Owner's Representative, with a copy to Contractor:

B. Classification and suitability of borrow material.

C. Field reports; in-place soil density tests.

D. Compaction Results

1. The Soils Engineer shall advise the Contractor and Owner or Owner's Representative immediately of any compaction tests failing to meet specified minimum requirements. The contractor shall take appropriate steps to meet the compaction requirements. No additional lift is to be placed onto a soil with any portion failing to meet compaction requirements.

1.05 DEFINITIONS

A. EXCAVATION: Consists of removal of material encountered to subgrade elevations indicated on the Plans, Specifications, Addenda, Change Orders or other written direction by the Owner.

B. UNAUTHORIZED EXCAVATION: Consists of removal of materials beyond indicated elevations or dimensions. Unauthorized excavation will be restored as indicated below at no expense to the Owner.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when approved by Soils Engineer.

2. In locations other than those above, backfill and compact unauthorized excavations with material approved by the Soils Engineer.

1.06 JOB CONDITIONS

A. The Contractor shall visit the site and acquaint himself with all existing conditions. The Contractor shall be responsible for his own subsurface investigations, as necessary, to satisfy requirements of this Section. All subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Owner's Representative.

B. SITE INFORMATION: The data provided regarding subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions made by the Contractor. .

C. It will be the responsibility of the Contractor to coordinate and schedule the grading operations with the excavation and Site Utility Contractors so as to provide for a smooth and orderly progression of the Work.

D. The Contractor shall provide the services of a Registered Land Surveyor to establish all lines, levels, grades, benchmarks and measurements required to lay out the Work.

E. Construction stakes becoming misaligned are to be checked before proceeding with the Work. Any re-staking required will be paid for by the contractor.

F. EXISTING UTILITIES: Locate existing underground utilities in areas of Work. If utilities are to remain in place, provide means of support and protection during earthwork operations.

1. Before starting site operations verify that the earlier Contractors have disconnected all temporary utilities which might interfere with the fine grading work.

2. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or relocate as indicated, specified, or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of active utilities.

3. Should pipes, conduit, or other utilities be encountered during excavation, consult Utility Owner immediately for directions. Cooperation with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Utility Owner.

4. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by the Owner and then only after acceptable temporary utility services have been provided.

a. Provide minimum of 48-hours' notice to the Owner and receive written notice to proceed before interrupting any utility.

G. Demolish and completely remove from Site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

H. Protect benchmarks, utilities, structures, fences, sidewalks, paving, and other facilities from earthwork equipment. In the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary. Contractor shall incur all cost for the replacement of damaged objects and vegetation.

I. Natural features which are not subject to changes by reason of the Drawings and Specifications shall not be defaced or injured in any manner.

J. The Contractor shall guard against movement or settlement of adjacent buildings or structures, and provide bracing, as necessary. He shall be responsible for safety and support of such buildings or structures and be liable for any movement or settlement. If at any time any adjacent buildings or structures appear to be endangered or unsafe, he should cease operations, and take precautions to support such buildings or structures. Once building or structures have been stabilized, the Contractor should notify the local Building Inspector and the Engineer. Operations shall be resumed only after permission has been granted. If the Engineer or Building Inspector considers additional bracing or shoring necessary to safeguard, or prevent movement or settlement, such bracing or shoring should be installed. If the Contractor fails to comply promptly with such order, such bracing and shoring may be placed by the Owner, at no expense to the Owner.

K. Dust control: Use all means necessary to prevent dust from construction operations from being a nuisance to adjacent property owners and from damaging finish surfaces on adjacent building, paving, etc. Methods used for dust control are subject to approval by the Landscape Architect of Owner's Representative.

PART 2- PRODUCTS

2.01 FILL MATERIAL

A. Materials for fill required to achieve design grades shall be either on- or offsite soils which are free of organic matter and debris. Refer to plan details for appropriate fill materials.

PART 3- EXECUTION

3.01 TOPSOIL STRIPPING / REMOVAL

A. Strip topsoil in all cut-and-fill areas and remove from site.

B. It shall be the responsibility of the contractor to dispose of any unused topsoil offsite in a legal manner.

3.02 PROOF ROLLING

A. Do all cutting, or site grading work required to meet indicated subgrades. After completion of the earthwork operation, the subgrade area not receiving fill material shall be proof rolled in place and then compacted as specified under "Compaction Density" for a particular area classification. The subgrade area receiving fill material shall be proof rolled prior to placement of fill.

1. During the performance of site grading operations, the subgrade shall be examined critically; and any areas discovered which, in the opinion of the Owner's Representative or Soils Engineer, are soft and unstable, shall be excavated to such depths as may be necessary to insure satisfactory supporting properties. These areas of excavation shall be backfilled immediately and shall be brought back to the elevation of the surrounding areas with approved fill material and in accordance with the earth fill construction procedure.

2. If pockets of unstable ground are encountered, notify the Owner's Representative or Soils Engineer to determine course of action. Do not proceed in area until authorization is granted.

3.03 PLACEMENT

A. Prior to grading operations, remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Fill all areas as required to meet indicated subgrades. Fill material shall conform to the requirements of these Specifications and shall be approved by the Soils Engineer prior to placement.

1. The surface of all areas shall be scarified by means of a disc or harrow to a minimum depth of 4-6 inches. An initial three-inch (3") layer of fill material shall then be spread over the scarified surface and the entire area compacted per the "Compaction Density" requirements.

C. Fill shall be deposited in 8-in. loose layers for material compacted by heavy compaction equipment, and not more than 4" layer when compacted by hand-operated tampers.

1. No frozen material should be used as fill nor shall any fill be placed on surfaces that are frozen or contain frost or ice.

2. When the fill meets the natural grade of a slope, a bench shall be cut in the existing slope. These cuts are to serve as keys to connect the existing grades with a newly-placed fill.

D. The moisture content of fill material shall not deviate from the optimum by more than 2 percent. Moisture content shall not exceed the optimum of any material which displays pronounced deformation under construction equipment. Drying of wet soil shall be expedited using plows, discs, harrows, or other approved methods. If additional water is required, it should be uniformly distributed and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.

1. If soft, yielding material is encountered in cuts or in fills as a result of trapping water, and cannot be satisfactorily stabilized by moisture control and compaction, the unstable material shall be excavated to the depth required by the Soils Engineer. The excavation shall then be filled with suitable material and compacted.

E. If sufficient approved native fill material is not available to achieve indicated subgrade elevations, the Contractor shall obtain additional material from off-site borrow pits.

F. Perform topsoil installation within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.

G. Regardless of finish grading elevations indicated, it is intended that grading be such that proper drainage of surface water will be directed away from buildings and that no low areas are created to allow ponding. Contractor to consult with Owner or Landscape Architect regarding minor variations in grade elevations before rough grading is completed.

H. Supply and spread topsoil to a uniform depth as noted on the plans or indicated in the landscape restoration section of the contract documents.

J. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture ready to accept seed or sod.

K. Provide earth crowning where indicated on drawings.

L. Crowning/mounding to be free flowing in shape and design, as indicated, and to blend into existing grades gradually so that toe of slope is not readily visible. Engineer to verify final contouring before planting.

M. The surface will be graded smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of +1/10 of a foot when tested with a 10' straightedge.

3.05 LAND BALANCE

A. A balanced grading plan is ***NOT*** provided for this project. All removal of material from the site or fill material necessary to bring the site to the indicated elevations shall be the Contractor's responsibility as part of the base bid. The Contractor is responsible to make his own determination of the quality of required fill or surplus material.

3.06 UNNECESSARY GRADING

A. Unnecessary Grading: The expense of grading of materials outside of limits indicated or ordered in writing by the Engineer and the correction thereof to the satisfaction of the Engineer shall be borne by the Contractor.

B. Unnecessary grading under footings: Either deepen footings to bear on actual subgrade elevation without changing top elevations or place concrete fill up to required elevation, as required by the Engineer.

C. Unnecessary grading other than under footings: Either place compacted fill or otherwise correct conditions, as required by the Engineer.

D. When required by the architect due to the unforeseen presence of unsatisfactory materials or other factors, perform additional grading and replace with approved compacted fill material in accordance with the Owner's instructions.

E. Payment for unforeseen additional work will be made in accordance with established unit prices or, if none, in accordance with provisions for changes in the work. No payment will be made for correction of subgrades improperly protected against damage from freeze-thaw or accumulation of water, or for correction of otherwise defective subgrades.

3.07 COMPACTION / DENSITY

A. Compact to at least the following percentage of maximum density, as determined by ASTM D-1557 (Modified Proctor). No deviation from these compaction densities will be allowed unless specifically approved by the Soils Engineer:

Material	% of Maximum Density
Fill under pavement or sidewalks, and within a 1:1 slope	95%
Fill in Landscape areas	85%

B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the Owner's Representative, and in no case until the masonry has been in place seven days.

C. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry or other exposed building surfaces.

D. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

3.08 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

D. Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent Work and eliminate evidence of restoration to greatest extent possible. No additional payment will be made.

3.09 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557.

B. If tests show Work does not meet specified requirements, remove Work, replace and retest.

C. Frequency of Tests: Every 50 feet apart or as specified by the Engineer.

D. Bring to required grade, areas where settlement, erosion, or other grade changes occur. Adjust grades as required to carry drainage away from buildings and to prevent ponding around the buildings and on pavements.

E. Remove all rock or objectionable material larger than 1 inch prior to commencing landscaping.

F. Contractor shall be responsible for stabilizing grades by approved methods prior to landscaping and shall be responsible for correction of grades as mentioned above, and cleanup of any wash outs or erosion.

3.011 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Contractor is to completely remove from site all waste material, including unacceptable excavated material, trash, and debris, in a legally established method.

END SECTION 31 2200

SECTION 31 2216 - FINE GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements. Which are hereby made a part of this section.

1.02 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment, and services to complete the Fine Grading work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Related work specified elsewhere:

1. Section 31 2200: Grading
2. Section 32 0515: Soils for Exterior Improvements
3. Section 32 8423: Underground Sprinklers
4. Section 32 9219: Seeding (Alternate 1)
5. Section 32 9223: Sodding (Base Bid)
6. Section 32 9300: Plants, Preparation and Accessories

1.03 SITE INSPECTION:

A. The Contractor shall visit the site and acquaint himself with all existing conditions. The Contractor shall be responsible for his own subsurface investigations, as necessary, to satisfy requirements of this Section. All subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Landscape Architect or Owner's Representative.

1.04 EXISTING CONDITIONS:

A. Obtain drawings showing proposed final grading from Civil Engineer, as indicated on drawings.

B. Major demolition, site preparation and general site earthwork will be accomplished under another, earlier contract. Verify that contours and grades established under that Contract are within one tenth (.1) of a foot of proposed grades shown on grading plans. Make whatever corrections and/or repairs necessary to make finish grades consistent with the requirements of the grading drawings and specifications.

1.05 UTILITIES:

A. Before starting site operations, verify that the earlier Contractors have disconnected all temporary utilities that might interfere with the fine grading work.

B. Locate all existing, active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or transversing the site that are designated to remain.

C. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or relocate as indicated, specified, or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of active utilities.

1.06 QUALITY ASSURANCE:

A. Requirements of all applicable building codes and other public agencies having jurisdiction upon the work.

B. Primary emphasis should be given to the aesthetic appearance and functioning of berming and swales, as directed by the Landscape Architect or Owner's Representative. The Contractor shall employ skilled personnel and any necessary equipment to ensure that finish grading is smooth, aesthetically pleasing, drains well and is ideal for receiving sod and plant materials.

PART 2 - MATERIALS

2.01 EXISTING SOIL:

A. Use on-site material, unless otherwise directed by Owner's Representative, free from debris, sod, biodegradable materials and other deleterious materials. The Contractor shall insure that all existing soil has sufficient percolation and surface drainage to support grasses and plant material and that extreme compaction occurs only in areas to receive paving.

B. In areas to receive seeding, verify that soil is scarified to depth of 4” and that soil contains enough organic matter to support and encourage rooting.

PART 3 - EXECUTION

3.01 JOB CONDITIONS:

A. Dust control: Use all means necessary to prevent dust from construction operations from being a nuisance to adjacent property owners and from damaging finish surfaces on adjacent building, paving, etc. Methods used for dust control are subject to approval by the Landscape Architect of Owner's Representative.

B. Burning: On-site burning will not be permitted.

C. Protection: Use all means necessary to protect curbs, gutters, sprinklers, utilities and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary to the approval of the Landscape Architect. Contractor shall incur all cost for the replacement of damaged objects and vegetation.

3.02 SCHEDULING:

A. Schedule all work in a careful manner with all necessary consideration for adjoining property owners and the public.

B. Coordinate schedule with other Contractors to avoid conflicts with their work.

3.03 EXCAVATION:

A. Excavate where necessary to obtain subgrades, percolation and surface drainage as required.

B. Materials to be excavated are unclassified.

C. Remove entirely any existing obstructions after approval by the Landscape Architect's or Owner's Representative.

D. Remove from site and dispose of debris and excavated material not required.

3.04 GRADING:

A. The Contractor shall establish finished grades as shown on the grading plan and as directed by the Architect, including areas where the existing grade has been disturbed by other work.

B. Finished grading shall be smooth, aesthetically pleasing, drain well and ready to receive sod and other plant material to full satisfaction of the Owner's Representative, Architect and Construction Manager.

3.05 COMPACTION:

A. Compact each layer of fill in designated areas with approved equipment to achieve a maximum density at optimum moisture, AASHTO T 180 - latest edition.

1. Under urbs, walks and other paved areas: compaction shall be to 95% of maximum density.

2. Under landscaped area, compaction shall not exceed 85% of maximum density.

B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the Owner's Representative, and in no case until the masonry has been in place seven days.

C. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry or other exposed building surfaces.

3.06 CORRECTION OF GRADE:

A. Bring to required grade levels areas where settlement, erosion or other grade changes occur. Adjust grades as required to carry drainage away from buildings and to prevent ponding around the buildings and on pavements.

B. Remove all rock or objectionable material larger than 1" any direction prior to commencing landscaping.

C. Contractor shall be responsible for stabilizing grades by approved methods prior to landscaping and shall be responsible for correction of grades as mentioned above and cleanup of any wash outs or erosion.

END OF SECTION 31 2216

31 2500 – EROSION AND SEDIMENTATION CONTROL

PART 1- GENERAL

1.01 REGULATORY REQUIREMENTS

A. The general conditions and supplemental conditions are made a part of this Section. Work under this Section includes all work necessary for effective soil erosion and sedimentation control in conformance with Part 91, Act 451, PA 1994, the Soil Erosion and Sedimentation Control Act.

B. Rules, regulations or laws of any controlling governmental agency shall govern, when they are more stringent than the requirements of this Section.

C. All earth changes shall be made in such a manner as to minimize the area of disturbed land exposed and unprotected against erosion and the duration of such exposure.

D. Sediment caused by accelerated soil erosion shall be restricted to a non-polluting minimum (as determined by the agency designated in accordance with and having jurisdiction and responsibility for the enforcement of sedimentation control).

E. All sedimentation control measures shall be maintained in an operating condition satisfactory to the designated agency, for the period of time which that agency deems necessary. This provision applies to all facilities that directly receive waters from the earth-change area, whether such facilities are a part of the proposed construction or existed prior to proposed construction.

F. Temporary stabilization measures shall be repeated when, and as often as, required by the governing agency.

G. Any facility constructed for the conveyance of water around, through or from the earth-change area shall limit the water flow to a non-erosive velocity.

H. Temporary sedimentation control devices and facilities shall be removed upon completion of the primary construction. The land surface area formerly occupied by such facilities shall then be graded and restored in accordance with the Plans and Specifications.

I. Obtain all pertinent permits including a Soil Erosion Control Permit from the county or local enforcing agency. Submit an NPDES Notice of Coverage, if required, when the soil erosion permit is received.

PART 2- PRODUCTS

2.01 MATERIALS

A. Straw bales and mulch shall be clean wheat straw or marsh hay. Straw shall be clean and free of weeds and weed seed. Hay will be allowed only when straw is not available. Bales are to be standard rectangular shape held together with 2 strands of hemp rope.

B. Sediment control / silt fence shall be a geotextile filter fabric capable of containing sediment, attached to wooden stakes capable of supporting the geotextile fabric.

C. Acceptable geotextile catch basin filter bag.

PART 3-EXECUTION

3.01 CONSTRUCTION SEQUENCE

A. To minimize the area of unstabilized land surface over which storm waters must flow, construction shall proceed from lower ground toward higher ground whenever possible.

3.02 TEMPORARY STOCKPILES

A. The Contractor shall take steps to prevent, or contain on-site, erosion from material stockpiles.

3.03 SEDIMENTATION CONTROL

A. The Contractor shall provide a suitable temporary sedimentation control facility at any connection to an existing enclosed storm drain, to minimize deposition of sediment in the existing storm drain during construction.

B. To prevent sediment from entering existing storm drains during the construction period, the Contractor shall provide suitable control facilities around storm water inlet facilities.

C. All open ditches and natural watercourses intercepted by the proposed construction shall be temporarily re-routed, provided with temporary sedimentation control facilities within their cross-section, and/or diverted into a newly-established drain via non-erosive channels.

D. Temporary sedimentation control devices and/or facilities shall be as designated on the Plans. Modifications to the Plan requires prior approval of the Engineer and local permitting agency.

E. In all cases, such facilities, whether permanent or temporary, shall be provided prior to any significant clearing, grading or surface disruption of the tributary area.

3.04 DE-WATERING

A. Pumped water from well points or de-watering wells installed to lower the water table to facilitate the proposed construction shall not discharge onto unstabilized areas. Such discharge shall be conveyed by pipe, hose or stabilized channel to a settling basin or other suitable sedimentation control facility.

3.05 VEHICULAR CONTROLS

A. Employ suitable cleaning methods to minimize the transfer of sediment-producing materials from the wheels of the vehicles onto adjacent improved surfaces. Contractor shall keep adjacent roads free of debris.

3.06 RESTABILIZATION OF TERRAIN

A. Final cleanup shall leave the property in as good or better condition than it was at the beginning of construction. Cleanup operations including at least rough grading and temporary stabilization shall be started as soon as feasibly possible where:

1. Pipe is laid in any location.

2. One acre or more of the ground surface is brought to its approximate proposed elevation, in an earth excavation, mining, landfilling, mass grading, or land balancing project; or of substantial completion of the base for the sidewalk construction and shall be completed within the next fifteen (15) days.

B. Temporary stabilization applied during freezing weather shall consist of hay or straw mulch applied at the rate of 2 tons per acre, "tacked" in place by locally approved methods. Temporary stabilization applied during other than freezing weather shall consist of perennial rye grass applied at the rate of 25 pounds per acre with hay or straw mulch applied at the rate of 2 tons per acre, "tacked" in place with locally approved methods.

C. Temporary stabilization shall be provided during the non-growing season for all areas to be seeded / sodded. This time period is generally from October 15 through April 15, both inclusive.

D. Temporary stabilization shall be provided for all uncompleted areas where significant earth disruption ceases for more than 30 days.

E. All areas which have been temporarily stabilized shall be permanently stabilized no later than 30 days following commencement of the planting season immediately following substantial completion of construction.

F. All mulch used for temporary stabilization shall be removed prior to permanent stabilization.

G, Permanent Stabilization is hereby defined as the Work described elsewhere in the Specifications.

3.07 CONTRACTOR'S GENERAL RESPONSIBILITY

A. The Contractor shall be responsible for the proper implementation of the "Soil Erosion and Sedimentation Control Plan" as a part of this Contract. If a Soil Erosion and Sedimentation Control plan is supplied in the project drawings, the contractor shall install the proposed Soil Erosion and Sedimentation Control measures per the plan, or as dictated by the governing agency. If a plan is not supplied, it is the responsibility of the contractor to meet all local and state ordinances. A regular inspection program and a thorough maintenance program shall be developed and implemented by the Contractor to insure the effectiveness of the erosion and sedimentation control practices.

END SECTION 31 2500

SECTION 32 0190 - OPERATION & MAINTENANCE OF PLANTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. The requirements of this section include a one year warranty period from date of acceptance of installation.

B. Related Work Specified Elsewhere:

1. Section 32 8423: Underground Sprinklers
2. Section 32 9219: Seeding (Alternate 1)
3. Section 32 9223: Sodding (Base Bid)
4. Section 32 9300: Plants, Preparation & Accessories

1.03 ACCEPTANCE OF INSTALLATION:

A. At the completion of all landscape installation, or pre-approved portions thereof, the Landscape Contractor shall request in writing an inspection for acceptance of installation in which the Landscape Contractor, Landscape Architect and Owner's Representative shall be present. After this inspection a "Punch List" will be issued by the Landscape Architect and/or Owner's Representative. After completion of punch list items, the Landscape Architect, Contractor and Owner's Representative shall re-inspect the project and upon satisfactory completion of punch list items, issue a written statement of acceptance of installation and establish the beginning of the project warranty period.

B. It is the responsibility of the Landscape Contractor to make the above written request for inspection of installation in a timely fashion. If there is plant material loss prior to the Landscape Contractor's written request for inspection of installation, the Landscape Contractor shall make all replacements of this dead material at no additional cost. These replacements are not considered to be the required one (1) replacement of dead plant material by the Landscape Contractor during the one (1) year project warranty period, as outlined below.

C. Landscape work may be inspected for acceptance in parts agreeable to Owner's Representative and Landscape Architect provided work offered for inspection is complete, including maintenance as required.

D. For work to be inspected for partial acceptance, supply a written statement requesting acceptance of this work completed to date.

1.04 PROJECT WARRANTY:

A. The project warranty period begins upon written acceptance of the project installation by Landscape Architect and Owner's Representative.

B. The landscape contractor accepts responsibility for the irrigation system operation, watering schedule, watering amounts and monitoring system for duration of maintenance and warranty period.

C . The Landscape Contractor shall guarantee trees, shrubs, ground cover bed and seeded areas through construction and for a period of one year after date of acceptance of installation against defects including death and unsatisfactory growth, except for defects resulting from neglect by owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Contractor's control.

D. The Landscape Contractor shall warranty plants due to overwatering or under watering by automatic irrigation system during maintenance and warranty period.

1.05 MAINTENANCE

A. To insure guarantee standards, the following maintenance procedures shall be executed during construction and for the full project warranty period.

B. Maintenance of Trees:

1. Landscape Contractor shall be responsible for only one (1) replacement of any plant materials after project acceptance date, see Section 1.03, that are dead or in the opinion of the Landscape Architect are in an unhealthy or unsightly condition, or having lost natural shape, resulting from die back, excessive pruning, excessive or deficient watering practices, or inadequate or improper maintenance as part of the guarantee. Prior to any replacements Landscape Contractor shall review individual plants in question with Landscape Architect and determine the reason for plant demise.

2. Replacements must meet specifications i.e. quality, species of plant material and planting procedures to receive approval of replacement materials by Landscape Architect.

3. Costs for replacements are assumed part of bid quotations and therefore will not result in an additional cost to Owner or Landscape Architect.

4. Areas damaged as result of replacement operations are to be restored by Contractor at no cost to the Owner or Landscape Architect.

5. The contractor shall be responsible for keeping guy wires taut, raise tree balls which settle, furnish and apply sprays as necessary to keep the plantings free of disease and insects until the end of the warranty period. All evergreens shall be watered thoroughly and wilt proofed in the fall to insure they do not go into the winter dry.

6. Winter Evergreen Protection (Trees and Shrubs): Treated burlap (green) and 2' x 2' x 8' hardwood stakes @ 4'-0" O.C. Attach burlap to wood lath with roofing nails. Contractor shall erect, remove and deliver to owner. Contractor shall install winter protection the first winter, install December 1 and remove April 15. Install screen height as required. Spray evergreens with wiltproof prior to December and again in February, two coatings are required; apply per manufacturer’s recommendations.

7. The contractor shall be responsible for watering of all plantings throughout construction, maintenance and warranty periods.

8. The contractor will be responsible for irrigation system operation, watering schedules, watering amounts and general monitoring of irrigation system throughout construction,

maintenance and warranty period. Overwatering or lack of from irrigation system source is the responsibility of the landscape contractor.

9. Remove and replace trees, shrubs, or other plants found to be dead or in unhealthy condition. Remove rejected plants and materials promptly. Make replacements during normal planting season and schedule. Replace trees and shrubs which are in doubt, unless, in opinion of Owner's Representative and Landscape Architect it is advisable to extend warranty period for a full-growing season. Remove all stakes, guy wires, tree wrap paper, dead twigs and branches from tree and plant materials at the end of this warranty period. Keep planting beds free of weeds during guarantee period. See Trees, Plants and Ground Covers Section for suggested herbicides.

C. Maintenance of Seeded Lawn Areas (Alternate 1)

1. The Contractor shall establish a dense lawn of permanent grasses, free from lumps and depressions or any bare spots, none of which is larger than one foot of area up to a maximum of 3% of the total seeded lawn area. Any part of the seeded lawn that fails to show a uniform growth and/or germination shall be reseeded until a dense cover is established.

2. If seeded in fall or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

3. The Contractor shall provide a minimum of two cuttings of the lawn or more as necessary until the inspection and acceptance of installation by the Owner's Representative and Landscape Architect. When the lawn reaches 3 inches in height it shall be cut to 2 inches in height. When meadow lawn reaches 6" in height it shall be cut to 4" in height.

4. The Owner assumes cutting responsibilities following the acceptance of installation by the Owner's Representative and the Landscape Architect.

5. After acceptance of installation, and for the duration of the project warranty period the Landscape Contractor shall continue all other maintenance procedures including fertilizing and weeding, and other operations such as rolling, regrading, replanting, and applying herbicides, fungicides, insecticides as required to establish a smooth, acceptable lawn free of eroded or bare areas.

6. Repair, rework, and re-seed all areas that have washed out, and eroded, or do not substantially germinate.

7. See Section 1.05,B: Items 6 and 7.

8. At conclusion of project warranty period and after receiving written final acceptance by Owner's Representative and Landscape Architect, the Owner shall assume <u>all</u> seeded lawn maintenance responsibilities.

D. Maintenance of Sodded Lawn Area (Base Bid)

1. Maintain sodded lawn areas, including watering, fertilizing, spot weeding, mowing, application of herbicides, fungicides, insecticides, and resodding until a full, uniform stand of sod is knitted to topsoil.

2. Water sod thoroughly, as required to establish proper rooting.

3. Repair, rework and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.

4. Provide a uniform stand of grass by watering, mowing, and maintaining lawn areas until acceptance of installation. Resod areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by Landscape Architect.

5. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specified height. Not more than 40% of grass leaf shall be removed at any single mowing. Minimum of two cuttings.

6. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, even colored viable lawn is established, free of weed, undesirable grass species, disease, and insects.

7. After acceptance of installation, and for the duration of the project warranty period the Landscape Contractor shall continue all maintenance procedures including fertilizing, weeding, rolling, regrading, resodding and applying herbicides, fungicides, insecticides as required to establish a smooth acceptable lawn, free of eroded or bare areas. The landscape contractor is not responsible for mowing after acceptance of installation and required cuttings.

8. See Section 1.05,B: Items 6 and 7.

9. At Conclusion of project warranty period and after receiving written final acceptance by Owner's Representative and Landscape Architect, the Owner shall assume all sodded lawn maintenance responsibilities.

1.06 FINAL ACCEPTANCE:

A. At the conclusion of the project warranty period the Landscape Contractor shall request a project inspection for final acceptance in which the Landscape Contractor, Landscape Architect and Owner's Representative shall be present. After this inspection a "Punch List" will be issued by the Landscape Architect. Upon completion of all punch list items, the Landscape Architect and Owner's Representative shall reinspect the project and issue a written statement of final acceptance. Upon final acceptance the Owner assumes all maintenance responsibilities for the landscape of the project.

PART 2 AND 3 - PRODUCTS AND EXECUTION

Not Applicable.

END OF SECTION 32 0190

SECTION 32 1090.33 - TREE AND SHRUB PRESERVATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of tree and plant protection is shown on drawings and by provisions of this Section.

B. Related Work Specified Elsewhere:

1. Section 02 4113: Selective Site Demolition
2. Section 31 2200: Grading
3. Section 32 2500: Soil Erosion and Sedimentation Control
4. Section 32 0515: Solis for Exterior Improvements

1.03 DEFINITIONS:

A. Protective Barrier: A temporary device installed during the full period of construction to protect existing vegetation from damage or disturbance.

B. Damage: Physical change to the site or its vegetation caused by equipment, materials, labor or grading operations which has occurred after on site work operations have commenced.

C. Drip Line: The outer perimeter of the plant canopy projected on the ground plane.

D. Existing Vegetation: Any existing tree, shrub or ground cover presently on site and which will remain.

E. Protection: Means of protecting existing site vegetation from trespass, damage or disturbance by use of barriers or other means necessary to prevent trespass, damage or disturbance.

1.04 QUALITY ASSURANCE:

A. Arborist Qualifications: Engage a qualified Arborist who has successfully completed tree protection and trimming to perform the following work:

1. Remove branches from trees that are to remain if required.

2. Recommend procedures to compensate for loss of roots and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.

3. Recommend procedures for excavation and grading work where adjacent to established plants.

4. Perform tree repair work for damage incurred by new construction.

1.05 SUBMITTALS:

A. Certification: Submit written certification by qualified Arborist that trees and plants indicated to remain have been protected during course of construction in accordance with recognized standards and that where damage did occur, trees and plants were promptly and properly treated. Indicate which damaged trees and plants (if any) are incapable of retaining full growth potential and are recommended to be replaced.

1.06 PROJECT CONDITIONS:

A. Temporary Protection: Provide temporary fencing, barricades or other suitable guards located outside drip-line to protect trees and other plants that are to remain from damage.

B. Root Systems: Do not store construction materials, debris, or excavated material within drip line of trees to remain. Do not permit vehicles within drip line. Restrict foot traffic to prevent excessive compaction of soil over root systems within drip line.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Barriers: Wood and wire snow fence or plastic safety fence 4’-0” high.

1. Support barriers with 6’-0” steel fence posts spaced not more than 8’-0” O.C.

B. Tree Pruning Compound: Waterproof, antiseptic, elastic and free of kerosene, coal tar, creosote and other substances harmful to plants.

C. Drainage Fill: Selected stone or gravel, graded to pass a 3 inch sieve and retained on a 1 inch sieve.

D. Topsoil: See Section 32 0515.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION:

A. Do not commence clearing operations prior to installing protective barriers.

B. Protect tree root systems from damage due to noxious materials caused by run-off or spillage during mixing, placement or storage of construction materials, Protect root systems from flooding, eroding or excessive wetting resulting from watering operations.

C. Do not allow fires under or adjacent to trees or other plants that are to remain.

D. Remove branches from trees that are to remain if required to clear new construction.

1. Where directed by Architect extend pruning operations to restore natural shape of entire trees.

2. Cut branches and roots, if required, with sharp pruning instruments; do not break or chop.

3.02 EXCAVATION AROUND TREES:

A. Excavate within proximity of trees only where indicated. Do not machine excavate within drip-line.

B. Where excavating for new construction is required within drip line of trees, hand excavate to minimize damage to root systems. Provide sheeting at excavations if required. Use narrow-tine spading forks and comb soil to expose roots.

1. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.

C. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

D. Where trenching for utilities is required within drip line, tunnel under or around roots by hand digging. Do not cut main lateral roots of tap roots; cut only small roots that interfere with installation of new work. Cut roots with sharp pruning instrucments; do not break or chop.

E. Prune branches to balance loss to root system caused by damage or cutting of root system.

3.03 GRADING AND FILLING AROUND TREES:

A. Maintain existing grade within drip-line of trees unless otherwise indicated.

B. Lowering Grades: Where existing grade is above new finish grade shown around trees, gradually slope grade away from trees as recommended by Arborist. Do not reduce grade with in drip-line.

1. Prune branches to stimulate root growth and to compensate for loss of roots. Provide subsequent maintenance during the contract period as recommended by Arborist. Provide owner with typed instructions as recommended by Arborist. Provide owner with typed instructions for recommended long-range maintenance procedures to be followed after completion of construction operations.

C. Raising Grades:

1. Minor Fills: Where existing grade is 6 inches or less below elevation of finish grade shown, use topsoil fill material specified. Place in single layer and do not compact; hand grade to required finish elevations.

2. Moderate Fills: Where existing grade is more than 6 inches, but less than 12 inches below finish grade elevation, place a layer of drainage fill on existing grade before placing topsoil. Carefully place against trunk of tree approximately 2 inches above finish grade elevation and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip line perimeter, place drainage fill to an elevation 6 inches below grade and completely fill with a layer of topsoil to finish grade elevation. Do not compact drainage fill or topsoil layers; hand grade to required elevations.

3.04 REPAIR AND REPLACEMENT OF TREES:

A. Repair trees damaged by construction operations. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

B. Remove and replace dead and damaged trees that Arborist determines to be incapable of restoration to normal growth pattern.

1. Provide new trees of same size and species as those being replaced. Plant and maintain as acceptable to Architect and provisions stated in Section 32 9300.

C. Maintain trees including fertilizing and watering.

3.05 DISPOSAL:

A. Burning removed trees and branches is not permitted on site.

B. Remove excess excavation, displaced trees and trimmings and dispose of off Owner's property.

END OF SECTION 32 0190.33

SECTION 32 0515 – SOILS FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of Topsoil Work is shown on drawings and by provisions of this section.

B. Topsoil for lawn work shall be provided by contractor from off-site sources free of herbicides and conforming to the specifications herein.

C. Related Work Specified Elsewhere:

1. Section 31 2216: Fine Grading
2. Section 32 9219: Seeding (Alternate 1)
3. Section 32 9223: Sodding (Base Bid)
3. Section 32 9300: Plants, Preparation & Accessories

1.03 QUALITY ASSURANCE:

A. Testing of supplied and/or stockpiled topsoil shall be performed by a qualified independent testing laboratory normally engaged in agronomic soil testing. Each soil sample tested shall be a composite of five to seven subsamples taken the full depth of proposed source. Discard upper 6 inches of stockpiled topsoil before collecting samples. All costs for collecting and testing of topsoil shall be borne by the Contractor.

1. Recommended testing laboratory:

A & L Great Lakes Laboratories, Inc.
3505 Conestoga Drive
Fort Wayne, IN 46808
(219) 483-4759

B. Required Topsoil Tests:

1. Chemical analysis indicating:

a. fertility: pH, nitrate nitrogen, ammonia nitrogen, phosphate phosphorous, potassium, calcium, magnesium.

b. suitability: total salinity, boron, sodium, potassium, calcium, magnesium, chloride, sulfate.

2. Physical properities including:

a. organic content

b. particle size distribution

1.04 SUBMITTALS:

A. Submit two certified copies of soil tests for approval prior to initiating work.

1.05 PROJECT CONDITIONS:

A. Known underground and surface utility lines are indicated on the civil drawings.

B. Protect existing trees, plants, lawns and other features designated to remain as part of the landscaping work.

C. Promptly repair damage to adjacent facilities caused by topsoil operations. Cost of repair at Contractor's expense.

D. Promptly notify the Landscape Architect of unexpected sub-surface conditions.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide topsoil as required to complete job. Topsoil must meet testing criteria results specified. All processing, cleaning and preparation of this topsoil to render it acceptable for use is the responsibility of this contractor.

Supplied topsoil, shall be fertile, friable sandy, sandy loam soil without admixture of subsoil and free of stones, stumps, root, trash, debris, and other materials deleterious to plant growth. Topsoil shall not frozen or muddy. Ph of existing or supplied soil to range between 6.5 and not more than 7.5. Topsoil that does not meet this pH range shall be amended with approved pH adjusters. Topsoil shall contain not less than 3% and not greater than 10% organic matter determined by loss through ignition. Clay content as determined by Bouyoucous Hydrometer Test shall range from 5% - 10%. Silt content shall not exceed 15%.

B. Gradation of Topsoil:

Sieve Designation	Percent Passing
1 inch screen	100
¼ inch screen	97-100
No. 10 U.S.S. mesh sieve	95-100
No. 140 U.S.S.	15-35

Percentages shall be based on dry weight of the sample.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine rough grades and installation conditions. Do not start topsoil work until unsatisfactory conditions are corrected.

3.02 FINISH GRADING:

A. Perform topsoiling within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to assure areas drain away from building structures and to prevent ponding and pockets of surface drainage.

C. Lawn Areas: Supply and spread topsoil to a minimum uniform depth of 4” or as noted. Remove vegetation, deleterious material and clumps and stones larger than 1” in diameter.

D. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture ready to accept seed or sod.

E. Provide earth crowning where indicated on drawings.

F. Crowning/mounding to be free flowing in shape and design, as indicated, and to blend into existing grades gradually so that toe of slope is not readily visible. Landscape Architect to verify final contouring before planting.

G. Regardless of finish grading elevations indicated, it is intended that grading be such that proper drainage of surface water will occur and that no low areas are created to allow ponding. Contractor to consult with Owner or Landscape Architect regarding minor variations in grade elevations before rough grading is completed.

3.03 CLEANING:

A. Upon completion of topsoiling operations, clean areas within contract limits, remove tools and equipment. Site shall be clear, clean, free of debris and suitable for site work operations.

END OF SECTION 32 0515

SECTION 32 1216 - ASPHALT PAVING

PART 1- GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements. Which are hereby made a part of this section.

1.02 WORK INCLUDED:

A. Plant mixed hot mix asphalt (HMA) consists of asphalt binder, aggregates, mineral filler and other additives. Refer to construction documents for additional requirements for producing, furnishing, and installing HMA.

B. All provisions of section 501 of the 2012 Michigan Department of Transportation (MDOT) Standard Specifications of Construction shall apply except as stated herein.

1.03 SECTION INCLUDES:

A. HMA paving

B. HMA patching

C. HMA paving overlays

D. MDOT 2012 Standard Specifications for Construction (MDOT)

E. American Society of Testing Materials (ASTM)

1.04 QUALITY ASSURANCE

A. Quality control for HMA pavements shall be in accordance with Section 503 of the 2012 MDOT Standard Specifications for Construction.

B. Submit proposed mix designs for each HMA mix prior to commencement of work. Follow the *Procedures Manual for Mix Design Processing* for all mix designs. Provide written certification that the materials used in the mixture are from the same source as those used in developing the mix design and that each material item meets specified requirements.

C. Testing, as required, will be performed by the owner/construction engineer in accordance with Section 504 of the 2012 MDOT Standard Specifications for Construction.

D. HMA materials not complying with specified requirements shall be repaired or removed and replaced with new paving.

1.05 WEATHER LIMITATIONS

A. Section 502 of the MDOT 2012 Standard Specifications for Construction shall govern.

B. Do not place HMA or apply bond coat when precipitation is imminent or when moisture on the existing surface will prevent satisfactory curing.

PART 2- PRODUCTS

2.01 MATERIALS

A. Coarse aggregate shall consist of crushed stone, crushed gravel, a mixture of uncrushed gravel with either crushed stone or crushed gravel, or other inert material having similar characteristics. It shall be composed of clean, tough, durable fragments free from an excess of flat or elongated pieces and shall be free of organic matter and deleterious substances and meet the requirements of Division 9 in the MDOT 2012 Standard Specifications for Construction.

B. Fine aggregate shall be well graded from coarse to fine and consist of natural sand, stone screenings, or a blend of natural sand and stone screenings. It shall be composed of rough surfaced and angular grains of quartz or other hard durable rock and meet the requirements of Division 9 in the MDOT 2012 Standard Specifications for Construction.

C. HMA surface course shall be a mixture of 4.5 percent to 7.0 percent viscosity graded Asphalt Cement 5E1 (85/100 penetration grade) meeting the requirements of Division 5 in the MDOT 2012 Standard Specifications for Construction for aggregate gradation and HMA. Recycled asphalt products (RAP) are not allowed in surface course mixes.

D. HMA leveling course shall be a mixture of 3 percent to 6 percent viscosity graded Asphalt Cement 4E1 (85/100 penetration grade) meeting the requirements of Division 5 in the MDOT 2012 Standard Specifications for Construction for aggregate gradation and HMA.

E. Bond Coat material shall be SS-1h or CSS-1h emulsified asphalt, Grade RS-2 and shall conform with the requirements specified in Section 904 of the 2012 MDOT Standard Specifications for Construction.

PART 3 EXECUTION

3.01 Base Preparation

A. Subgrade preparations shall consist of the final machining of the subgrade immediately prior to placing the bituminous base course. The surface shall be true to line and grade. Proof-roll all areas to receive the base course to locate all soft surface areas. Replace soil that deflects and will not compact with acceptable fill material and compact such fill in accordance with these Specifications.

B. Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

3.02 HMA PLACEMENT

A. HMA pavement construction methods shall conform to 502.03.F of the MDOT 2012 Standard Specifications for Construction.

3.03 LINE AND GRADE

A. The contractor shall be responsible to provide construction layout to establish the line and grade from the construction plans.

3.04 BOND COAT APPLICATION

A. The bond coat shall be applied with a pressure distributor and applied uniformly to horizontal and vertical surfaces abutting new HMA pavement at a rate of 0.10-gallons per square yard.

B. The bond coat shall be applied sufficiently in advance of the laying of the wearing surface to permit drying but shall not be applied so far in advance or over such an area as to lose its adhesiveness as a result of being covered with dust or other foreign material. Suitable precautions shall be taken by the Contractor to protect the surface while the bond coat is drying and until the wearing surface is applied.

3.05 GENERAL TRANSPORTING, SPREADING AND FINISHING

A. Section 502 of the MDOT 2012 Standard Specifications for Construction shall govern.

3.06 EQUIPMENT

A. Section 502 of the MDOT 2012 Standard Specifications for Construction shall govern.

3.07 PLACING AND COMPACTION

A. Section 502 of the MDOT 2012 Standard Specifications for Construction shall govern.

B. Protect newly placed HMA after final rolling. Do not permit vehicular traffic on the asphalt pavement until it has properly cured, and in no case sooner than six hours after compaction.

3.08 MINIMUM QUALITY REQUIREMENTS

A. Test the in-place HMA base, leveling, and surface courses for compliance with the requirements for density, thickness, and surface smoothness. Take not less than 3 inches diameter pavement specimens of each completed course, as specified under Field Quality Control for in-place Work, from locations as directed by the testing Engineer. Repair holes from test specimens as specified for patching defective Work.

B. Core pavement to determine in-place compacted thickness and compare to cross-sectional pavement detail on the plans. Any thickness less than plan is not acceptable and will require replacement of the asphalt with no additional payment. Test in-place density according to ASTM D-2950.

C. Each HMA course shall be tested for smoothness, using a 10-foot straightedge applied parallel with and at right angles to centerline of paved area according to MTM 722. Surfaces shall not be acceptable if exceeding the tolerances set forth in Section 502 of the MDOT 2012 Standard Specifications for Construction.

3.09 EXISTING DRAINAGE

A. Do not block road drainage. Maintain shoulders, gutters and ditches affected by construction operations to carry drainage flows.

3.10 TEMPORARY REPAIRS

A. Where it is not feasible to replace pavements immediately after completion of the excavation and backfill, furnish, and place crushed stone or gravel as required to maintain traffic until the pavement can be restored. Continuously maintain the temporary crushed stone or gravel surfaces in a smooth condition, free of potholes or ruts, until the permanent pavement is restored.

B. Restore permanent pavement within 30 days after the existing pavement has been cut.

3.11 COLD MILLING (ALTERNATE NO. 2)

A. Clean existing pavement surface of deleterious material immediately before cold milling.

B. Remove existing asphalt pavement and minimum 1” of aggregate base by cold milling to grades and cross sections indicated.

C. Mill to a uniform finished surface free of gouges, grooves, and ridges.

D. Control rate of milling to prevent tearing of existing asphalt course.

E. Repair or replace curbs, manholes, and other construction damaged during cold milling.

F. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled asphalt.

G. Transport milled hot-mix asphalt to asphalt recycling facility.

3.12 PULVERIZING / BASE CRUSHING (ALTERNATE NO. 2)

A. Work shall be performed in accordance with Section 305 of the MDOT 2012 Standard Specifications for Construction.

B. After crushing, 95 percent of the crushed material shall have a maximum particle size of 1-1/2 inches, with no particle size exceeding 4 inches.

C. Pulverized material shall be graded and shaped to match the grades shown on the plans, or to provide positive drainage towards a storm water collection area where grades are not provided.

D. Excess crushed material, if suitable, may be used as base or shoulder aggregate.

3.13 HMA PATCHING / REPAIRS

A. Vertically sawcut full depth and along straight lines around deteriorated pavement and into adjacent sound pavement.

B. Remove deteriorated pavement without damaging sawcut edges and dispose of legally offsite. Damaged edges shall be re-sawcut.

C. Repair or replace curbs, structures, and other construction damaged during pavement excavation.

D. Use 21AA material as specified and recompact to bring aggregate base course to bottom of existing pavement section.

E. Use appropriate mechanical or hand placement equipment to install HMA in lifts not to exceed 2” compacted in place.

F. Patching / repair HMA material shall consist of appropriate base, leveling, and wearing course mixes, to be approved by the owner prior to installation.

G. Install necessary leveling wedges in compacted lifts not exceeding 2 inches thick.

H. Use hot-applied joint sealant to seal joints around pavement repair.

END SECTION 32 1216

SECTION 32 1723 - PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 SECTION INCLUDES

A. Furnishing and applying permanent pavement markings.

1.03 DESCRIPTION OF WORK

A. Provide all materials, labor, equipment, and services necessary to complete all traffic lane and parking lot striping as indicated in the Construction Documents.

B. Work includes, but not limited to painting of letters, markings, stripes and islands on the pavement surface applied in accordance with this Section and at the locations shown on the Plans or as directed by the Engineer.

1.04 QUALITY ASSURANCE

A. All work under this section shall be performed in accordance with the current 2012 MDOT Standard Specifications for Construction, unless otherwise indicated on the drawings.

B. All physically handicapped / barrier free markings shall be in accordance with current ADA requirements and the current Michigan Barrier Free Graphics Design Manual.

C. Each paint container shall be clearly marked showing the name and address of manufacturer, description of material, date of packaging, and volume and weight of contents.

D. Use only personnel completely trained and experienced in installation of materials and equipment.

1.05 SUBMITTALS

A. Manufacturer's literature: Submit descriptive product data of materials, installation methods and procedures.

B. Certification of compliance: Furnish a certification from manufacturer that material for this project has been sampled, tested and complies with requirements of specifications.

PART 1 PRODUCTS

1.01 MATERIALS

A. The paint shall meet the specifications set forth in Section 920 of the 2012 MDOT Standard Specifications for Construction, unless otherwise indicated on the drawings.

B. Color shall be as Specified on the Plans or as follows:

Striping Item	Color	Stripe Width
1. Standard Parking Stalls	Yellow	4 inches
2. Barrier Free Parking Stalls and Graphic Symbol	Blue	4 inches
3. Barrier Free Access Areas	Blue	4 inches

PART 2 EXECUTION

2.01 WEATHER LIMITATIONS

A. The painting shall be performed only when the existing surface is dry and clean, when the minimum atmospheric temperature is in accordance with Table 811-2 of the 2003 MDOT Standard Specifications for Construction, and when the weather is not excessively windy, dusty or foggy.

2.02 EQUIPMENT

A. All equipment for the Work shall be approved by the Contractor and shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, and such auxiliary hand painting equipment as may be necessary to satisfactorily complete the job.

B. The mechanical marker shall be an approved self-propelled marking machine suitable for application of traffic paint. It shall produce an even and uniform film thickness at the required coverage and shall be designed so as to apply markings of uniform cross-sections and clear-cut edges without running or spattering and within the limits for straightness set forth herein.

C. Suitable adjustments shall be provided on the sprayer/sprayers of a single machine or by furnishing additional equipment for painting the width required.

2.03 PREPARATION OF EXISTING SURFACE

A. Immediately before application of the paint, the existing surface shall be cleaned, dry and entirely free from dirt, grease, oil, acids, laitance, or other foreign matter which could reduce the bond between the coat of paint and the pavement. Areas which cannot be satisfactorily cleaned by brooming and blowing shall be scrubbed as directed with a water solution of tri-sodium phosphate or an approved equal solution. After scrubbing, the solution shall be rinsed off and the surface dried prior to painting.

B. Existing markings or stripes, which are to be abandoned or removed, shall be obliterated or obscured by the best methods suited for the purpose and to the satisfaction of the Owner.

2.04 LAYOUTS AND ALIGNMENT

A. The Contractor is responsible for laying out proposed striping, which is to be approved by the Owner, before the Contractor is to proceed with the striping procedure. The Contractor is to ensure that all subsequent striping meets the quality of the approved application.

B. On those sections of pavements where no previously applied figures, markings, or stripes are available to serve as a guide, suitable layouts and lines of proposed stripes shall be spotted in advance of the paint application. Control points shall be spaced at such intervals as will ensure accurate location of all markings.

C. The Contractor shall provide an experienced Technician to supervise the location, alignment, layout, dimensions and application of the paint.

2.05 APPLICATION

A. Markings shall be applied at the locations and to the dimensions and spacing indicated on the Plans or as specified. Paint shall not be applied until the indicated alignment is laid out and the conditions of the existing surface have been approved by the Owner.

B. The paint shall be mixed in accordance with the manufacturer's instructions before application. The paint shall be thoroughly mixed and applied to the surface of the pavement with the marking machine at its original consistency without the addition of thinner. If the paint is applied by brush, the surface shall receive 2 coats; the first coat shall be thoroughly dry before the second coat is applied.

C, Prior to marking of the pavement, 14 days shall elapse from the application of the bituminous seal coat, slurry seal or the placement of the HMA surface course.

D. In the application of straight stripes, any deviation in the edges exceeding 1/2-inch in 50-feet shall be obliterated and the marking corrected. The width of the markings shall be as designated within a tolerance of 5 percent.

2.06 PROTECTION

A. After applications of the paint, all markings shall be protected while the paint is drying. The fresh paint shall be protected from injury or damage of any kind. The Contractor shall be directly responsible and shall erect or place suitable warning signs, flags, or barricades, protective screens or coverings as required. Markings defaced by traffic or pedestrians shall be reinstalled at the contractor’s expense.

END SECTION 32 1723

SECTION 32 3115 - WOOD FENCES AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 WORK INCLUDED:

A. All labor, material, and equipment necessary for, and incidental to proper completion of all fencing installation. Location and extent of fencing as shown on drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

1. Section 03 3300: Cast-in-Place Concrete
2. Section 31 2200: Grading
3. Section 32 3132 - Wood Composite Fences and Gates (Alternate 3)
4. Section 32 9219: Seeding (Alternate 1)
5. Section 32 9223: Sodding (Base Bid)
6. Section 32 9300: Trees, Plants and Ground Covers

1.04 REFERENCE STANDARDS:

A. NFPA, National Forest Products Association - National Design Specification for stress grade lumber and its fastenings.

B. Lumber: Comply with American Softwood Lumber Standard PS-20-70. Provide species complying with grading rules of the following associations. Provide lumber grading agency certificate of inspection and grade compliance, with each shipment.

1. Southern Pine: Standard Grading Rules for Southern Pine Lumber, published by Southern Forest Products Association (SFPA).

2. Standard Grading Rules for Southern Pine Lumber (2014, or current edition published by Southern Pine Inspection Bureau (SPIB).

3. Western Red Cedar: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading Rules published by West Coast Lumber Inspection Bureau (WCLIB).

C. Lumber Treatment: Comply with American Wood Protection Association (AWPA) Standards for Wood Preservative Treatment Scheduled.

D. Hot-Dip Zinc Galvanizing Coating for fasteners, connectors, anchors and accessories, ASTM, A-153.

1.05 QUALITY ASSURANCE:

A. Shop pressure treat, precut, drill and line dry or air-seasoned all wood members as required, and deliver to job site ready for installation.

B. Identify lumber with a grade stamp of an agency certified by SFPA.

C. All metal components to meet applicable ASTM standards, and recommendations of the American Zinc Institute.

1.06 SUBMITTALS:

A. Submit complete shop drawings for entire wood fencing assembly indicating all dimensions, grades of wood, component profile, drilled holes, fasteners, connectors, erection details, etc.

B. Submit certification that required grade or lumber has complied with specification requirements.

C. Sample Panel: Before starting wood fencing provide a sample panel using materials indicated for the project work. Build one full fence section at the site at full height. Correct and rebuild sample panel until Architect's acceptance of the work. Retain panel during construction as a standard for completed wood fencing work.

1. The approved sample panel may be a finished section of the work and remain in place. Location as directed by the Architect.

2. Sample panel, if not utilized as a finished section, shall be removed by this contractor.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle all wood members with care during shipping and installation to maintain undamaged and unmarked exposed faces. Damage members will be rejected.

B. All lumber shall be protected from the weather and elements.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Fence Posts:

1. All wood shall be 4” x 4” pressure treated Southern Pine, No. 2 grade, in accordance with Standard Grading Rules for Southern Pine as published by Southern Pine Inspection Bureau (SPIB).

2. All lumber shall be kiln dried, to moisture content of not more than 19%, free from shakes, large or loose knots which might repair strength or durability of lumber.

3. Discard any pieces bowed, warped, twisted, or checked to the extent of causing a detrimental effect.

B. Rails:

1. All railings shall be 2” x 6” Western Red Cedar, S4S, D clear grade, in accordance with grading rules of (WCLIB) and (WWPA).

2. All lumber shall be kiln dried, to moisture content of not more than 19%, before and after pressure treatments, free from shakes, large or loose knots, cracks of other imperfections.

3. Discard any pieces bowed, warped, twisted, or checked to the extent of causing a detrimental effect.

C. Nails:

1. Double Hot Dipped Zinc Galvanized coating Maze 'Stormguard' nails with spiral shank. Manufactured by Maze Nails, Peru, Illinois 61354.

D. Concrete: ASTM C94 ready-mixed concrete minimum 28 day compressive strength of 2.500 psi, air entrained 2% to 4%.

E. Drainage Fill: MDOT 6A (3/8" to 3/4") clean uniformly graded natural aggregate, no fines.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine final grade and installation conditions. Do not start wood fencing work until unsatisfactory conditions are corrected. Should work commence prior to corrective measures being completed any adjustments or modifications to wood fencing shall be the responsibility of this contractor and cost for these modifications shall be borne by this contractor.

3.02 LAYOUT:

A. Layout complete fence line. Locate and mark post positions. Space line posts equally and at maximum of 6'-0" on center spacing, unless otherwise specified on the drawings. Layout shall be approved by Architect prior to initiating fence construction.

3.03 INSTALLATION:

A. Install wood fencing of the type, design, and height indicated on the drawings.

B. Drill post holes into firm undisturbed or compacted earth.

1. Install 12" diameter x 42" depth concrete footings for all solid gate and line posts. Bell bottom of footing as indicated on the drawings.

C. Align and plumb each post both vertically and laterally. Secure in position during concrete and earth fill placement.

D. Install railings and fencing materials as indicted on drawings and specified herein.

E. Use only sound, thoroughly seasoned materials of the longest practical lengths and sizes to minimize jointing. Use materials free from warp which cannot be easily corrected by anchoring and attachment.

F. Securely attach work to substrates by anchoring and fastening as required to provide a rigid finished fence structure.

G. Set work accurately to required level and lines, with members plumb and true, and accurately cut and fit.

H. Brush apply 2 coats of wood preservative to surface of preservative treated materials which have been field cut, dressed or drilled.

3.05 CLEANING:

A. Perform cleaning during installation of work and upon completion of the work. Remove from site all debris and equipment. Repair all damage resulting from wood fencing installation at this contractor's expense.

END OF SECTION 32 3115

SECTION 32 3119 – DECORATIVE METAL FENCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions Sections, apply to work specified in this section.

1.02 DESCRIPTION OF WORK

A. All labor, material, and equipment necessary for, and incidental to proper completion of all fencing installation. Location and extent of fencing as shown on drawings.

B. Fence components (i.e. pickets, rails, posts, and hardware) shall be as manufactured by Ameristar Fence Products. Model: Montage Plus, or approved substitute.

C. Related Work Specified Elsewhere:

1. Section 03 3300: Cast in Place Concrete
2. Section 32 3216: Segmental Retaining Wall
2. Section 32 9353: Plants, Preparation and Accessories

1.03 QUALITY ASSURANCE

A. Manufacturer's: As approved by Owner's Representative and Landscape Architect.

B. Fabrication and Installation: Fabricator and installer shall be a subcontractor with not less than five years of successful experience in the required types of metal fabrication and installation procedures.

C. Welding: Welding shall conform to AWS, American Welding Society Standards.

1.04 SUBMITTALS

A. Shop drawings: Details of fabrication, installation footings, brackets and hardware, and methods of installation.

B. Manufacturer's Literature.

C. Certificates: Manufacturer's certification that materials meet the specification requirements.

D. Brackets, anchors and hardware.

E. Powdercoat finished mock-up sample of 4’ fence section of each specified fence type.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials with manufacturer's tags and labels intact.

B. Handle and store so as to avoid damage.

C. All equipment parts and material shall be new.

1.06 WARRANTY

A. All structural fence components (i.e. rails, pickets, posts and hardware) shall be guaranteed against defects in material finish, including cracking,peeling, chipping, blistering or corroding for 10 (ten) years from time of final acceptance. Contractor to remedy any unsatisfactory conditions during guarantee period at no cost to owner.

PART 2 - PRODUCTS

Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved substitute:

A. BASIS-OF-DESIGN

AMERISTAR Montage Plus® *Welded and Rackable* (ATF – All Terrain Flexibility) Ornamental Steel, Majestic design, extended picket bottom rail treatment, (3-Rail) majestic style top, including but not limited to panels, posts and hardware as manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.60 oz/ft2 (184 g/m2), Coating Designation G-60.

B. Material for pickets shall be 3/4” square x 18 Ga. tubing. The rails shall be steel channel, 1.50” x 1. 50” x .14 Ga. Picket holes in the rail shall be spaced 4.675” on center. Fence posts shall be 2.50” square x 16 Ga.

F. Powder Coating: A minmmum six stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder with a minimum thichness of 2 mils. The topcoat shall be a "nomar" TGIC polyester powder coat finish with a minimum thickness of 2 mils. Top coat color shall be gloss black.

2.03 FABRICATION

A. Pickets, rails, and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection.

C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be BLACK. The coated panels and posts shall meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that all concrete is completed and approved by Owner's Representative and Landscape Architect prior to beginning fence and gate installation.

B. Any unsatisfactory conditions shall be reported to the Owner's Representative and Landscape Architect immediately. Do not proceed with work under this section until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Measure and layout and fencing locations per drawings.

B. Coordinate all work with other subcontractors and other work.

3.03 FENCE INSTALLATION

A. Completely install fencing with related hardware to conform with all approved shop drawings.

B. Fencing shall be erected plumb, square and level, with all metal pre coated and welded in shape prior to installation. Welding shall be continuous in accordance with AWS Standards; and all joints shall be ground smooth and painted to match coating.

3.03 FENCE INSTALLATION MAINTENANCE

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty.

3.04 CLEANING

A. Remove all debris and excess material immediately from project site.

B. Restore adjacent work by other contractors to its original condition.

C. Leave project area clean, orderly, and free of any hazardous conditions.

END OF SECTION 32 3119

SECTION 32 3132 - WOOD COMPOSITE FENCES AND GATES (ALTERNATE NO. 3)

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 WORK INCLUDED:

A. Provide all labor, materials, necessary equipment, and services to complete work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK SPECIFIED ELSEWHERE:

1. Section 31 2200: Grading
2. Section 03 3300: Cast-in-Place Concrete
3. Section 32 3115: Wood Fences and Gates (Base Bid)

1.03 REFERENCE STANDARDS:

A. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM D 143 - Standard Test Methods for Small Clear Specimens of Timber.

D. ASTM D 198 - Standard Test Methods of Static Tests of Lumber in Structural Sizes.

E. ASTM D 1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.

F. ASTM D 1413 - Standard Test Method for Wood Preservatives by Laboratory Soil-Block Cultures.

G. ASTM D 1761 - Standard Test Methods for Mechanical Fasteners in Wood.

H. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

I. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

J. ASTM D 2394 - Standard Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.

K. ASTM D 2395 - Standard Test Methods for Specific Gravity of Wood and Wood-Based Materials.

L. ASTM D 4761 - Standard Test Methods for Mechanical Properties of Lumber and Wood-Base Structural Material.

M. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

N. ASTM F 1679 - Standard Test Method for Using a Variable Incidence Tribometer (VIT). American Wood Protection Association (AWPA) Standards for Wood Preservative Treatment Scheduled.

1.2 DESIGN / PERFORMANCE REQUIREMENTS

A. Design Requirements: Design fence system to withstand Miami/Dade County 110 MPH steady wind and 130 MPH gusting wind tests.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 3300.

B. Product Data: Manufacturer's data sheets on each product to be used indicating sizes, profiles, surface finishes, and performance characteristics, and including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Instructions on care and cleaning of composite wood products.

C. Verification Samples: For each finish product specified, two samples, minimum size 9 inches (229 mm) square, representing actual product, color, and patterns.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for cleaning and maintenance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's instructions.

B. Store level and flat, off ground or floor, with supports at each end and maximum 24 inches on center.

C. Do not stack wood composite over 8 feet (203 mm) high.

D. Cover wood composite with waterproof covering, vented to prevent moisture buildup.

1.5 WARRANTY

A. Provide manufacturer's 25 year residential warranty / 10 year commercial warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites, and fungal decay of wood composite.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Trex Fencing.

B. Substitutions: Not permitted.

2.2 MATERIALS

A. Wood composite: Reclaimed wood and plastic with integral coloring; free from toxic chemicals and preservatives:
   1. Characteristics:
      a. Abrasion resistance: 0.01 inch wear per 1000 revolutions, tested to ASTM D 2394.
      b. Hardness: 1124 pounds, tested to ASTM D 143.
      c. Self ignition temperature: 743 degrees F, tested to ASTM D 1929.
      d. Flash ignition temperature: 698 degrees F, tested to ASTM D 1929.
      e. Flame spread rating: 80, tested to ASTM E 84.
      f. Water absorption, 24 hour immersion, tested to ASTM D 1037:
         1) Sanded surface: 4.3 percent.
         2) Unsanded surface: 1.7 percent.
      g. Thermal expansion coefficient, 36 inch long samples:
         1) Width: 35.2 x 10-6 to 42.7 x 10-6.
         2) Length: 16.1 x 10-6 to 19.2 x 10-6.
      h. Fastener withdrawal, tested to ASTM D 1761:
         1) Nail: 163 pounds per inch.
         2) Screw: 558 pounds per inch.
      i. Static coefficient of friction:
         1) Dry: 0.53 to 0.55, tested to ASTM D 2047.
         2) Dry: 0.59 to 0.70, tested to ASTM F 1679.
         3) Wet: 0.70 to 0.75, tested to ASTM F 1679.
      j. Fungus resistance, white and brown rot: No decay, tested to ASTM D 1413.
      k. Termite resistance: 9.6 rating, tested to AWPA E-1.
      l. Specific gravity: 0.91 to 0.95, tested to ASTM D 2395.
      m. Compression:
         1) Parallel: 1806 PSI ultimate, 550 PSI design, tested to ASTM D 198.
         2) Perpendicular: 1944 PSI ultimate, 625 PSI design, tested to ASTM D 143.
      n. Tensile strength: 854 PSI ultimate, 250 PSI design, tested to ASTM D 198.
      o. Shear strength: 561 PSI ultimate, 200 PSI design, tested to ASTM D 143.
      p. Modulus of rupture: 1423 PSI ultimate, 250 PSI design, tested to ASTM D 4761.
      q. Modulus of elasticity: 175,000 PSI ultimate, 100,000 PSI design, tested to ASTM D 4761.
      r. Thermal conductivity: 1.57 BTU per inch per hour per square foot at 85 degrees F, tested to ASTM C 177.

2.3 COMPONENTS

A. Fence System: Seclusions Privacy Fence System.
   1. Fence height:
      a. 4 feet; overall post height. See typical detail.

   2. Components:
      a. Fence post 4’ x 4” pressure treated
      b. Post sleeves: 4” x 4” x 108”; cut to receive finished grade
      c. Post caps: 4” x 4” Flat.

d. Railings: 2” x 6” square edge board

3. Color: By owner, submit samples of each component for approval.

2.4 ACCESSORIES

A. Fasteners: 1-5/8 inch galvanized or corrosion-resistant coated steel. Provide finish nails where applicable.

B. Concrete: Provide concrete conforming to ASTM C 94; minimum 2500 PSI compressive strength at 28 days, with a 3 to 5 inch slump.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut and drill wood composite using carbide tipped blades.

C. Space posts maximum 6 feet on center, unless otherwise noted. See drawings.

D. Drill post holes into undisturbed or compacted soil; excavate deeper in soft or loose soils and for posts with heavy lateral loads.

E. Drill posts to 12 inch diameter. Locate bottom of post 42 inches below grade

F. Place top of concrete per typical detail.

G. Cut rails to lengths required.

H. Place post caps over post tops and secure with construction adhesive or four finish nails.

3.4 CLEANING

A. Clean wood composite to remove stains:
1. Mold, mildew, and berry and leaf stains: Clean surfaces with conventional deck wash containing detergent or sodium hypochlorite.

2. Rust and ground-in dirt: Clean surfaces with cleaner containing oxalic or phosphoric acid.

3. Oil and grease: Clean surfaces with detergent containing degreasing agent.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 32 3132

SECTION 32 3216– SEGMENTAL RETAINING WALLS

PART - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions sections, apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent of retaining walls is shown on drawings.

B. Type of retaining walls required include the following:

1. Segmental concrete masonry retaining walls with soil reinforcement.

C. Related Work Specified Elsewhere:

1. Section: 31 2200: Grading
2. Section: 31 2216: Fine Grading
3. Section: 32 0515: Soils for Exterior Improvements
4. Section 33 4616.19: Pipe Underdrains

1.03 SYSTEM PERFORMANCE REQUIREMENTS:

A. Structural Performance: Design, engineer and install segmental concrete retaining walls to withstand the effects of loads due to soil pressure resulting from grades indicated;

1. Design retaining walls according to NCMA's "Design Manual for Segmental Retaining Walls".

B. Engineering Responsibility: Engage a manufacturer who assumes undivided responsibility for engineering segmental concrete retaining walls by employing a Registered Professional Engineer specializing in structures in the State of Michigan.

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Industry Standards: Comply with recommendations of National Concrete Masonry Association (NCMA) as applicable

C. Installer Qualifications: Engage an experienced installer with a minimum of (5) years experience who has completed segmental retaining walls similar in material, design and extent to that indicated for Project that has resulted in construction with a record of successful in-service performance

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and other information for each retaining wall material or product required, including but not limited to soil reinforcement if required by engineer, and filter fabric.

B. Shop Drawings: Submit shop drawings for approval indicating layout and construction of proposed retaining wall. Design drawings shall be prepared by manufacturer for segmental concrete retaining walls. Show height, length, profile, soil reinforcement, base and drainage fill.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification Purposes: Sets for each color, finish and pattern of concrete unit required. Include sample of concrete wall units showing the full range of variations expected for approval prior to ordering of concrete wall units.

1.06 PROJECT CONDITIONS:

A Test borings and other exploratory operations may be performed by Retaining Wall Contractor, at the Retaining Wall Contractor's option; however, no change in the contract sum will be authorized for such additional exploration.

B. Protection: Protect existing structures, utilities, sidewalks, pavements and other facilities in areas of work. Barricade open excavations an provide warning lights. Comply with regulations and requirements of authorities having jurisdiction.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to project site in an undamaged condition.

B. Store and handle retaining wall units and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.

C. Store accessories to prevent corrosion and accumulation of dirt or oil

D. Store and handle geotextiles according to ASTM D 4873.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. Base: Gravel or crushed stone, 21AA crushed limestone, or approved substitute.

B. Drainage Fill. 6A (3/8" to 3/4") natural aggregate, no fines.

C. Soil Reinforcement: Geogrid specifically manufactured for use as soil reinforcement and with necessary properties to comply with performance requirements.

D. Filtration/Separation Fabric: Manufacturer's non-woven geotextile fabric of poly propylene or polyester fibers, or a combination thereof.

1. Terrafix 270R
2. Mirafi 160 N

1.02 SEGMENTAL CONCRETE MASONRY MATERIALS:

A. Segmental Concrete Masonry Units: Provide manufacturer's standard high-strength, regular-weight concrete units, designed for use in segmental retaining walls, complying with ASTM C 90, except with net area compressive strength of 3000 psi for average of 3 units and 2500 psi for individual unit, maximum water absorption of 8 percent, and variation in height limited to 1/16 inch.

1. Provide units with lugs, projections, or holes and pins that locate successive courses in relation to the course below and maintain that alignment as backfill is placed, and that interlock with units above and below.

2. Shapes: Provide units of basic shapes and dimensions indicated.

3. Exposed Faces: Manufacturer's standard split or rock face. Color selected by Landscape Architect.

4. Special Units: Provide special corner, end and cap units, and other special shapes as necessary matching exposed faces of segmental concrete masonry units.

5. Manufacturer: Provide one of the following:

a. Fendt Builders Supply (734) 663-4277 (Basis of Design)
b. Versa Lok Midwest (651) 770-3166
c. Unilock (248) 437-7037

B. Connecting Pins: Manufacturer's standard non-corrosive nylon fiberglass reinforced units.

C. Concrete Adhesive: Manufacturer's standard formulated to adhere cap units to segmental concrete masonry wall construction.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Excavate to required depth and configuration as specified on the drawings.

B. Compact top 12 inches below subgrade to not less than 95 percent maximum density in accordance with ASTM D 1557.

C. Construct leveling pad on compacted subgrade for segmental retaining walls not less than 6 inches thick extending not less than 6 inches from front and back of initial course. Use specified granular fill material, and compact to not less than 95 percent maximum density in accordance with ASTM D 1557.

3.02 SEGMENTAL CONCRETE RETAINING WALLS:

A. General: Place units according to manufacturer's written instructions and in accordance with Design Drawings. Lay units in running bond, overlapping half units of course below.

1. Form corners and ends by using manufactured special units.

B. First Course: Place first course of retaining wall units on leveling base/course for full length of wall. Place units in firm contact with each other, properly aligned and level.

1. Tamp units into leveling base as necessary to bring tops of units into a level plane.

2. Place and compact drainage fill as indicated to top of first course. Place fill on both sides of wall at same time without disturbing alignment of units. Fill voids between and within units with drainage fill.

C. Subsequent Courses: Sweep excess fill from tops of course below. Place units in firm contact, properly aligned, and directly on course below:

1. Carefully align holes in units above with holes below and insert pins according to manufacturer's written instructions.

2. Place and compact fill as each course is laid. Place fills on both sides of wall at same time, where both sides are indicated to be filled.

3. Fill voids between and within units with drainage fill.

4. Verify subsequent courses are level.

D. Cap Units: Place cap units and secure with cap adhesive according to manufacturer's written instructions.

3.03 BACKFILL:

A. Backfill retaining walls promptly as work progresses.

B. Prepare ground surface to receive fill by removing vegetation, debris, unsatisfactory soil materials and obstructions. Scarify as required so that fill material will bond with existing surface.

C. Place specified and referenced soil material in layers to required subgrade elevations.

D. Place backfill soil materials in layers not more than 8 inches in loose depth, compacting each layer to specified density. Do not place fill or backfill materials on surfaces that are muddy, frozen or contain ice or frost.

E. Place, spread and compact fill in uniform lifts for full width and length of embankment as wall is laid. Begin at back of wall and place and spread fill toward embankment.

1. Use only hand-operated compaction equipment within 36 inches of wall.

2. Compact drainage fill to not less than 95 percent maximum dry density according to ASTM D 1557.

3. Compact reinforced soil fill to not less than 95 percent maximum dry density according to ASTM D 1557.

F. Place soil reinforcement in horizontal joints of retaining wall according to soil reinforcement manufacturer's written instructions. Embed reinforcement a minimum of 8 inches into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill on it.

1. Use additional soil reinforcement at corners and curved walls to provide continuous reinforcement and to comply with manufacturer's written instructions.

2. Before compacting, place sufficient depth of fill over reinforcement to produce compacted depth of 4 inches for wheeled vehicles or 6 inches for tracked vehicles.

3. Do not turn vehicles on fill until first layer of fill is compacted and second layer is placed over each soil-reinforcement layer.

G. Coordinate backfill placement with installation of Underdrainage System specification Section 02715.

H. Rough grade to allow for place of topsoil specification in Section 32 0515.

3.04 MAINTENANCE:

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded and rutted or otherwise damaged areas. In damaged compacted areas, scarify surface, reshape and compact to required density prior to further construction.

3.05 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Remove trash, debris excess soil materials and waste materials and legally dispose of off owner's property.

END OF SECTION 32 3216

SECTION 32 8423 UNDERGROUND SPRINKLERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to the Bidding and Contract Requirements and General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. The system shall be constructed to grades and conform to areas and locations as shown on the drawings. Removal and or restoration of existing improvements, excavation and back-fill, and all other work in accordance with plans and specifications are required.

B. Extent of irrigation system work is shown on drawings and by provisions of this Section.

C. Sprinkler lines shown on the drawings are essentially diagrammatic. Spacing of the sprinkler heads or quick coupling valves are shown on the drawings and shall be exceeded only with the permission of the Owner's authorized representative.

D. Items of work specifically included are:
1. Procurement of all applicable licenses, permits, and fees.
2. Coordination of all utilities.
3. Connection of electrical power supply to the irrigation control system.
4. Connection of water source/supply to the irrigation system.
5. Maintenance period.
6. Sleeving for irrigation pipe and wire.

E. Related work specified elsewhere

1. Section 02 3000: Subsurface Investigation
2. Section 31 2200: Grading
3. Section 32 9219: Seeding (Alternate 1)
4. Section 32 9223: Sodding (Base Bid)
5. Section 32 9300: Plants, Preparation & Accessories

1.03 QUALITY ASSURANCE

A. The "Contractor" shall maintain continuously a competent superintendent, satisfactory to the Owner, with authority to act for him in all matters pertaining to the work.

B. The "Contractor" shall coordinate his work with the other trades

C. The "Contractor" shall confine his operations to the area to be improved and to the areas allotted him by the Owner's representative for material and equipment storage.

D. The “Contractor” shall have a minimum of 5 years experience installing irrigation systems of comparable size and complexity.

1.04 SUBMITTALS

A. Submit samples under provisions of Section 01300-Submittals.

B. Materials List: Include backflow device, valves, valve boxes, sprinklers, controller, rain sensors, wire, wire connectors, pipe, fittings and clamps to be used on the project prior to purchasing materials. Quantities of material need not be included.

C. Manufacturer’s Data: Submit manufacturer’s catalog cuts, specifications, and operating instructions for equipment shown on the materials list.

D. Shop Drawings: Upon irrigation system acceptance, submit written operating and maintenance instructions. Provide format and contents as directed by the Landscape Architect. Include instruction sheets and parts lists for all operating equipment.

E. Project Record (As-Built) Drawings
1. Submit record drawings under provisions of Section 017000 – “Contractor” Closeout, Record Documents.
2. Record pipe and wiring network alterations. Record work that is installed differently than shown on the construction drawings. Record which valve operates which area by “clouding” or encircling the area and placing the correct valve number and controller identification nearby. Record accurate reference dimensions, measured from at least two permanent reference points of each irrigation system valve, each controller or control unit, each sleeve end, each stub-out for future pipe or wiring connections, and other irrigation components enclosed within a valve box. Place all dimensions and notes on the same page as the drawing. Use arrows and legends when needed.
3. Before construction completion, obtain from the engineer/landscape architect/owner’s representative an AutoCad file copy of the drawings. Using AutoCAD, duplicate information contained on the project drawings maintained on site. Label each sheet “Record Drawings”. Completion of the record drawings will be a prerequisite for the review at the completion of the irrigation system installation.

1.05 RULES AND REGULATIONS

A. Work and materials shall be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.

A. When the contract documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the contract documents.

B. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only. It is the “Contractor’s” responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.

B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends either threaded or plain.

C. Store and handle materials to prevent damage and deterioration

D. Provide secure, locked storage for valves, sprinkler heads and similar components that cannot be immediately replaced, to prevent installation delays.

1.07 CODES AND STANDARDS

A. The entire installation shall fully comply with all local and state laws and ordinances and with all established codes applicable thereto.

B. Any permits for the installation or construction of the work included under this contract which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the "Contractor", each at the proper time. He shall also arrange for and pay all costs concerning any inspections and examinations required by these authorities.

C. In all cases where inspection of the sprinkler system work is required and/or where portions of the work are specified to be performed under the direction and/or inspection of the Owner's authorized representative, the "Contractor" shall notify the Owner's authorized representative at least 24 hours in advance of the time and such inspection and/or direction is required.

D. Any necessary re-excavation or alterations to the system needed because of failure of the "Contractor" to have the required inspections shall be performed at the "Contractor's" own expense.

1.08 TESTING

A. Notify the engineer/landscape architect/owner's representative three days in advance of testing.

B. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial completion of backfill. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.

C. Subsections of mainline pipe may be tested independently, subject to the review of the engineer/landscape architect/owner's representative.

C. Furnish clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests.

D. Volumetric Leakage Test:
   1. Cap riser of mainline components for volumetric pressure tests. Backfill to prevent pipe from moving under pressure. Expose coupling and fitting.

2. Purge all air from the pipeline before test.
3. Subject mainline pipe to the anticipated operating pressure of 100 PSI for two hours. Maintain constant pressure. The amount of additional water pumped in during the test shall not exceed 1.24 gallon per 100 joints of 3-inch diameter pipe and 1.6 gallons per 100 joint of 4-inch diameter pipe. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes test.
4. Cement or caulking to seal leaks is prohibited.

E. Operational Test:
1. Activate each remote control valve in sequence from controller. The engineer/landscape architect/owner's representative will visually observe operation, water application patterns, and leakage.
2. Replace defective remote control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
3. Replace, adjust, or move water emission devices to correct operational or coverage deficiencies.
4. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
5. Repeat test(s) until each zone passes all tests.
6. Repeat tests, replace components, and correct deficiencies at no additional cost to the owner.

1.09 CONSTRUCTION REVIEW

A. The purpose of on-site reviews by the engineer/landscape architect/owner's representative is to periodically observe the work in progress, the "Contractor's" interpretation of the construction documents, and to address questions with regard to the installation.

B. Scheduled reviews such as those for irrigation system layout or testing must be scheduled with the engineer/landscape architect's/owner's representative as required by these specifications.

C. Impromptu reviews may occur at any time during the project.

D. A review will occur at the completion of the irrigation system installation and project record (as-built) drawing submittal.

1.10 GUARANTEE/WARRANTY AND REPLACEMENT

A. It shall be the "Contractor's" responsibility to ensure and guarantee satisfactory operation of the entire system and the workmanship and restoration of the area. The entire system shall be guaranteed to be complete and perfect in every detail for **a period of one year from the date of its final acceptance** and he hereby agrees to repair or replace any such defects occurring within that year, free of expense to the Owner. If final acceptance is not given the "contractor" will continue to be responsible for and maintain the irrigation system until acceptance is granted.

B. Minor maintenance and adjustment shall be by the Owner.

C. For a period of one year from commencement of the formal maintenance period, fill and repair depressions or settling more than one-quarter (¼ "). Restore landscape or structural

features damaged by the settlement of irrigation trenches or excavation. Repair damage to the premises caused by a defective item.

D. Make repairs with in seven (7) days of notification from the engineer/landscape architect/owner's representative.

E. Contract documents govern replacements identically as with new work. Make replacements at no additional cost to the contract price.

F. Guarantee/warranty applies to originally installed materials, equipment, and replacements made during the guarantee/warranty period.

1.11 WINTERIZATION AND SPRING START-UP

A. Coordinate the winterization and start-up with the landscape maintenance personal.

B "Contractor" shall winterize the system each year until final acceptance is granted and throughout the warranty period as part of this contract. "Contractor" will provide written instructions to the Owner for future service and maintenance.

C. Return to the site during the subsequent spring season and demonstrate to the Owner the proper procedures for the system start-up, operation, and maintenance. Repair any damage caused in improper winterization at no additional cost to the owner.

D. After completion, testing and acceptance of the system, the "Contractor" will instruct the Owner's personnel in the operation and maintenance of the system.

PART 2 - MATERIALS

2.01 GENERAL

Use materials that are new and without flaws or defects of any type, and which are the best of their class and kind. All material overages at the completion of the installation are the property of the "Contractor" and are to be removed from the site.

2.02 SUBSTITUTIONS

The Contractor shall use materials as specified. Material other than specified will be permitted only after written application by the "Contractor" and written approval by the Landscape Architect. Substitutions will only be allowed when in the best interest of the Owner.

2.03 SLEEVING

A. Install separate sleeve beneath paved areas to route each run of irrigation pipe or wiring bundle.
   1. Sleeving material beneath pedestrian pavements shall be PVC Class 160 pipe with solvent welded joints.
   2. Sleeving beneath drives and streets shall be PVC Class 160 pipe with solvent welded joints.
   3. Sleeving diameter: equal to twice that of the pipe or wiring bundle.

2.04 PIPE AND FITTINGS

A. Mainline Pipe and Fittings:

1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end.
2. Use Class 160, SDR-26, rated at 160 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use PVC pipe rated at higher pressures than Class 160 in the case of small nominal diameters that are not manufactured in Class 160.
3. Use rubber-gasketed pipe equipped with Reiber Gasket System for mainline pipe with a nominal diameter greater than 3-inches. Use rubber-gasketed deep bell ductile iron fitting conforming to ASTM A-536 and ASTM F-477. Use lubricant approved by the pipe manufacturer. Size slip fitting socket taper to permit a dry unsoftened pipe end to be inserted no more than halfway into the socket. Saddle and cross fittings are not permitted. Use male adapters for plastic to metal connections. Hand Tighten male adapters plus one turn with a strap wrench.
4. Use solvent weld pipe for mainline pipe with a nominal diameter less than or equal to 3-inches or where a pipe connection occurs in a sleeve. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standard D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.
5. Use flexible non-toxic polyethylene (PE) pipe. Use SDR-11.5, PE23, rated at PSI that is National Sanitation Foundation (NSF) approved, conforming to ASTM Standard D2239. Use Type 1, PVC insert fitting conforming to ASTM Standard D2609 designed for use with flexible polyethylene (PE) pipe. Use stainless steel worm gear clamps (including stainless steel screw) to join pipe and fittings. Double clamp all fittings.
6. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters wrinkles and dents.
7. Provide pipe continuously and permanently marked with manufacturer’s name or trademark, size schedule and type of pipe working pressure at 73 degrees F. and (NSF) approval
8. Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the “Contractor”.
9. All pipes damaged or rejected because of defects shall be removed form the site at the time of said rejection.

B. Lateral Pipe and Fitting

1. All sprinkler laterals pipe downstream from the zone valves, sized 2” and smaller shall be flexible non-toxic polyethylene (PE) pipe. Use SDR-11.5, PE23, rated at PSI that is National Sanitation Foundation (NSF) approved, conforming to ASTM Standard D2239. Use Type 1, PVC insert fitting conforming to ASTM Standard D2609 designed for use with flexible polyethylene (PE) pipe. Use stainless steel worm gear clamps (including stainless steel screw) to join pipe and fittings.
2 Use Class 160, SDR-26, rated at 160 PSI, conforming to the dimensions and tolerances established by ASTM Standard D2241. Use solvent weld pipe for lateral pipe. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784 for PVC pipe. Use primer approved by the pipe manufacturer and purple in color. Solvent cement to conform to ASTM Standard

D2564, of a type approved by the pipe manufacturer appropriate to weather conditions.

3. For drip irrigation laterals downstream of zone control valves, use UV radiation resistant polyethylene pipe manufactured from prime Union Carbide or a Union Carbide licensee with a minimum of 2% carbon black. Use PVC/compression line fittings compatible with the drip lateral pipe. Use tubing stakes or landscape fabric staples to hold aboveground pipe in place.

C. Specialized Pipe and Fittings:

1. All above grade pipe shall be copper pipe: Use Type “M” rigid conforming to ASTM Standard B88. Use wrought copper or cast bronze fitting, soldered or threaded per the installation details. Use 95% tin and 5% antimony solder.
2. Galvanized steel pipe: Use Schedule 40 conforming to ASTM Standard A120. Use galvanized, threaded, standard weight malleable iron fittings.
3. Ductile iron pipe: Use Class 50 conforming to ANSI A21.51. Use a minimum of Class 53 thickness pipe for flanged piping. Use mechanical joints conforming to ANSI A21.10 and ANSI A21.11 (AWWA C111) or flanged fittings conforming to ANSI/AWWA C110 and ANSI B16.1 (125#).
4. Use a dielectric union wherever a copper-based metal (copper, brass, and bronze) is joined to an iron-based metal (iron, galvanized steel, and stainless steel).
5. Low-Density Polyethylene Hose:
   a. Use pipe specifically intended for use as a flexible swing joint.
      Inside diameter: 0.490 $\pm$ 0.010 inch.
      Wall thickness: 0.100 $\pm$ 0.010 inch.
      Color: Black
   b. Use spiral barb fittings supplied by the same manufacturer as the hose.
7. Assemblies calling for threaded pipe connections shall use PVC Schedule 80 nipples and PVC Schedule 40 threaded fittings.
8. Joint sealant: Use only Teflon-type tape or Teflon-based paste pipe joint sealant on plastic threads. Use non-hardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.

D. Thrust Blocks:

1. Use thrust blocks for fitting on pipe greater than or equal to 3-inch diameter or any diameter rubber gasket pipe.
2. Use 3,000-PSI concrete.
3. Use 2-mil plastic.
4. Use No. 4 re-bars wrapped or painted with asphalt tar based mastic coating.

2.05 MAINLINE COMPONENTS

A. Main System Shutoff Valve: per local practice and in compliance with local code.

B. Winterization Assembly: per local practice and in compliance with the local code.

C. Backflow Prevention Assembly: as presented in the installation details.

D. Isolation Gate Valve Assembly: as presented in the installation details. Install a separate valve box over a 3-inch depth of ¾-inch gravel for each assembly.

E. Quick Coupling Valve Assembly: double swing joint arrangements as presented in the installation details.

2.06 SPRINKLER AND BUBBLER IRRIGATION COMPONENTS

A. Remote Control Valve (RCV) Assembly for Sprinkler and Bubbler Laterals: as presented in the installation details. Use 3M DBY wire connectors to join control wires to solenoid valves. Install a separate valve box over a 3" depth of ¾" gravel for each assembly.

B . Sprinkler Assembly: as presented in the drawings and installation details. When required use the sprinkler manufacturer's pressure compensating screens (ex. Rain Bird PCS) to achieve 30 PSI operating conditions on each sprinkler and to control excessive operating pressures.

C. Bubbler Assembly: as presented in the drawings and installation details.

2.07 CONTROL SYSTEM COMPONENTS

A. Irrigation Controller Unit:
1. As presented in the drawing and installation details.
2. Lighting protection: Provide 8-foot copper-clad grounding rod at controller location (when specified).
3. Wire markers: Pre-numbered or labeled with indelible non-fading ink, made of permanent, non-fading material.

B. Control Wire:
1. Use Hunter ID Wire two wire communication cable, Type UF or PE cable, or 14 AWG Single Strand UL approved for direct underground burial cable from the controller unit to each remote valve (when specified).
2. Color: Use white for common ground wire. Use red colors for control wires. Wire color shall be continuous over its entire length.
3. Splices: Use 3M DBY-R-6 wire connector with waterproof sealant. Wire connector to be of plastic construction.

C. Instrumentation:
1. As presented in the drawing and installation details.
2. When required provide, install and test an anemometer for irrigation shutdowns at user-present wind velocity thresholds, soil moisture monitoring to override irrigation in the event of high soil moisture levels, and a temperature sensor to prevent irrigation when temperatures drop below a user-preset threshold.
3. Provide a rain sensor to prevent irrigation during or immediately after rainfall events

D. Power Wire (when Specified):
1. Electric wire from the power source to satellite control unit shall be solid or stranded copper, Type UF single-conductor cable, UL approved for direct underground burial. Power wires shall be black, white, and green in color. Size as presented in the drawings. The "Contractor" is responsible for verifying that the power wire sizes shown on the drawings are compatible and adequate for the control system being used.
2. Splices: Use 3M DBY-R connectors.
3. Conduit: PVC Schedule 40.

2.08 OTHER COMPONENTS

A. Tools and Spare Parts: Provide operating keys, servicing tools, test equipment, spare parts, and other items indicated in the general notes of the drawings.

B. Other Materials: Provide imported fill material as required to complete this work. Provide other materials or equipment shown on the drawings or installation details, which are part of the irrigation system, although such items may not have been referenced in these specifications.

PART 3 – EXECUTION

3.01 INSPECTION AND REVIEWS

A. Site Inspections:
1. The bidder acknowledges that he has examined the site, plans and specifications, and the submission of a proposal shall be considered evidence that examination has been made.
2. Verify construction site conditions and note irregularities affecting work of this section. It shall be the contracting installer's responsibility to report to the Owner's authorized representative any deviations between drawings, specifications and the site. Failure to do so before the installing of equipment and resulting in replacing and/or relocation of equipment shall be done at the "Contractor's" expense.
3. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.
4. Beginning work of this section implies acceptance of existing conditions.

B. Utility Locations:
1. The exact location of all existing utilities and structures and underground utilities are not indicated on the drawings; their locations shall be determined by the "Contractor", and he shall conduct his work so as to prevent interruption of service or damage to them.
2. Arrange for and coordinate with local authorities the location of all underground utilities.
3. Repair any underground utilities damaged during construction. Make repairs at no additional cost above the contract price.
4. The "Contractor" shall protect existing structures and utility services and be responsible for their replacement if damaged by him.
5. The "Contractor" shall be responsible to verify onsite water pressure when applicable prior to construction. The "Contactor" is responsible to remedy any water pressure discrepancy discovered at their expense if the discrepancy is not reported prior to construction.

C. Irrigation System Layout Review:
1. Irrigation system layout review will occur after the staking has been completed unless specifically waived by the Landscape Architect. Notify the engineer/landscape architect/ owner's representative one-week in advance of review.
2. The engineer/landscape architect/owner's representative at this review will identify modifications.

3.02 LAYOUT OF WORK

A. Stake out the irrigation system. Items staked include: sprinklers, pipe, control valves, manual drains, quick coupling valves, backflow preventer, controller, and isolation valves.

B. Install all mainline pipe and mainline components inside of project property lines.

C. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. Final system layout shall be acceptable to the Landscape Architect.

3.03 EXCAVATION, TRENCHING, AND BACKFILLING

A. Excavating shall be considered unclassified and shall include all materials encountered, except materials that cannot be excavated by normal mechanical means.

B. Excavate to permit the pipes to be laid at the intended elevations and to permit work space for installing connections and fittings.

C. Minimum cover (distance from top of pipe or control wire to finish grade):
1. 14-inch over mainline pipe and over electrical conduit.
2. 6-inch over control wire.
3. 10-inch over lateral pipe to sprinklers and bubblers and over manifold pipe to drip system zone control valves.
4. 8-inch over drip in turf or paved areas downstream of drip system zone control valves.
5. 3-inch minimum mulch cover over drip lateral pipe in planting beds downstream of drip system zone control valves.
6. PVC UV radiation-resistant lateral pipe shall be installed directly on the soil surface.

D. PVC or PE lateral pipes may be pulled into the soil using a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depths equals minimum cover listed above provided soil moisture content and other conditions are suitable to allow for full depth of bury with a minimum of stretching and scraping of the pipe. Landscape Architect reserves the right to determine suitability or conditions.

E. Backfill only after lines have been reviewed and tested.

F. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, and stones larger than 2 inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe.

F. Backfill unsleeved pipe by depositing the backfill material equally on both sides of the pipe in 6-inch layers and compacting each layer to 90% Modified Proctor Density, ASTM D1557. Use of water for compaction, “puddling,” will not be permitted.

G. Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves. Minimum compaction of backfill for sleeves shall be 95% Modified Proctor Density, ASTM D1557. Use of water for compaction around sleeve, “puddling,” will not be permitted.

H. Dress backfilled areas to original grade. Incorporate excess backfill into existing site grades.

I. Where utilities conflict with irrigation trenching and pipe work, contact the engineer/landscape architect/owner's representative for trench depth adjustments.

J. Provide approved fine grained earth fill or sand to point 4" above the top of pipe, where soil conditions are rocky or otherwise objectionable.

K. Excavate trenches and install piping and backfill during the same working day. Do not leave open trenches or partially filled trenches open overnight.

3.04 SLEEVING AND BORING

A. Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.

B. Extend sleeve ends six inches beyond the edge of the paved surface. Cover pipe ends and mark with stakes. Mark concrete with a chiseled "X" at sleeve end and locations.

C. Bore for sleeves under obstructions that cannot be removed. Employ equipment and methods designed for horizontal boring.

3.05 ASSEMBLING PIPE AND FITTING

A. General:
   1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
   2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.
   3. All mainline and continuously pressurized pipe is to be installed using open trenches. Lateral pipe may be installed be "Plowing" if soil conditions permit, and soils do not contain gravel, rock, construction debris, or other potential damaging material.
   4. Trenches may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe. Minimum radii of curvature are 25 feet for 2-inches diameter pipe and 100 feet for 2 ½, 3, and 4-inch diameter pipe. All curvature results from the bending of the pipe lengths. No deflection will be allowed at a pipe joint.

B. Mainline and Fittings:
   1. Use only strap-type friction wrenches for threaded plastic pipe.
   2. PVC Rubber-Gasketed Pipe:
      a. Use pipe lubricant. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
      b. Epoxy-coated steel fittings shall not be struck with a metallic tool. Cushion blows with a wood block or similar shock absorber.
   3. PVC Solvent Weld Pipe:
      a. Use a primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.
      b. Cure for 30 minutes before handling and 24 hours before allowing water in pipe.
      c. Snake pipe from side to side within the trench.

4. Fittings: the uses of cross type fittings or saddle-tees are not permitted.
5. Install thrust blocks on the mainline pipe work in accordance with pipe manufacturer's written instructions.

C. Lateral Pipe and Fittings:
1. Use only strap-type friction wrenches for threaded plastic pipe.
2. PVC Solvent Weld Pipe:
   a. Use primer and solvent cement. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
   b. Cure for 30 minutes before handling and 24 hours before allowing water in the pipe.
   c. Snake pipe from side to side within the trench:
3. Polyethylene (PE) Pipe:
   a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
   b. Snake pipe from side to side within the trench.
   c. Double clamp pipe 1-1/2" diameter and larger.
4. UV Radiation-Resistant Polyethylene Pipe:
   a. Join pipe in the manner recommended by the manufacturer and in accordance with accepted industry practices.
   b. Snake pipe side to side within the trench, on the soil surface, and hold in place with the tubing stakes or landscape fabric staples spaced every five feet. Pipe is not to compressed or crimped by the stake or staple or other construction activity.
5. The use of cross types fittings and /or saddle tees are not permitted.

D. Specialized Pipe and Fitting:
1. Copper Pipe:
   a. Buff surface to be joined to a bright finish. Coat with solder flux.
   b. Solder so that a continuous bead shows around the joint circumference.
2. Galvanized Steel Pipe:
   a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
   b. Use factory-made threads whenever possible. Field-cut threads will be permitted only where necessary. Cut threads on axis using clean, sharp dies.
   c. Apply Teflon-type tape or pipe joint compound to the male threads only.
3. Ductile Iron Pipe:
   a. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.
   b. Insert dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, and stainless steel) are joined.
4. Low-Density Polyethylene Hose: Install per manufacturer's recommendations.
5. PVC Threaded Connections:
   a. Use only factory-formed threads. Field-cut threads are not permitted.
   b. Use only Teflon-type tape or Teflon-based paste.
6. Threaded Connections:
   a. When connection is plastic to metal, the plastic component shall have male threads and the metal component shall have female threads.
   b. Make metal-to-metal, threaded connections with Teflon-type tape or pipe joint compound applied to the male threads only.

E. Thrust Blocks:
1. Use cast-in-place concrete bearing against undisturbed soil.
2. Size, orientation, and placement shall be as shown on the installation details.
3. Wrap fitting with plastic to protect bolts, joint, and fitting from concrete.
4. Install re-bar with mastic coating as shown on the installation details.

3.06 INSTALLATION OF MAINLINE COMPONENTS

A. Main System Shut Off Valve: Install where indicated on the drawing.

B. Winterization Assembly: Install where indicated on the drawing.

C. Backflow Prevention Assembly: Install where indicated on the drawing. Install assembly so that its elevation, orientation, access, and drainage conform to the manufacturer's recommendations and all applicable health codes.

D. Quick Coupling Valve Assembly: Install where indicated on the drawings.

E. Manual Drain Valve Assembly: Install where indicated on the drawings and at other low points in the mainline piping.

3.07 INSTALLATION OF SPRINKLER AND IRRIGATION COMPONENTS:

A. Remote Control Valve (RCV) Assembly for Sprinkler and Bubbler Laterals:
1. Flush mainline before installation of RCV assembly.
2. Install where indicated on the drawing. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wire. Install connectors and sealant per the manufacturer's recommendations.
3. Install only one RCV to a valve box. Locate valve box at least 12 inches from and align with nearby walls and edges of paved areas. Group RCV assemblies together where practical. Arrange grouped valve boxes in rectangular patterns. Allow at least 12 inches between valve boxes.
4. Adjust RCV to regulate the downstream operating pressure.
5. Attach ID tag with controller station number to control wiring.

B. Sprinkler Assembly:
1. Flush lateral pipe before installing sprinkler assembly.
2. Install per the installation details at locations shown on the drawings.
3. Locate rotor sprinklers 6 inches from adjacent walls, fences, or edges of paved areas.
4. Locate spray sprinklers 3 inches from adjacent walls, fences, or edges of paved areas.
5. Install sprinklers perpendicular to the finish grade.
6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
7. Adjust the radius of throw of each sprinkler for best performance.

C. Bubbler Assembly:
1. Flush lateral pipe before installing bubbler assembly.
2. Install bubbler assembly per the installation details at locations shown on the drawings.

3. Adjust the output flow of each bubbler for performance.

3.08 INSTALLATION OF CONTROL SYSTEM COMPONENTS:

A. Irrigation Controller Unit:
1. The location of the collector unit as depicted on the drawings is approximate; the engineer/landscape architect/owner's representative will determine the exact site location during sprinkler layout review.
2. Lighting protection: Drive 8-foot copper-clad grounding rod into the soil. If rock prevents driving, bury at least four feet deep. Use one rod for each controller. Connect controller to ground rod with AWG No. 10 solid conductor copper wire. Secure wire to grounding rod with brass or bronze clamp. Locate the connection in a separate valve box (when specified).
3. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification numbers (see drawings) of the remote control valve to which the control wire is connected..
4. Connect control wires to the corresponding controller terminal.

B. Control Wire:
1. Bundle control wires where two or more are in the same trench. Bundle with pipe wrapping tape at 10-foot intervals.
2. Control wiring may be chiseled into the soil using a vibratory plow device specifically manufactured for pie pulling and wire installation. Appropriate chisel must be used so that wire is fed into a chute on the chisel, and wire is not subject to pulling tension. Minimum burial depth must equal minimum cover previously listed.
3. Provide a 24-inch excess length of wire in an 8-inch diameter loop at each 90-degree change of direction, at both ends of sleeves and at 100-foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil 24-inch length of wire within each remote control valve box.
4. Install common ground wire for each remote control valve decoder.
5. If a control wire must be spliced, make splice with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Locate splice in a valve box that contains an irrigation valve assembly, or in a separate 6-inch round valve box.
6. Use same procedure for connection to valves as for in-line splices.
7. Unless noted on plans, install wire parallel with and below PVC mainline pipe.
8. Protect wire not installed with PVC mainline pipe with a continuous run of warning tape placed in the backfill six inches above the wiring.

C. Instrumentation:
1. Install sensor per the installation details and manufacturer's recommendations. Install at locations shown on the drawings.
2. Install electrical connections between central control unit components and sensors per manufacturer's recommendations.

D. Power Wire (when specified):
1. Route power wire as directed on plans. Install with a minimum number of field splices. If a power wire must be spliced, make splice with recommended connector, installed per manufacturer's recommendations. Locate all splices in a separate 10-inch round valve box. Coil 2 feet of wire in valve box.

2. All power wire shall be laid in a trench. The use of a vibratory plow is not permitted.

3. Green wire shall be used as the common ground wire from power source to all satellites.
4. Carefully backfill around power wire to avoid damage to wire insulation or wire connectors.
5. Unless noted on plans, install wire parallel with and below mainline pipe. Install wire 2 inches below top of PVC mainline pipe.
6. Encase wire not installed with PVC mainline pipe in electrical conduit with a continuous run of warning tape placed in the backfill, 6 inches above wiring.

3.09 INSTALLATION OF OTHER COMPONENTS:

A. Tools and Spare Parts: Prior to the review at completion of construction, supply to the owner operating keys, servicing tools, spare parts, test equipment, and any other items indicated in general notes on the drawings. Provide at least (2) quick coupling keys and hose adapters.

B. Other Materials: Install other materials or equipment shown on the drawings or installation details which are part of the irrigation system, even though such items may not have been referenced in these specifications.

3.10 MAINTENANCE:

A. Upon completion of construction and review by the engineer/landscape architect/owner's representative, maintain irrigation system for duration of 30 calendar days. Make periodic examinations and adjustments to irrigation system components to achieve the most desirable application of water.

B. Following completion of the "Contractor's" maintenance period, the owner will be responsible for maintaining the system in working order during the remainder of the guarantee /warranty period, for performing necessary minor maintenance, for trimming around sprinklers, for protecting against vandalism, and for preventing damage after the landscape maintenance operation.

3.11 ACCEPTANCE

A. Instruct the Owner's designated personnel in the operation of the system, including adjustment of sprinklers, controller(s), valves, pump controls, and moisture sensing controls.

3.12 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soils, debris, and equipment. Repair damage resulting from sprinkler system installation.

END OF SECTION 32 8423

SECTION 32 9219 – SEEDING (Alternate 1)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of seeded lawns is shown on drawings and by provision of this Section.

B. Types of work required includes the following:

1. Soil preparation
2. Seeding lawns
3. Mulching
4. Hydroseeding lawns (Contractor's option)

C. Related Work Specified Elsewhere:

1. Section 31 2216: Fine Grading
2. Section 32 0190: Operation and Maintenance of Planting
3. Section 32 0515: Soils for Exterior Improvements
4. Section 32 8423: Underground Sprinklers
5. Section 32 9223: Sodding (Base Bid)

1.03 SUBMITTALS:

A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight and percentages of purity, germination and weed seed for each grass species.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.05 PROJECT CONDITIONS:

A. Work notification: Notify Landscape Architect at least 7 working days prior to start of seeding peration.

B. Protect existing utilities, paving and other facilities from damage caused by seeding operations.

C. Perform seeding work only after planting and other work affecting ground surface has been completed.

D. Provide hose and lawn watering equipment as required.

E. The irrigation system will be installed prior to seeding. Locate, protect and maintain the irrigation system during seeding operations. Repair irrigation system components damaged during seeding operations at this Contractor's expense.

1.06 WARRANTY:

A. Refer to Section 32 0190.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Topsoil for Seeding Lawn Areas: Refer to Section 32 0515 and to drawings.

B. Seed: Fresh, clean and new crop seed mixture. Mixed by approved methods.

C. Composed of the following varieties, mixed to the specified proportions by weight and tested to minimum percentages of purity and germination.

D. Seed Mixture: Proportioned by weight as indicated below:

Irrigated Lawn Areas

	Minimum Proportion	Minimum Purity	Germination
Merit Kentucky Bluegrass	25%	95%	80%
Baron Kentucky Bluegrass	25%	95%	80%
Manhattan II Turf Type Rye	50%	95%	80%

Spread at a rate of 7 lbs./1000 sf

No noxious weed seeds permitted.

E. Fertilizer: Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

1. Type A: Starter fertilizer 6-24-24 by weight or similar approved composition.

F. Ground limestone: Used if required by soil test report. Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20% mesh sieve.

G. Granulated sulfur 0-0-0-90 to lower PH. Use if determined by soil tests to be necessary. Apply per soil test recommendations at specified rate.

H. Straw mulch: Used in crimping process only. Clean oat or wheat straw well seasoned beforebailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds.

I. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by Contractor. Test for excess Alkalinity, if necessary.

J. Wood Cellulose Fiber Mulch: Degradable green dyed wood cellulose fiber or 100% recycled long fiber pulp, free from weeds or other foreign matter toxic to seed germination and suitable to hydromulching.

AVAILABLE MANUFACTURER AND TYPE:

CONWED HYDROMULCH: CONWED CORP., ST. PAUL MN

K. Paper Mulch: Degradable paper mulch, free of foreign debris. Do not use on slopes over 30%. Available manufacturer and type NU Wool Hydro Mulch, Jennison, MI.

L. Tackifier: Liquid concentrate diluted with water forming a transparent 3-dimensional film like crust permeable to water and air and containing not agents toxic to seed germination.

AVAILABLE MANUFACTURER AND TYPE:

FINN HYDROSTIK, FAIRFIELD, OH

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Landscape architect must approve finish surfaces, grades, topsoil quality and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SEEDED LAWN AREAS:

A. Limit preparation to areas which will be immediately seeded.

B. Treat lawn areas if required with "Round Up", by Monsanto, per label directions to kill existing vegetation prior to seeding.

C. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter.

D. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges and fill depressions as required to drain.

E. Apply amendments to supplied or existing topsoil, if required by soil test report, at rate determined by the soil test, to adjust pH of topsoil. Distribute evenly by machine and incorporate thoroughly into topsoil.

F. Apply fertilizer to indicated turf areas at a rate equal to 1 lb. of actual nitrogen per 1,000 sq. ft. (43 lbs/acre). Omit this process if applied with hydroseeding process.

G. Apply fertilizers by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to a depth of 1" by discing or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

H. Restore prepared areas to specified condition if eroded, settled or otherwise disturbed after fine grading and prior to seeding.

3.03 INSTALLATION:

A. Seed lawns only between April 1 and June 1 and fall seeding between August 15 and October 15 or at such other times acceptable to Landscape Architect.

B. Seed immediately after preparation of bed. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

C. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour velocity.

D. Apply seed with a rotary or drop type distributor. Install seed evenly by sowing equal quantities in directions, at right angles to each other.

E. Sow seed at a rate of 7 lbs/1000 sf. (300 lbs/acres).

F. After seeding, rake or drag surface of soil lightly to incorporate seed into top 1/8" of soil. Roll with light lawn roller.

3.04 MULCHING:

A. Place straw mulch on seeded areas within 24 hours after seeding.

B. Place straw mulch uniformly in a continuous blanket at a rate of 2-1/2 tons per acre or (2) 50 lb. bales per 1,000 sq. ft. of area. A mechanical blower may be used for straw mulch application when acceptable to the Architect.

C. Crimp straw into soil by use of a "crimper". Two passes in opposite direction required.

3.05 HYDROSEEDING: (Optional Method)

A. Use a hydromulcher (sprayer) and apply mixture(s) at the following rate. Mix in accordance with manufacturer's recommendations.

B. Apply hydroseed slurry to indicated areas. Use tackifier only on erosion prone areas. Apply fertilizer with hydro mix.

Seed: 300 pounds per acre
Fertilizer: 400 pounds per acre
Tackifier: 60 gallons per acre
Wood Cellulose Fiber Mulch: 2000 pounds per acre

C. Care must be taken not to get hydroseed materials on buildings, walks, roadways, plant beds etc.

3.06 LAWN ESTABLISHMENT:

A. Establish dense lawn of permanent grasses, free from lumps and depressions. Any area failing to show uniform germination to be reseeded; continue until dense lawn established. Damage to seeded area resulting from erosion to be repaired by Contractor. Scattered bare spots over 5 percent not allowed.

B. In event contractor does not establish dense lawn during germination period, return to project to refertilize and reseed to establish dense lawn.

C. Should the seeded lawn become largely weeds after germination, Contractor responsible to kill the weeds and reseed the proposed lawn areas to produce a dense turf, as specified.

3.07 CLEANING:

A. Perform cleaning during installation of the work and upon completion of the work to the approval of the Landscape Architect. Remove from site all excess materials, debris and equipment. Repair damage resulting from seeding operations. Clean all areas where overspray has occurred from hydroseeding operations.

END OF SECTION 32 9219

SECTION 32 9223 – SODDING (Base Bid)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions, hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of sodded lawns is shown on drawings and by provisions of this Section.

B. Types of work required include the following:

1. Soil preparation
2. Sodding lawns

C. Related work specified elsewhere:

1. Section 31 2216: Fine Grading
2. Section 32 0190: Operation and Maintenance of Planting
3. Section 32 0515: Soils for Exterior Improvements
4. Section 32 9219: Seeding (Alternate1)
5. Section 32 8423: Underground Sprinklers
5. Section 32 9300: Plants, Preparation & Accessories

1.03 QUALITY ASSURANCE:

A. Sod: Comply with American Sod Producers Association (ASPA) classes of sod materials.

1.04 SUBMITTALS:

A. Submit sod growers certification of grass species including special shade grown species. Identify source location.

B. Manufacturer's certification of fertilizer.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Cut, deliver and install sod within 24 hour period.

B. Do not harvest or transport sod when moisture content may adversely affect sod survival.

C. Protect sod from sun, wind and dehydration prior to installation. Do not tear, stretch or drop sod during handling and installation.

1.06 PROJECT CONDITIONS:

A. Work notifications: Notify Landscape Architect at least 7 working days prior to start of sodding operation.

B. Protect existing utilities, paving and other facilities from damage caused by sodding operations.

C. Perform sodding work only after planting and other work affecting ground surface has been completed.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Provide hose and lawn watering equipment as required.

F. An irrigation system will be installed prior to sodding. Locate, protect and maintain the irrigation system during sodding operations. Repair irrigation system components damaged during sodding operations at this Contractor's expense.

1.07 WARRANTY:

A. Refer to Section 32 0190

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Sod: An "approved" nursery grown blend of improved Kentucky Blue-grass varieties.

1. Sod containing Common Bermudagrass, Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Timothy, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel or Bramegrass weeds will not be acceptable.

B. Provide well-rooted, healthy sod, free of diseases, nematodes and soil borne insects. Provide sod uniform in color, leaf texture, density and free of weeds, undesirable grasses, stones, roots, thatch and extraneous material; viable and capable of growth and development when planted.

C. Furnish sod machine stripped in square pads or strips not more than 3'-0" long; uniformly 1" to 1-1/2" thick with clean cut edges. Mow sod before stripping.

D. Fertilizer: Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.

1. Type A: Starter fertilizer containing 20% nitrogen, 12% phosphoric acid and 8% potash by weight or similar approved composition.

E. Ground limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve. Use if determined by soil tests to be necessary.

F. Stakes: Softwood, 3/4" x 8" long.

G. Water: Free of substance harmful to sod growth. Hoses or other methods of transportation furnished by Contractor.

H. Topsoil: Refer to Section 32 0515

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine finish surfaces, grades, topsoil quality and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 PREPARATION:

A. Limit preparation to areas which will be immediately sodded. Spread topsoil, fine grade.

B. Treat lawn areas with "Round Up", by Monsanto, per label directions as required to kill existing vegetation prior to sodding.

C. Loosen topsoil of lawn areas to minimum depth of 3". Remove stones over 1" in any dimension and sticks, roots, rubbish and extraneous matter.

D. Grade lawn areas to smooth, free draining and even surface with a loose, uniformly fine texture. Roll and rake; remove ridges and fill depressions as required to drain.

E. Apply type A fertilizer at the rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft. (43 lbs./acre). Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with the soil to depth of 1" by discing or other approved methods. Fertilize areas inaccessible to power equipment with hand tools and incorporated it into soil.

F. Dampen dry soil prior to sodding.

G. Restore prepared area to specified condition if eroded, settled or otherwise disturbed after fine grading and prior to sodding.

3.03 INSTALLATION:

A. Lay sod to form a solid mass with tightly-fitted joints. Butt ends and sides of sod strips. Do not overlay edges. Stagger strips to offset joints in adjacent course. Remove excess sod to avoid smothering of adjacent grass. Provide sod pad top flush with adjacent curbs, sidewalks, drains and landscaped areas.

B. Do not lay dormant sod or install sod on saturated or frozen soil.

C. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area. Place subsequent rows parallel to and lightly against previously installed row.

D. Peg sod on slopes greater than 3 to 1 to prevent slippage at a rate of 2 stakes per yd. of sod.

E. Water sod thoroughly with a fine spray immediately after laying.

F. Roll with light lawn roller to ensure contact with sub-grade.

G. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.

3.04 MAINTENANCE:

A. Refer to Section 32 0190

3.05 ACCEPTANCE:

A. Refer to Section 32 0190

3.06 CLEANING:

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

END OF SECTION 32 9223

SECTION 32 93 00 - PLANTS, PREPARATION & ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Bidding and Contract Requirements, and to General and Supplemental Conditions hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of trees, shrubs and ground covers is shown on drawing and by provisions of this Section.

B. Types of work required include the following:

1. Soil preparation
2. Trees, shrubs, and ground covers
3. Planting mixes
4. Mulch and planting accessories
5. Soil percolation tests

C. Related work specified elsewhere:

1. Section 31 2200: Grading
2. Section 31 2216: Fine Grading
3. Section 32 0190: Operation & Maintenance of Plantings
4. Section 32 0515: Soils for Exterior Improvements
5. Section 32 8423: Underground Sprinklers
6. Section 32 9219: Seeding (Alternate 1)
7. Section 32 9223: Sodding (Base Bid)

1.03 QUALITY ASSURANCE:

A. Plant names indicated, comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

B. Comply with sizing and grading standards of the latest edition of “American Standard for Nursery Stock". A plant shall be dimensioned as it stands in its natural position.

C. All plants shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of 2 years.

D. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional charge. Larger plants shall not be cut back to size indicated.

E. Provide "specimen" plants with a special height, shape or character of growth. Landscape Contractor to tag specimen trees or shrubs at the source of supply. The Landscape Architect will inspect specimen selections at the source of supply for suitability and adaptability to selected location. When specimen plants cannot be purchased locally, provide sufficient photographs of the proposed specimen plants for approval. The Landscape Contractor shall

inspect all plant material at source prior to Landscape Architect's approval. Landscape Contractor shall accompany Landscape Architect on final selection trip.

F. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.

G. Provide percolation testing by filling plant pits with water and monitoring length of time for water to completely percolate into soil. Submit test results to landscape architect prior to starting work.

1.04 SUBMITTALS:

A. Submit the following material samples:

1. Shredded bark mulch.

B. Submit the following materials certification:

1. Topsoil source and pH value
2. Plant fertilizer

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.

B. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved "Anti-Dessicant" immediately after digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival. A copy of certificate shall be filed with the Landscape Architect. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss or in a manner acceptable to the Landscape Architect. Water heeled-in plantings as required to keep root system moist until planting. No plant shall be bound with rope or wire in a manner that could damage or break the branches.

C. Cover plants transported on open vehicles with a protective covering to prevent windburn.

D. Frozen or muddy topsoil is not acceptable.

1.06 PROJECT CONDITIONS:

A. Work Notification: Notify Architect at least 7 working days prior to installation of plant material.

B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations. See AIA General Conditions.

C. A complete list of plants, including a schedule of sizes, quantities and other requirements is shown on the proposal form. In the event that quantity discrepancies or material omissions occur in the proposal form, Contractor shall notify the Landscape Architect during the proposal bidding process.

D. An irrigation system will be installed prior to planting. Locate, protect and maintain the irrigation system during planting operations. Repair irrigation system components damaged during planting operations, at this Contractor's expense.

E. Perform percolation testing.

F. Verify availability of on-site water.

G. Concealed contingencies. Refer to General Conditions.

1.07 WARRANTY:

A. Refer to Section 32 0190.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Plants: Provide plants typical of their species or variety; with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces.

1. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Cracked or mushroomed balls are not acceptable.

2. Provide tree species that mature at heights over 25'-0" with a single, main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable.

3. Trees to have clay or clay loam balls; sandy loam or sand balls are not acceptable.

4. Plants planted in rows shall be matched in form. (See specimen stock).

5. Plants larger than those specified in the plant list may be used when acceptable to the Landscape Architect.

6. If the use of larger plants is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.

7. The height of the trees, specified by height, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the proposal form.

8. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.

9. Evergreen trees shall be unsheared and branched to the ground.

10. Shrubs and small plants shall meet the requirements for spread and height indicated on the proposal form.

B. Container-grown Stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.

1. No plants shall be loose in the container.

2. Container stock shall not be root bound.

3. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.

4. Single stemmed or thin plants will not be accepted.

5. Side branches shall be generous, well twigged and the plant as a whole well bushed to the ground.

6. Plants shall be in a moist, vigorous condition, free from dead wood, bruises or other root or branch injuries.

C. Specimen Stock: All specimen designated plantings are to be nursery grown, fully developed, excellent quality and typical example of the species. Plants designated to be planted in rows must be matched, symmetrical and uniform in height, spread, caliper and branching density.

1. Matched plantings should be obtained from same nursery and, preferably, from same row or line. All specimen material will be approved by Landscape Architect at nursery.

D. Topsoil for Planting Mix: Refer to Section 32 0515.

E. Peat Moss: Brown to black in color, weed and seed free granulated raw peat.

1. Provide ASTM D 2607 sphagnum peat moss with a PH below 6.0 for ericaceous plants.

F. Compost: Shall be mature/stabilized, humus-like material derived from the aerobic decomposition of yard clippings or other compostable materials. Dark brown or black color capable of supporting plant growth without the addition of fertilizers or other soil amendments and shall not have an objectionable odor. The compost shall be free of plastic, glass, metal, and other physical contaminants, as well as viable weed seeds and other plant parts capable of reproducing (except airborne weed species). The compost shall be visually inspected and approved prior to placement. The compost mixture shall be such that no visible free water or dust is produced when handling it.

G. Planting Mixture Type A: Standard planting backfill shall be a mixture of 1/3 topsoil, 1/3 sand and 1/3 peat per cubic yard of mixture. Add fertilizer Type "A" to planting mixture per manufacturer's requirements. Follow planting details.

H. Planting Mixture Type B (for Flowers, Ground Cover Beds, Ericaceous Plants and Ornamental Grasses): Planting backfill shall be a mixture of 1/3 topsoil, 1/3 sand and 1/3 compost Adding fertilizer type "B" to mixture per manufacturer requirements. Follow planting details.

I. Plant Fertilizer Type A: "Scotts Pro Grow 18-3-6 landscape fertilizer plus minors, applied per manufacturer's recommendations.

J Plant Fertilizer Type B: Approved acid-base fertilizer; "Espoma Holly-Tone". 4-6-4 applied per manufacturer's instructions.

K. “MyCor” Tree Saver Soil Conditioner manufactured by Plant Health Care, Inc., 1-800-421-9051. Use for all tree and shrub species except Rhododendrons, Azaleas and Laurels.

L. Superphosphate: Composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than eighteen (18%) percent available phosphoric acid. Apply as required based upon soil test report.

M. Lime: Ground dolomitic limestone, ninety-five (95%) percent passing through #100 mesh screen. Use to adjust soil pH only, under direction of Landscape Architect or based upon soil test report.

N. Sand: Clean, coarse, ungraded conforming to MDOT Class II.

O. Anti-Dessicant: Protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instructions.

P. Shredded Bark Mulch: Clean, free of debris and sticks, and well aerated. Materials shall be uniform in size, shape, and texture. Submit samples to owner for approval prior to installation.

Q. Water: Free of substances harmful to plant growth. Hoses or other methods of transportation furnished by Contractor.

R. Stakes for Staking: Hardwood, 2" x 2" x 6'-0" minimum length.

S. High tensity synthetic fiber. 3/4" wide with minimum breaking strength of 900 pounds.

1. Approved synthetic fiber manufacturers:

a. Arbortie by Deep Root
1.800.458.7668
info@deeproot.com

b. Arbortape by American Arborist Supplies
1.800.441.8381
info@arborist.com

T. Stakes for Guying: Hardwood, 2" x 2" x 36" minimum length.

U. Guying Wire: No. 11 gauge galvanized wire.

V. Turnbuckles: Galvanized steel of size and gauge required to provide tensile strength equal to that of the wire. Turnbuckle opening shall be at least 3".

W. Guying Hose: Two-ply, reinforced garden hose not less than 1/2" inside diameter.

X. Tree Wrap: Standard waterproofed tree wrapping paper, 2-1/2" wide, made of 2 layers of crepe kraft paper weighing not less than 30 lbs. per ream, cemented together with asphalt.

Y. Twine: Two-ply jute material.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.02 PREPARATION:

A. Time of planting:

1. Evergreen material: Plant evergreen materials between August 15 and October 1 or in spring before new growth begins. If project requirements require planting at other times, plants shall be sprayed with anti-dessicant prior to planting operations.

2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-dessicant prior to planting operation.

3. Planting times other than those indicated shall be acceptable to the Landscape Architect.

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

C. Individual plant locations shall be staked on the project site by the Contractor and approved by the Landscape Architect before any planting pits are dug. The Landscape Architect reserves the right to adjust plant material locations to meet field conditions, without additional cost to the Owner.

D. Planting pits shall be round, with vertical sides and flat bottoms and sized in accordance with outlines and dimensions shown on the planting details.

E. Accurately stake plant material according to the drawings. Stakes shall be above grade and painted a bright color to be clearly visible for inspection.

F. If obstructions are encountered that are not indicated, do not proceed with planting operations until alternative plant locations have been selected and approved in writing by the Landscape Architect. Where location or spacing dimensions are not clearly shown, request clarification by the Landscape Architect.

G. See drawings for planting details.

H. Vegetation Removal:

1. Strip existing grass and weeds, including roots, from all bed areas, till and fine grade existing topsoil, leaving the soil surface one inch below finished grade (in areas shown on plan).

2. Herbicide: Use Round Up (Monsanto Co.) as required to prepare areas for new planting, applied to all ground cover, evergreen and shrubbery beds and all mulch areas before application of pre-emergence herbicide, per manufacturer's recommendations. Clean area of all dead material after five (5) days.

3. Pre-Emergence Herbicide: DACTHAL W-75 (Diamond Shamrock Agricultural Chemicals) applied to one (1) ounce per l00 square feet to same area where "Herbicide" has been applied and after area is cleared of dead vegetation.

4. Herbicides to be applied by licensed applicator as required by the state.

3.03 INSTALLATION:

A. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide plant pits per planting details. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4".

B. Provide pre-mixed planting mixture Type "A" for use around the balls and roots of all deciduous and evergreen tree plantings.

C. Beds for Ground Cover, Flowers, Ericaceous Plants and Ornamental Grasses: Excavate existing soil to 12" depth over entire bed area and remove soil from site. Set plants according to drawings and backfill entire bed with pre-mixed planting mixture Type "B".

D. Mass Shrub Beds/Hedge Beds: Excavate existing soil to 18" depth over entire bed area and remove soil from site. Scarify bottom of the bed to a 4" depth. Set plants according to drawings and specs. and backfill entire bed with (pre-mixed) specified planting mixture Type "A".

E. Planting:

1. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb and faced to give the best appearance or relationship to each other or adjacent structure. Set plant material 2"-3" above the finish grade. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water in non-irrigated areas.

2. After balled and burlapped plants are set, muddle planting soil mixture around bases of balls and fill all voids. Sufficiently compact to prevent settlement.

3. Add “MyCor” Tree Saver to mix per manufacturer’s directions.

4. Remove all burlap, ropes, and wires from the tops of balls.

5. Space ground cover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 12" of the trunks of trees and shrubs within planting bed and to within 6" of edge of bed.

6. Spread and arrange roots of bare-rooted plants in their natural position. Work-in planting mixture. Do not mat roots together. Cut all broken and frayed roots before installing planting mixture.

7. Water immediately after planting.

F. Mulching:

1. Mulch tree and shrub planting pits and shrub beds with required mulching material 3" deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

G. Wrapping, Guying, Staking:

1. Inspect trees for injury to trunks, evidence of insect infestation and improper pruning before wrapping.

2. Wrap trunks of all trees spirally from bottom to top with specified tree wrap and secure in place.

3. Stake/guy all trees immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may affect tree survival or appearance occur, the Architect shall require immediate staking/guying.

4. Stake deciduous trees under 4" caliper. Stake evergreen trees under 12'-0" tall with 2 x 2 cedar stakes, 2 per tree.

5. Guy deciduous trees 4" caliper and over. Guy evergreen trees 12'-0" tall and over with metal fence post, 3 per tree.

H. Pruning:

1. Prune branches of deciduous stock, after planting, to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. Remove or cut back broken, damaged and unsymmetrical growth of new wood.

2. Multiple leader plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches flush with the branch collar. Make cut on an angle.

3. Prune evergreen trees only to remove broken or damaged branches.

3.04 MAINTENANCE:

A. Refer to Section 32 0190.

3.05 CLEANING:

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

END OF SECTION 32 9300

SECTION 33 4616.19 - PIPE UNDERDRAINS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, and General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 SUMMARY

A. Extent of Underdrainage System work is shown on drawings.

B. Underdrainage system work includes, but not limited to, the following:

1. Perforated under drains and connections

C. Related Work Specified Elsewhere:

1. Section: 31 2200: Grading
2. Section: 31 2216: Fine Grading
3. Section: 32 0515: Soils for Exterior Improvements
4. Section 32 3223: Segmental Retaining Walls

1.03 QUALITY ASSURANCE

A. Installers' Qualifications: Firm with at least 3 years of successful installation experience on projects with underdrainage system work similar to that required for project.

B. Codes and Standards:

1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of underdrainage system's materials and products.
2. Conform with all requirements of the City/Township and other agencies having jurisdiction.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for underdrainage system materials and products.

B. Certification: Submit certification signed by underdrainage system installer that installed materials conform to specified requirements and system was successfully checked and tested prior to covering with drainage fill.

C. Record Drawings: At project closeout, submit as-built record drawings of installed underdrainage system piping and products.

PART 2 PRODUCTS

2.01 CONDUCTING PIPES AND PIPE FITTINGS

A. General: Provide pipes of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

2.02 PERFORATED DRAINS

A. Finish drainage pipe complete with bends, reducers, adapters, couplings, collars and joint materials.

B. Provide perforated, corrugated polyethylene tubing, 4 Inch diameter ASTM F 405.

C. Manufacturer: Subject to compliance with requirements, provide foundation drainage system products of one of the following:

1. Advance Drainage Systems, Inc.
2. Plastic Systems, Inc.

2.03 TRENCH MATERIALS

A. Drainage Fill: Evenly graded mixture of ¾ inch diameter clear natural stones.

B Filter Fabric: Approved non-woven cloth filter fabric.

1. Terrafix 270R
2. Mirafi 160N or approved substitutes

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer must examine the areas and conditions under which underdrainage system work is to be installed and notify the General Contractor in writing of conditions detrimental to the proper and timely completion of the work. Proceed with the work when unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PERFORATED DRAINAGE SYSTEM

A. Excavation:

1. Excavate for underdrainage system to provide a clear horizontal distance between drain pipe and the trench walls, on both sides not less than 2 times diameter of drain pipe and sufficient depth to provide not less than 4 inch compacted impervious fill unless subgrade is already equivalent of impervious fill. Grade bottom of trench excavations to required slope and compact to a firm, solid bed for drain system.

B. Laying Drain Pipe:

1. Lay fabric into excavation in direct contact with adjacent subgrade. Allow sufficient fabric to encapsulate entire drainage profile lapping not less than 6 inches on top and 12 inch at edge.
2. Lay perforated pipe solidly bedded in filtering material.(3/4" stone) Provide full bearing for each pipe section throughout its length, to true grades and alignment, and continuous slope in the direction of flow.
3. Lay perforated pipe with perforations down and joints tightly closed in accordance with pipe manufacturers recommendations. Provide collars and couplings as required.
4. Connect pipe to storm system per plans. Provide coupling boot at catch basin connection to provide positive unobstructed flow.

C. Testing Drain Lines: Test or check lines before backfilling to assure free flow. Remove obstructions, replace damaged components, and retest system until satisfactory.

D. Drainage Fill:

1. Backfill drainage fill to encapsulate, cover and fill trench to within 4 inch of finish grade. Wrap drainage fill with excess filter fabric prior to backfilling with soil. Compact to depth as indicated in typical detail on drawings.
2. Fold filter fabric ends over top of trench, overlapping to ensure enclosure of drainage fill within filter fabric.
3. Install and compact topsoil over trench as indicated in typical detail.

3.03 BACKFILLING

A. General: Conduct backfill operations closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.04 FIELD QUALITY CONTROL

A. Testing: Perform testing of completed piping in accordance with all authorities having jurisdiction or as directed by the Engineer/Architect.

END OF SECTION 33 4616.19

APPENDIX A
Report on Geotechnical Investigation

French Landing Park Improvements
12090 Haggerty Road
Van Buren Charter Township, Michigan 48111

G2 Project 203164
June 22, 2020

CONSULTING GROUP

Report on Geotechnical Investigation

French Landing Park Improvements Haggerty Road, S. I-94 Service Drive Van Buren Charter Township, Michigan 48111

Latitude 42.215493° N
Longitude -83.439965° W

Prepared for:

Russell Design, Inc.
114 Rayson Street, Suite 2A
Northville, Michigan 48167

G2 Project No. 203164
June 22, 2020

g2consultinggroup.com

Headquarters	1866 Woodslee St	Troy, MI 48083	P 248.680.0400	F 248.680.9745
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CONSULTING GROUP

June 22, 2020

Mr. Mark R. Russell
Principal
Russell Design, Inc.
114 Rayson Street, Suite 2A
Northville, Michigan 48167

Re: Report on Geotechnical Investigation
French Landing Park Improvements
Haggerty Road, South of I-94 Service Drive
Van Buren Charter Township, Michigan 48111
G2 Project No. 203164

Dear Mr. Russell:

We have completed the geotechnical investigation within the French Landing Park located at the aforementioned address in Van Buren Charter Township, Michigan. This report presents the results of our observations and analyses and our recommendations for earthwork operations, foundation and pavement design, and construction considerations as they relate to the geotechnical conditions on site.

We appreciate the opportunity to be of service to Russell Design, Inc., and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding the report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Tyler Hesse

Tyler S. Hesse, E.I.T.
Staff Engineer

Jason B. Stoops

Jason B. Stoops, P.E.
Associate / Office Manager

TSH/JBS/jbs

EXECUTIVE SUMMARY

We understand that the project consists of performing various improvements within the French Landing Park located in Van Buren Charter Township, Michigan. Moreover, we understand that a new kayak launch station, boardwalk, and canopy structure, as well as bituminous walkways and parking areas will be constructed.

Approximately 3 to 10 inches of sandy topsoil are present at the ground surface within B-03 through B-05. Medium compact sand and hard silty clay fill soils underlie the topsoil within B-04 and B-05 and extend approximately 2-1/2 feet below grade. Native very loose to loose granular soils consisting of sand and clayey sand are present at the ground surface within B-01 and B-02, underlie the topsoil within B-03, and underlie the fill soils within B-04 and B-05 extending to approximate depths ranging from 2 to 6-1/2 feet. Native very stiff to hard silty clay underlies the native granular soils and extends to the explored depths ranging from 15 to 35 feet. Groundwater measurements were performed during and upon completion of drilling operations. During drilling operations, groundwater was encountered at approximate depths ranging from 2 to 4 feet below existing grades. Upon completion, groundwater was measured at approximate depths ranging from 3 to 6 feet below existing grades. No groundwater was encountered during or upon completion of drilling operations within borings B-01 and B-03.

As previously stated, sand and silty clay fill soils were encountered at the ground surface within B-04 and B-05, respectively. These soils appear to have been placed in an engineered manner, have relatively low moisture contents, and may be left in place, provided they pass a proof roll evaluation.

Based on the information provided by Russell Design, Inc., the proposed boardwalk and kayak launch station will be supported on a deep driven timber pile foundation system. At the time of this report, information related to the diameter or design loads of the aforementioned timber piles were not available. However, for evaluation purposes, it will be assumed that the timber piles will be 12-inches in diameter with a 15 kip design load. Similarly, information related to tip elevations and stickup length of the timber piles were unavailable at the time of this investigation.

Based on our preliminary analyses, it appears that 12-inch nominal diameter timber piles embedded approximately 13 feet into the very stiff to hard native clays will provide an allowable compressive capacity of greater than 15 kips. A Factor of Safety of 3 was used in estimating the allowable capacities. The allowable estimated capacities of timber piling at alternative depths can be evaluated once loading conditions for the piles have been determined.

We anticipate caving and sloughing of the upper native granular and/or granular fill soils will occur during foundation and utility excavation operations. The contractor should, therefore, be prepared to over-excavate and form foundations, as necessary to prevent caving or sloughing and to provide smooth and vertical foundation sides to reduce the risk of frozen soil adhering to the concrete and raising foundations.

We anticipate that perched groundwater will be encountered within foundation and utility excavations extending below a depth of 2 to 4 feet. In consideration of the predominately cohesive soils, it is expected that any surface precipitation run-off water flowing onto the exposed subgrade and any groundwater can be reasonably controlled with temporary pumping from properly constructed sumps.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.

PROJECT DESCRIPTION

We understand that the project consists of performing various improvements within the French Landing Park located in Van Buren Charter Township, Michigan. Moreover, we understand that a new kayak launch station, boardwalk, and canopy structure, as well as bituminous walkways and parking areas will be constructed.

At the time of this investigation, design loads for the boardwalk, kayak launch station, and canopy structure were not available; however, for evaluation purposes, it will be assumed that timber pile design loads will be approximately 15 kips, and the canopy structure single column loads will range from approximately ½ to 1 kips. It was reported to us that a supplemental geotechnical investigation will be required to provide timber pile design recommendations and construction considerations of the aforementioned boardwalk and kayak launch station; however, general preliminary recommendations are presented herein. Similarly, no information related to anticipated traffic frequencies was available at the time of this report; however, it will be assumed that traffic volumes are similar with other public park developments in the area.

Information related to existing and final site grades were not available at the time of this report. The recommendations presented within this report assume that future structures will be constructed within one foot of existing grades.

Once loading conditions, traffic conditions, and pavement grades have been determined, G2 should be notified so we can evaluate our recommendations presented herein. The purpose of our exploration is to determine and evaluate the general subsurface conditions within the French Landing Park and to develop recommendations for the subgrade preparation, foundation design, pavement design, and construction considerations as they relate to the geotechnical conditions on site.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering in this area. Our scope of services for this project is as follows:

1. We drilled a total of five (5) soil borings throughout the French Landing Park. Soil borings B-01 and B-03 were performed within the vicinity of the proposed kayak launch station and boardwalk, respectively, extending to a depth of 35 feet each. Soil boring B-02 was performed within the vicinity of the proposed canopy structure extending to a depth of 15 feet. Soil borings B-04 and B-05 were performed within the vicinity of the proposed bituminous walkways and parking areas, respectively, extending to a depth of 15 feet each.

2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, and determination of Atterberg limits and unconfined compressive strength.

3. We prepared this engineering report. The report includes recommendations regarding subgrade preparation, soil bearing capacity, estimate settlement, pavement cross-sections, and construction considerations as they related to foundation and pavement construction.

FIELD OPERATIONS

Russell Design, Inc., in conjunction with G2, selected the depth and location of the soil borings. The boring locations were located in the field by G2 using conventional taping methods from known surface features prior to our drilling operations. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1. At the time of this investigation, topographic information at the soil boring locations was not provided.

The soil borings were drilled using a truck-mounted rotary drilling rig. Continuous flight 2-1/4 inch inside diameter hollow-stem augers were used to advance the borehole to the explored depths. Soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and at intervals of 5 feet thereafter. The samples were obtained by the Standard Penetration Test method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). The blow counts for each 6-inch increment and the resulting N-value are presented on the soil boring logs.

The soil samples were placed in sealed containers and brought to our laboratory for testing and classification. During field operations, the driller maintained logs of the subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field boring logs supplemented by laboratory soil classification and test results. The boreholes were backfilled with auger cuttings upon completion of drilling operations.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design and site preparation. An experienced geotechnical engineer classified the samples in general accordance with the G2 General Notes Terminology and applications of the Visual-Manual Unified Soil Classification System.

Laboratory testing included determination of natural moisture content, Atterberg limits, and unconfined compressive strength, which were determined in accordance with the following test methods:

- "Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)" (ASTM D4288);
- "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass" (ASTM D2216);
- "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils" (ASTM D4318);
- "Standard Test Methods for Unconfined Compressive Strength of Cohesive Soil" (ASTM D2166).

The unconfined compressive strengths were determined by ASTM Test Method D 2166, and using a spring-loaded hand penetrometer. Per ASTM Test Method D 2166, the unconfined compressive strength of cohesive soils is determined by axially loading a small cylindrical soil sample under a slow rate of strain. The unconfined compressive strength is defined as the maximum stress applied to the soil sample before shear failure. If shear failure does not occur prior to a total strain of fifteen percent, the unconfined compressive strength is defined as the stress at a strain of fifteen percent. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the moisture contents, as well as Atterberg limits and unconfined compressive strength determinations are presented on the individual soil boring logs, Figure Nos. 1 through 5, at the applicable depths. In addition, the results of the Unconfined Compressive Strengths determined in accordance with ASTM D 2166 and Atterberg limits determined in accordance with ASTM D 4318 are presented graphically in the Appendix as Figure Nos. 6 and 7, respectively. We will hold the soil samples for 60 days from the date of this report, after which time they will be discarded. If you would like the samples, please let us know.

SITE DESCRIPTION

The French Landing Park is located northwest of the Haggerty Road and Haggerty Highway intersection

in Van Buren Township, Michigan. The site currently consists of two (2) small maintenance buildings, a boardwalk and associated observation deck, and associated bituminous pavements. The remainder of the site is grass covered with select wooded areas. In addition, the site is bordered by Belleville Lake to the west and the surrounding properties are residential in nature. At the time of this report, information related to existing site grades was not available; however, based on visual observations, the site is generally flat with approximate grade changes of 3 to 5 feet.

SOIL CONDITIONS

Approximately 3 to 10 inches of sandy topsoil are present at the ground surface within B-03 through B-05. Fill soils consisting of sand and silty clay underlie the topsoil within B-04 and B-05 and extend approximately 2-1/2 feet below grade. Native granular soils consisting of sand and clayey sand are present at the ground surface within borings B-01 and B-02, underlie the topsoil within boring B-03, and underlie the fill soils within borings B-04 and B-05 extending to approximate depths ranging from 2 to 6-1/2 feet. Native silty clay underlies the native granular soils and extends to the explored depths ranging from 15 to 35 feet.

The sand fill soils are medium compact in relative density, with a Standard Penetration Test (SPT) N-value of 15 blows per foot (bpf). The silty clay fill soils are hard in consistency, with a natural moisture content of 11 percent, and an unconfined compressive strength of 9,000 pounds per square foot (psf). The native granular soils are very loose to loose in relative density, with SPT N-values ranging from 2 to 8 bpf. The native silty clay soils are very stiff to hard in consistency, with natural moisture contents ranging from 13 to 22 percent, dry densities ranging from 124 to 134 pounds per cubic foot (pcf), and unconfined compressive strengths ranging from 6,000 to in excess of 9,000 psf.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between and away from the boring locations. Additionally, the stratigraphic lines represent the approximate boundaries between soil types. The transition may be more gradual than indicated. We have prepared the boring logs on the basis of the field logs of the soil conditions encountered supplemented by laboratory classification and testing.

The Soil Boring Location Plan, Plate No. 1, and Soil Boring Logs, Figure Nos. 1 through 5, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report are presented on Figure No. 8.

GROUNDWATER CONDITIONS

Groundwater measurements were performed during and upon completion of drilling operations. During drilling operations, groundwater was encountered at approximate depths ranging from 2 to 4 feet below existing grades. Upon completion, groundwater was measured at approximate depths ranging from 3 to 6 feet below existing grades. No groundwater was encountered during or upon completion of drilling operations within B-01 and B-03. An estimate in the historical groundwater levels may be made based on the soil color change from browns (aerobic conditions where free oxygen is available) to grays (anaerobic condition where free oxygen is not available). This color change occurs at approximate depths ranging from 6-1/2 to 12 feet below the ground surface.

Fluctuations in perched and long term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should also be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

SITE PREPARATION

We anticipate that earthwork operations will consist of complete removal of existing topsoil, trees,

vegetation, and root masses within the influence of the proposed structures and pavements, proof rolling / proof compacting the exposed subgrade, excavating for utilities and foundations, and preparing the site for pavement support. We recommend that all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified personnel under the direction of a licensed professional engineer.

At the start of earthwork operations, any existing topsoil, trees, or vegetation should be removed in their entirety from the proposed development areas. Any existing utilities within the footprint of proposed structures should be completely removed and backfilled with engineered fill. Existing utilities outside the proposed structural footings can be removed or abandoned in place and completely filled with grout.

At the time of this report, information related to final site grades was not available; however, it will be assumed that pavement grades will be within 1 foot of existing grades. Once pavement grades have been determined, G2 must be notified to evaluate their effect on our recommendations. The conclusions and recommendations presented in this report are not valid unless G2 reviews the changes. G2 will then confirm the recommendations presented herein or make changes in the writing.

After the existing topsoil has been completely removed within the proposed pavement areas, the exposed subgrade should be thoroughly proof rolled / proof compacted. Where granular soils are encountered, soils should be proof-compacted with a heavy smooth-drum vibratory roller and should be visually evaluated for instability and/or unsuitable soil conditions by a qualified geotechnical engineer or technician. We recommend 10 passes in two perpendicular directions during the proof-compaction operations. Where cohesive soils are encountered, soils should be proof-rolled with a fully loaded tandem-axle dump truck and evaluated for stability. We advise against the use of belly-pan scrapers for proof-rolling operations. Unsuitable soils or soils exhibiting excessive instability, such as severe rutting, should be improved with additional compaction or undercut to expose stable soils. Resulting excavations should be backfilled with engineered fill.

As previously stated, sand and silty clay fill soils were encountered at the ground surface within B-04 and B-05, respectively. These soils appear to have been placed in an engineered manner, have relatively low moisture contents, and may be left in place, provided they pass a proof roll / proof compaction evaluation.

Engineered fill should be free of organic matter, frozen soil, clods, or harmful material. The fill should be placed in uniform horizontal layers not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a dry density corresponding with 95 percent of the maximum dry density as determined by the Modified Proctor Compaction test (ASTM D1557). We recommend the use of granular fill soils within confined areas such as utility trenches and adjacent to foundation walls. Granular engineered fill is generally more easily compacted than cohesive soils within these confined areas. Additionally, the proper placement and compaction of backfill within these areas is imperative to provide adequate support for overlying floor slabs and pavements.

FOUNDATION RECOMMENDATIONS

Canopy Foundations

At the time of this report, information related to final site grades was unavailable. However, for evaluation purposes, it will be assumed that the canopy structure foundations will extend approximately 3-1/2 feet below existing grades. As previously mentioned, information related to type or structural loading conditions of the canopy structure foundations were not provided; however, it will be assumed that the canopy structure will be supported on conventional spread footings with column loads on the order of ½ to 1 kips. Once information related to anticipated loading conditions becomes available, G2 should be informed to reevaluate the recommendations presented herein.

We recommend that proposed canopy structure be constructed with conventional shallow spread

footings designed to bear within the native loose clayey sand soils. Foundations bearing within the native loose clayey sand soils can be designed with a net allowable soil bearing pressure of 2,000 psf. If a higher net allowable bearing capacity is desired, foundations can extend through the upper granular soils and bear within the underlying very stiff to hard silty clay. A net allowable soil bearing pressure of 6,000 psf can used for foundation bearing within the very stiff to hard silty clay.

Exterior foundations must bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. We recommend G2 be on site during construction to observe the foundations excavations and verify the adequacy of the bearing soils.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure should be within 1 inch and 1/2 inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structures proposed. We recommend all foundations be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

Vertical Capacity of Driven Timber Pile Foundations

Based on the information provided by Russell Design, Inc., the proposed boardwalk and kayak launch station will be supported on a deep driven timber pile foundation system. At the time of this report, information related to the diameter or design loads of the aforementioned timber piles were not available. However, for evaluation purposes, it will be assumed that the timber piles will be 12-inches in nominal diameter with a 15 kip design load. Similarly, information related to tip elevations and stickup length of the timber piles were unavailable at the time of this investigation. In order to determine tip elevations and stickup length, a supplemental investigation will be required to determine the bottom elevation of Belleville Lake.

Based on our preliminary analyses, it appears that 12-inch diameter nominal timber piles embedded approximately 13 feet into the very stiff to hard silty clay will provide an allowable compressive capacity of greater than 15 kips. A Factor of Safety of 3 was used in estimating the allowable capacity. The allowable estimated capacities of timber piling at alternative depths can be evaluated if desired once the required loading conditions have been determined. If the boardwalk is supported on driven timber piling that extends at least beyond the minimum recommended pile tip elevations, total and differential settlement should be limited primarily to the elastic compression of the piling.

Lateral Capacity of Driven Timber Pile Foundations

Lateral loads may be resisted by the bending resistance of the timber piling and by the passive resistance of the adjacent soils. It may be assumed that the soils adjacent to a 12-inch nominal diameter timber pile can safely resist lateral loads imposed at the ground surface up to 4.5 kips. The lateral resistance of other pile sizes may be assumed to be proportional to the pile diameter.

In calculating the maximum bending moment in a pile, the lateral load imposed at the ground surface may be multiplied by an assumed moment arm of 3 feet. For design purposes, it may be assumed that the maximum bending moment will occur at the ground surface and that the bending moment will decrease to zero at a depth of 16 feet below the ground surface. Our estimates are based upon an allowable lateral deflection of 1/4 inch.

Alternatively, lateral loads can be resisted by installing the piling at a maximum batter of 1:3 (horizontal:vertical). The lateral capacity for 15-kip compression piles, based upon the lateral vector component, is 3.8 kips and 5 kips per pile for 1:4 and 1:3 (horizontal:vertical) batters, respectively.

Driven Pile Installation

Center-to-center pile spacing should not be less than 3 pile diameters to avoid any reduction in downward pile capacity due to group action. Variations in the depths and relative strength and

consistency of the soils from location to location may result in driving resistance differences; therefore, pile-driving refusal may be experienced at shallower elevations than estimated.

PAVEMENT RECOMMENDATIONS

We understand that bituminous pavements will be constructed for both parking areas and pedestrian pathways. Information related to final pavements grades or anticipated traffic frequencies were not available at the time of this report. Once this information becomes available, G2 should be notified to re-evaluate the recommendations presented herein.

We anticipate that standard duty flexible pavements will be utilized within the parking areas and associated access drives, with traffic consisting of regular passenger vehicles, and will be subjected to traffic loads on the order of 75,000 Equivalent 18-kip Single Axle Loads (ESALs) over a 20-year design life. Similarly, we anticipate that a standard duty flexible pavements will be utilized within the pedestrian pathway areas, with traffic consisting of primarily pedestrians and occasional maintenance vehicles, and will be subjected to loads on the order to 50,000 ESALs over a 20-year design life.

Provided the recommendations presented in the *SITE PREPARATION* section of this report are adhered to, we anticipate subgrade resilient moduli of 7,000 pounds per square inch (psi) can be used for the native granular and/or sand and silty clay fill soils. For evaluation purposes, we assumed a serviceability loss of 2.0, a standard deviation of 0.49, and a reliability of 90 percent.

Flexible Pavement Design – Standard-Duty – Parking Areas and Access Drives			
Material Type	**Minimum Thickness (in)**	**Structural Coefficient**	**Structural Number (SN)**
MDOT 5E1 Bituminous Wearing Course	1-1/2	0.42	0.63
MDOT 3C Bituminous Base Course	2	0.42	0.84
MDOT 21AA Aggregate Base Course (dense-graded)	8	0.14	1.12
		Total SN →	2.59

Flexible Pavement Design – Standard Duty – Pedestrian Pathways			
Material Type	**Minimum Thickness (in)**	**Structural Coefficient**	**Structural Number (SN)**
MDOT 5E1 Bituminous Wearing Course	1-1/2	0.42	0.63
MDOT 3C Bituminous Base Course	1-1/2	0.42	0.63
MDOT 21AA Aggregate Base Course (dense-graded)	8	0.14	1.12
		Total SN →	2.38

We recommend “stub” or “finger” drains be provided around catch basins to minimize the accumulation of water above and within any frost susceptible subgrade soils. The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water from ponding. We also recommend pavement subbase materials consist of non-frost susceptible aggregates where possible. Any undercut areas within predominantly clayey soils should be connected with finger drains to the closest catch basins to drain water from within the granular undercut backfill material.

Regular timely maintenance should be performed on the bituminous pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

CONSTRUCTION CONSIDERATIONS

At the time of this report, information related to utility type, alignment, or depth were not available. Similarly, information related to the canopy foundation bearing depths were not available at the time of this report. However, for evaluation purposes, it will be assumed that utilities extend approximately 5 to 8 feet below existing grades and foundation excavations will extend 3-1/2 feet below existing grades. If this information becomes available; G2 should be notified to re-evaluate the recommendations presented herein.

We anticipate caving and sloughing of the upper native granular and/or granular fill soils will occur during foundation and utility excavation operations. The contractor should, therefore, be prepared to over-excavate and form foundations, as necessary to prevent caving or sloughing and to provide smooth and vertical foundation sides to reduce the risk of frozen soil adhering to the concrete and raising foundations. We anticipate that perched groundwater will be encountered within foundation and utility excavations extending below a depth of 2 to 4 feet. In consideration of the predominately cohesive soils, it is expected that any surface precipitation run-off water flowing onto the exposed subgrade and any groundwater can be reasonably controlled with temporary pumping from properly constructed sumps.

It should generally be expected that vertical or near-vertical excavations would be unstable. Where sufficient space is available, temporary unsurcharged trench and excavation sides should be sloped back. Temporary unsurcharged slopes may be cut at 2 horizontal units to 1 vertical unit (2H:1V) within the native very loose to loose granular soils and sand fill soils, and (3/4H:1V) within the native very stiff to hard cohesive soils for temporary excavations extending below a depth of 5 feet. Where seepage from excavation cuts is observed, the slopes will need to be flattened sufficiently to achieve stability, but in no case left steeper than 3H:1V at and below the seepage level. All excavations should be safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, lower angle slopes or stronger shoring must be used to resist the extra pressure due to the superimposed loads.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the project location, anticipate type of structure, and anticipated surface grades for the proposed site. Any significant change in this data should be brought to our attention for review and evaluation with respect to prevailing subsurface conditions. Furthermore, if changes occur in the design, location, or concept of the project, conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of anticipated structures and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. A supplemental investigation with additional soil borings will be required to provide final design recommendations of the timber pile foundation systems. This report does not reflect variations that may occur between the actual boring locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

We recommend G2 Consulting Group, LLC observe all geotechnical related work, including foundation construction, subgrade preparation, and engineered fill placement. G2 Consulting Group, LLC will perform the appropriate testing to confirm the geotechnical conditions given in the report are found

during construction.

APPENDIX

Legend

Soil Borings drilled by Triple R Drilling, LLC on May 23, 2020

Notes

1. Soil Borings B-01 and B-03 drilled to a depth of 35 feet.
2. Soil Borings B-02, B-04, and B-05 drilled to a depth of 15 feet.

Soil Boring Location Plan		
French Landing Park Haggerty Road, South of I-94 Service Drive Van Buren Charter Township Michigan 48111		
2G CONSULTING GROUP	Project No. 203164	
	Drawn by: TSH	
	Date: 05/29/20	Plate No. 1
	Scale: NTS	

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.216138° Longitude: -83.440223°

Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Very Loose Brown Sand with trace silt and gravel		S-01	1 1 1	2			
		2.0							
5		Very Stiff to Hard Brown Silty Clay with trace sand and gravel	5	S-02	5 6 7	13	18.8	124	6560
				S-03	7 12 12	24	16.1		9000*
		9.0							
10		Hard Mottled Brown and Gray Silty Clay with trace sand and gravel	10	S-04	7 10 12	22	17.1		9000*
		11.5							
15		Very Stiff to Hard Silty Clay with trace sand and gravel	15	S-05	4 7 10	17	15.6		8000*
20			20	S-06	4 7 11	18	16.0		8000*

Total Depth: 35 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 1a

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.216138° Longitude: -83.440223°

Soil Boring No. B-01

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
25			25	S-07	4 6 10	16	16.3		9000*
30		Very Stiff to Hard Silty Clay with trace sand and gravel *(continued)*	30	S-08	4 6 7	13	18.0		8000*
35		35.0	35	S-09	4 6 7	13	17.1		6000*
40		End of Boring @ 35 ft	40						

Total Depth: 35 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 1b

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.215753° Longitude: -83.439973°

Soil Boring No. B-02

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Loose Brown Sand with trace clay and gravel		S-01	2 3 5	8			
		2.0							
5		Loose Brown Clayey Sand with trace gravel	5	S-02	1 2 5	7			
		6.5		S-03	3 7 8	15	13.7	134	12560
10			10	S-04	4 7 8	15	13.7		9000*
		Hard Gray Silty Clay with trace sand and gravel							
15		15.0	15	S-05	4 7 11	18	14.5		8000*
		End of Boring @ 15 ft							
20			20						

Total Depth: 15 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
2 feet during drilling operations; 3 feet upon completion

Notes:
Borehole collapsed at 4 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 2

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.215253° Longitude: -83.440292°

Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

Topsoil: Brown Sand (8 inches) — 0.7

Loose Light Brown Clayey Sand with trace gravel — 3.0

Hard Mottled Brown and Gray Silty Clay with trace sand and gravel — 12.0

Very Stiff to Hard Gray Silty Clay with trace sand and gravel

SOIL SAMPLE DATA

DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	S-01	2 3 3	6			
5	S-02	7 12 12	24	15.2		9000*
	S-03	8 13 18	31	14.6		9000*
10	S-04	12 17 23	40	13.8		9000*
15	S-05	5 8 11	19	14.8		9000*
20	S-06	4 7 10	17	14.6		9000*

Total Depth: 35 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 3a

SOIL / PAVEMENT BORING 203164.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.215253° Longitude: -83.440292°

Soil Boring No. B-03

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
25			25	S-07	4 6 8	14	16.2		9000*
30		Very Stiff to Hard Gray Silty Clay with trace sand and gravel *(continued)*	30	S-08	4 7 8	15	14.6		7000*
35		35.0	35	S-09	4 6 8	14	15.3		7000*
40		End of Boring @ 35 ft	40						

Total Depth: 35 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
Dry during and upon completion of drilling operations

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 3b

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.215493° Longitude: -83.439965°

Soil Boring No. B-04

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

DEPTH (ft)	PRO-FILE		DEPTH (ft)
		Topsoil: Brown Sand (10 inches) 0.8	
		Fill: Medium Compact Brown Sand with trace cobbles 2.5	
		Loose Light Brown Sand with trace silt and gravel 4.0	
5		Hard Brown Silty Clay with trace sand and gravel 7.0	5
10		Hard Gray Silty Clay with trace sand and gravel 15.0	10
15		End of Boring @ 15 ft	15
20			20

SOIL SAMPLE DATA

SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
S-01	5 7 8	15			
S-02	3 3 4	7			
S-03	5 9 9	18	20.3		9000*
S-04	6 9 10	19	14.9		9000*
S-05	3 5 6	11	15.7		9000*

Total Depth: 15 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

Water Level Observation:
4 feet during drilling operations; 3 feet upon completion

Notes:
Borehole collapsed at 3 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 4

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No. 203164

Latitude: 42.215572° Longitude: -83.439490°

Soil Boring No. B-05

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

DEPTH (ft)	PRO-FILE		DEPTH (ft)
		Topsoil: Brown Sand (3 inches) 0.3	
		Fill: Hard Gray Silty Clay with trace sand, gravel, and pulverized asphalt (LL=49. PL=17) 2.5	
		Loose Light Brown Clayey Sand with trace gravel 4.0	
5			5
		Very Stiff Light Brown Silty Clay with trace sand and gravel, occasional cobbles 7.0	
10			10
		Hard Gray Silty Clay with trace sand and gravel 15.0	
15			15
		End of Boring @ 15 ft	
20			20

SOIL SAMPLE DATA

SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
S-01	4 5 6	11	10.6		9000*
S-02	2 3 3	6			
S-03	4 7 7	14	21.4		7000*
S-04	6 7 7	14	15.1		9000*
S-05	3 5 7	12	15.9		9000*

Total Depth: 15 ft
Drilling Date: May 23, 2020
Inspector:
Contractor: Triple R Drilling, LLC
Driller: R. Rau

Drilling Method:
2-1/4 inch inside diameter hollow-stem auger

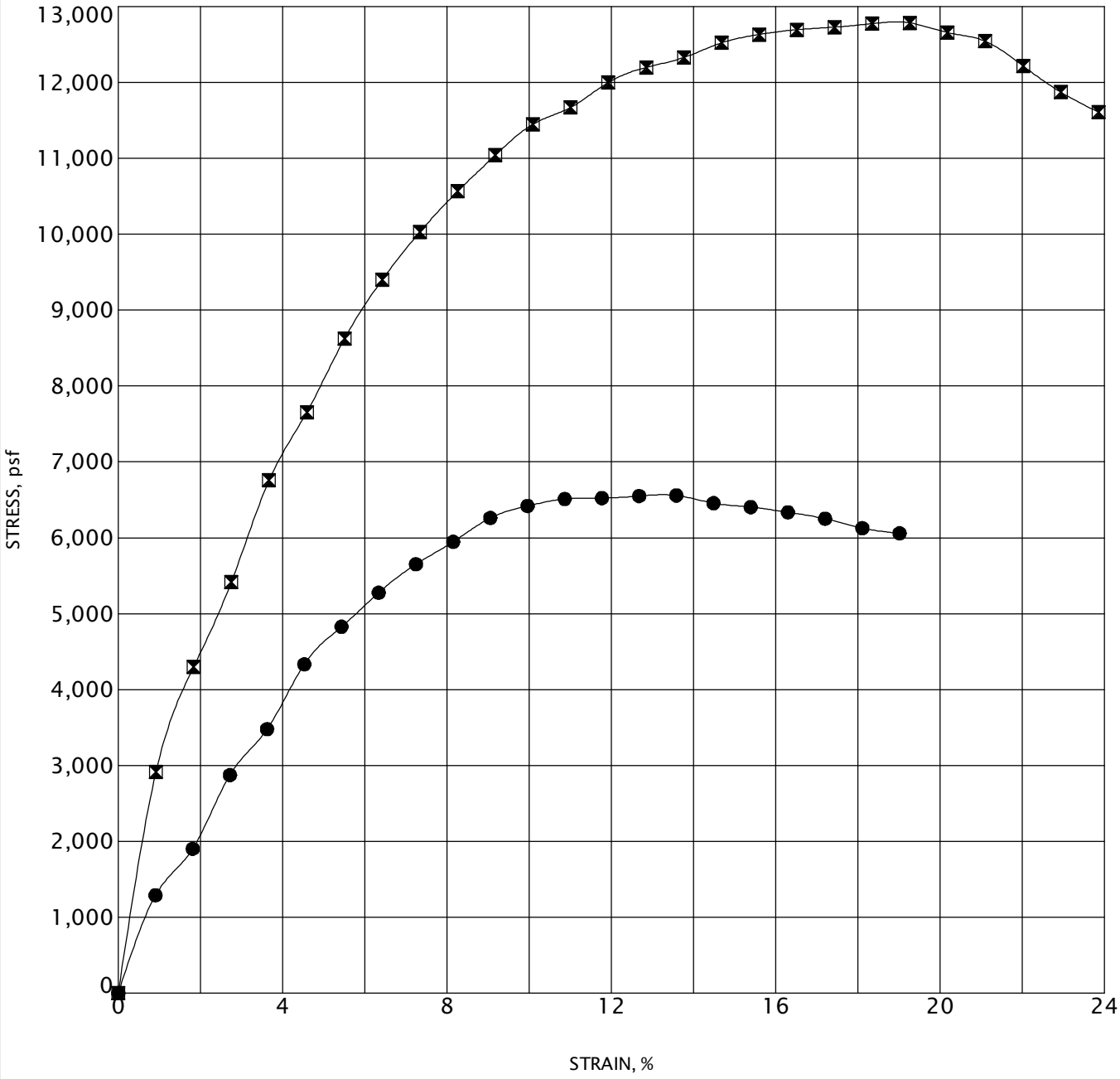
Water Level Observation:
4 feet during drilling operations; 6 feet upon completion

Notes:
Borehole collapsed at 6-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 5

SOIL / PAVEMENT BORING 203164.GPJ 20150116.G2 CONSULTING DATA TEMPLATE.GDT 6/10/20



Specimen		Classification	MC%	γ_d	UC
● B-01	S-02	Very Stiff Brown Silty Clay	19	124	6560
⊠ B-02	S-03	Hard Gray Silty Clay	14	134	12560

CONSULTING GROUP

UNCONFINED COMPRESSIVE STRENGTH TEST

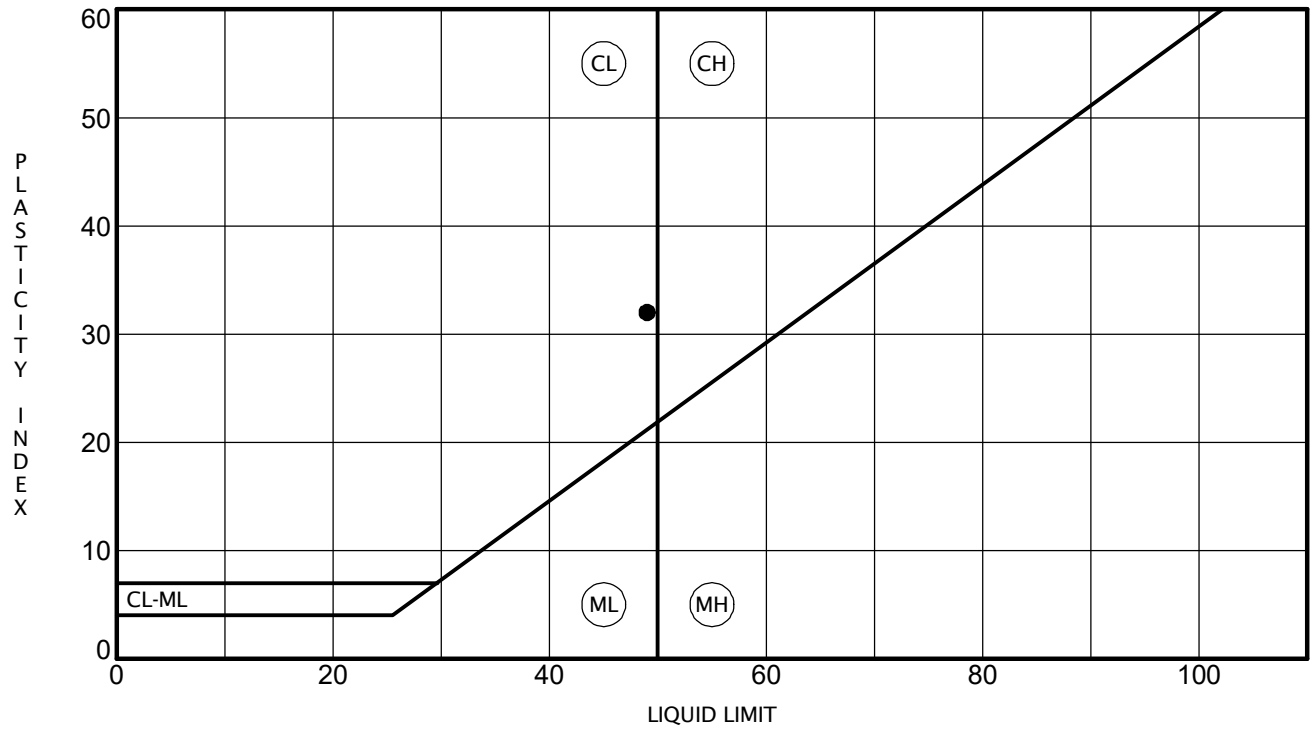
Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No.: 203164

Figure No. 6

US_UNCONFINED 203164.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 6/9/20



	Specimen Identification		LL	PL	PI	Fines	M %	Classification
●	B-05	S-01	49	17	32		11	Fill: Gray Silty Clay

CONSULTING GROUP

ATTERBERG LIMITS RESULTS

Project Name: French Landing Park Improvements

Project Location: NW of Haggerty Road and Haggerty Highway Intersection
Van Buren Charter Township, Michigan

G2 Project No.: 203164

Figure No. 7

US_ATTERBERG_LIMITS 203164.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 6/9/20

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders		- greater than 12 inches
Cobbles		- 3 inches to 12 inches
Gravel	- Coarse	- 3/4 inches to 3 inches
	- Fine	- No. 4 to 3/4 inches
Sand	- Coarse	- No. 10 to No. 4
	- Medium	- No. 40 to No. 10
	- Fine	- No. 200 to No. 40
Silt		- 0.005mm to 0.074mm
Clay		- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).