Outagamie County Parks Department
Plamann Park Multi-Sport Courts Project

Appleton, WI

June 2025

Rettler Corporation Project #23.045

your vision. our design.

Intentionally left blank

SECTION 02 05 00 - COMMON WORK RESULTS FOR EXISTING CONDITIONS

PART ONE - GENERAL

SCOPE

This section provides information common to two or more technical site work specification sections or items that are of a general nature, and not included in other sections. This section applies to ALL site work, as applicable. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Referenced Organizations
- Referenced Documents
- Quality Assurance
- Safety
- Permits
- Construction Limits
- Work by Others
- Submittals
- Off Site Storage
- Codes
- Certificates and Inspections

PART TWO - PRODUCTS
- Barricades, Signs, and Warning Devices

PART THREE - EXECUTION
- Maintenance of Site and Building Access/Egress
- Continuity of Existing Traffic/Parking and Traffic Control
- Protection and Continuity of Existing Utilities
- Protection of Existing Work and Facilities
- Stormwater/Excavation Water Management

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

02 41 00 – Demolition

REFERENCED ORGANIZATIONS

Applicable provisions of the General Conditions shall govern all work under this section.

Abbreviations of organizations referenced in these specifications are as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
FHA	Federal Highway Administration
EPA	Environmental Protection Agency
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
STI	Steel Tank Institute
UL	Underwriters Laboratories Inc.
WDNR	State of Wisconsin Department of Natural Resources
WisDOT	State of Wisconsin Department of Transportation

REFERENCED DOCUMENTS

Where reference is made to “State Specifications” it shall mean: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2024 edition.

Where reference is made to “Standard Specifications” it shall mean: “Standard Specifications for Sewer and Water Construction in Wisconsin,” Sixth Edition, December 22, 2003 and Addendum 1, December 22, 2004 and Addendum No. 2, April 22, 2008.

Incorporate following listing of correction of referenced chapters or sections contained within “Standard Specifications.”

Page	General Section	Noted Reference Section or Chapter	Correct Reference Section or Chapter
3-21	3.2.6(n)1	4.17.0	4.16.0

Where reference is made to “PAL” it shall mean Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website.

Where reference is made to “BMPH”, it shall mean the Wisconsin Construction Site Best Management Practice Handbook, current edition as published by the WDNR.

Method of measurement and basis of payment sections in referenced documents shall not apply.

QUALITY ASSURANCE

Provide materials and products as required by individual specification sections. Refer to General Conditions of the Contract regarding substitutions.

Contractor shall provide quality assurance testing and reporting as required by individual specification sections.

SAFETY

Contractor is solely responsible for worksite safety.

Perform all work in accordance with applicable OSHA, state and local safety standards.

Contact Diggers Hotline at 1-800-242-8511 in accordance with statutory requirements. Request that non-member utilities and private utilities be located by the appropriate parties.

PERMITS

Unless otherwise noted in the Contract Documents, CONTRACTOR shall be responsible for obtaining and paying for all permits necessary to complete the work.

CONSTRUCTION LIMITS

Construction Limits are indicated on the drawings. In the absence of such a designation on the drawings, confine work to the minimum area reasonably necessary to undertake the work as

determined by the LA/E. In no case shall construction activities extend beyond OWNER'S property lines or construction easements.

Restore all disturbed areas in accordance with the drawings and specifications. If drawings and specifications do not address restoration of specific areas, these areas will be restored to pre-construction conditions as approved by the LA/E.

WORK BY OTHERS
Coordinate work under this project with work by OWNER, other CONTRACTORS and Utility Contractors on site including the following:

Owner will remove trees. Grubbing to be completed by Contractor.

SUBMITTALS
Refer to General Conditions of the Contract.

Submit manufacturer's shop drawings, product data, samples, substitutions, operation, and maintenance (O&M) data for approval as required by individual specification sections.

Unless otherwise noted, submit electronically to LA/E unless otherwise directed by LA/E at the Pre-Construction Meeting.

OFF SITE STORAGE
Refer to General Conditions

In general, payments for materials stored off site will only be considered in instances where there is limited space available for storage on site. Prior approval by the LA/E, together with the execution of a Storage Agreement will be required.

CODES
Comply with the requirements of all applicable, local, state and federal codes.

CERTIFICATIONS AND INSPECTIONS
Refer to Section GC - General Conditions.

Obtain and pay for all required sampling, testing, inspections, and certifications except those expressly listed as provided by the OWNER, LA/E or other third party in the Contract Documents. Deliver originals of certificates and documents to the LA/E within 3 days; provide copies to the OWNER. Include copies of the certifications and documents in the O&M Manual.

PART TWO - PRODUCTS

BARRICADES, SIGNS, AND WARNING DEVICES
Traffic barricades, traffic signs, and warning devices shall meet the requirements of applicable OSHA standards and the FHA Manual of Uniform Traffic Control Devices (MUTCD).

PART THREE - EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS
All construction access shall ingress and egress from location shown on drawings only.

Unless otherwise shown or directed, maintain existing access and egress to adjacent facilities throughout construction. Maintain ANSI A117 compliant access for disabled persons, delivery

access, emergency vehicle access, and emergency egress. Do not interrupt access and egress without prior written approval from the LA/E.

CONTINUITY OF EXISTING TRAFFIC/PARKING AND TRAFFIC CONTROL

Refer to Section GR - General Requirements.

Do not interrupt or change existing traffic, delivery, or parking without prior written approval from LA/E. When interruption is required, coordinate schedule with the OWNER agency to minimize disruptions. When working in public right-of-way, obtain all necessary approvals and permits from applicable municipalities.

When CONTRACTOR'S activities impede or obstruct traffic flow, CONTRACTOR shall provide traffic control devices, signs and flaggers in accordance with other Contract Documents and the current version of the MUTCD, or as shown on the drawings.

PROTECTION AND CONTINUITY OF EXISTING UTILITIES

Verify the locations of any water, drainage, gas, sewer, electric, telephone/communication, fuel, steam lines or other utilities and site features which may be encountered in any excavations or other sitework. Properly underpin and support all lines to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from the LA/E, affected utilities and users. Notify all users impacted by outages minimum of 48 hours in advance of outage. Provide notification in writing and describe nature and duration of outages and provide name and number of CONTRACTOR'S foreman or other contact.

Cut off and cap any service connections encountered which are to be removed at the limits of the excavation in accordance with the requirements of applicable codes and any specifications governing such removals.

PROTECTION OF EXISTING WORK AND FACILITIES

Verify the locations of, and protect, any signs, paved surfaces, buildings, structures, landscaping, streetlights, utilities, and all other such facilities that may be encountered or interfered with during the progress of the work. Take measures necessary to safeguard all existing work and facilities that are outside limits of work or items that are within construction limits but are intended to remain. Report any damage to existing facilities to LA/E immediately. Correct and pay for all damages.

STORMWATER/EXCAVATION WATER MANAGEMENT

Control grading around structures, pitch ground to prevent water running into excavated areas.

Pits, trenches within building lines and other excavations shall be maintained free of water. Provide trenching, pumping, other facilities required.

Notify LA/E if springs or running water is encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to LA/E of points and areas that water will be discharged. At the LA/E's option, CONTRACTOR shall drain the spring to the storm sewer system by the use of field tile.

Contractor responsible for control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas.

End of Section

SECTION 02 32 00 - GEOTECHNICAL INVESTIGATION

PART ONE - GENERAL

SCOPE

This section provides information resulting from subsurface investigations completed at the site as part of this project. This section may contain information applicable to ALL site work, and other technical specification sections, as well. All CONTRACTORS are expected to review this information as part of their duties to familiarize themselves with the site.

Results of the geotechnical investigation apply only to the locations at which data was collected, at the specific time it was collected. Geotechnical conditions may differ elsewhere on the site.

Prior to making additional investigations of his own using test pits, borings, or other methods; Bidder shall first gain permission from property OWNER and General CONTRACTOR. Geotechnical investigations completed by Bidder shall comply with all applicable requirements of Division 00 through Division 33 of this project.

Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work

PART TWO - PRODUCTS
- Not Used

PART THREE - EXECUTION
- Not Used

RELATED WORK

Applicable provisions of the General Conditions govern work under this Section.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

Not Used

End of Section

Intentionally left blank

Geotechnical Engineering Exploration and Analysis

Plamann Park Redevelopment
Plamann Park
1375 East Broadway Drive
Appleton, Wisconsin

Prepared for:

Outagamie County Parks System
Appleton, Wisconsin

January 19, 2024
Project No. 1G-2312007

GILES
ENGINEERING ASSOCIATES, INC.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Dallas, TX
• Los Angeles, CA
• Manassas, VA
• Milwaukee, WI

January 19, 2024

Outagamie County Parks System
1375 East Broadway Drive
Appleton, WI 54913

Attention: Mr. Loren R. Dieck
Director

Subject: Geotechnical Engineering Exploration and Analysis
Proposed Redevelopment
Plamann Park
1375 East Broadway Drive
Appleton, Wisconsin
Giles Project No. 1G-2312007

Dear Mr. Dieck:

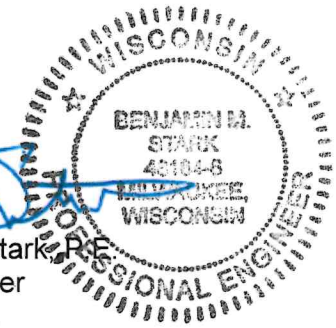
As requested, Giles Engineering Associates, Inc. ("Giles") conducted a *Geotechnical Engineering Exploration and Analysis* for the proposed project. The accompanying report describes the services that were performed, and it provides geotechnical-related findings, conclusions, and recommendations that were derived from those services.

We sincerely appreciate the opportunity to provide geotechnical consulting services for the proposed project. Please contact the undersigned if there are questions about the report, or if we may be of further service.

Very truly yours,

GILES ENGINEERING ASSOCIATES, INC.

Evan R. Axtell, E.I.T.
Staff Professional



Benjamin M. Stark, P.E.
Project Engineer

Distribution: Loren R. Dieck
Attn: Mr. Loren R. Dieck (pdf via email: loren.dieck@outagamie.org)

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED REDEVELOPMENT
PLAMANN PARK
1375 EAST BROADWAY DRIVE
APPLETON, WISCONSIN
GILES PROJECT NO. 1G-2312007

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED REDEVELOPMENT
PLAMANN PARK
1375 EAST BROADWAY DRIVE
APPLETON, WISCONSIN
GILES PROJECT NO. 1G-2312007

1.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. ("Giles") conducted for the proposed project. The *Geotechnical Engineering Exploration and Analysis* included a geotechnical subsurface exploration program, geotechnical laboratory services, and geotechnical engineering. The scope of each service area was narrow and limited as directed by our client and based on our understanding and assumptions about the proposed project. Services are briefly described later. Requested environmental testing of topsoil samples was conducted by a third-party laboratory and results of that testing are included in this report, however, additional environmental consulting was beyond Giles' authorized scope for this project.

Geotechnical-related recommendations are provided in this report for design and construction of the fence foundations. Furthermore, geotechnical-related recommendations are provided for pavement areas. Site preparation recommendations are given but are only preliminary as the means and methods of site preparation will depend on factors that were unknown when this report was prepared. Those factors include, but are not limited to, the weather before and during construction, the actual subsurface conditions that are exposed during construction, and the finalized details of the proposed development.

2.0 SITE AND PROJECT DESCRIPTION

The proposed project consists of redeveloping part of Plamann Park. The redevelopment area is located southeast of the Plamann Park main office building at 1375 East Broadway Drive in Appleton, Wisconsin. The proposed redevelopment includes a baseball field, tennis court, basketball court and other pavement areas. Topographically, the site slopes downward to the northeast. Ground surface elevations within the proposed improvement areas range between ±El. 818.0 and ±El 827.0, based on topographic contours shown on the *Soil Boring Layout Map,* prepared by Rettler Corporation. The proposed redevelopment area is shown on the *Test Boring Location Plan*, enclosed as Figure 1 in Appendix A.

3.0 GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM

To explore subsurface conditions, seven geotechnical test borings were conducted in the proposed improvement areas. The test borings were advanced to depths of ±11 to ±21 feet below-ground. The test boring locations were positioned on-site based on measurements from existing site features and by estimating right angles. Approximate locations of the test borings are shown on the *Test Boring Location Plan*.

Samples were collected from each test boring, at certain depths, using the Standard Penetration Test (SPT), conducted with the drill rig. A brief description of the SPT is given in Appendix B along with descriptions of other field procedures. Immediately after sampling, select portions of the SPT samples were placed in sealed containers that were labeled at the site for identification. A Standard Penetration Resistance value (N-value) was determined from each SPT. N-values are reported on the *Test Boring Logs* (in Appendix A), which are records of the test borings.

Boreholes from the test boings were backfilled, but backfill materials will likely settle or heave, creating a hazard that can injure people and animals. Borehole areas should, therefore, be carefully and routinely monitored by the Plamann Park's maintenance personnel or by others; settlement and heave of backfill materials should be repaired immediately. Giles will not monitor or repair boreholes.

Ground elevations at the test boring locations were estimated using the topographic contour lines on the *Soil Boring Layout Map*. The test boring elevations are noted on the *Test Boring Logs* and are considered accurate within about one foot.

4.0 GEOTECHNICAL LABORATORY SERVICES

Soil samples that were retained from the test borings were transported to Giles' geotechnical laboratory where the samples were classified using the descriptive terms and particle-size criteria shown on the *General Notes* in Appendix D and by using the Unified Soil Classification System (ASTM D 2488) as a general guide. The classifications are shown on the *Test Boring Logs* along with horizontal lines that show estimated depths of material change; the actual material change is likely more gradual. Field-related information pertaining to the test borings is also shown on the *Test Boring Logs*. For simplicity and abbreviation, terms and symbols are used on the *Test Boring Logs;* the terms and symbols are defined on the *General Notes*.

Soil samples retained from Test Boring 7, conducted within the proposed stormwater management area, were also visually classified using the USDA textural classification system in general accordance with the guidelines provided in the *Field Book for Describing and Sampling Soils* (USDA, Sept. 2012). USDA classifications of the observed soils are shown on the attached Wisconsin DSPS *Soil and Site Evaluation – Storm* logs. Also, the subsurface conditions at the test borings are summarized below. It is important to note that the conclusions and recommendations in this report are strictly based on the conditions observed within the test borings.

Unconfined compression (without measured strain), penetrometer resistance, and moisture content tests were performed on select soil samples to evaluate their general engineering properties. Results of the laboratory tests are on the *Test Boring Logs*. Because SPT samples were used, which are categorized as disturbed samples, results of the unconfined compression

and penetrometer resistance tests are approximate. Laboratory procedures are briefly described in Appendix C.

As requested by the client, Giles performed grain-size analyses on topsoil samples from Test Borings 1, 3, 4, 5, and 6. The particle size distributions are reported in Figures 2 through 6. Additionally, portions of the topsoil samples from these test borings were sent to Rock River Laboratory, Inc., an independent analytical testing laboratory, for soil nutrient and pH testing. The results of the analytical laboratory testing are shown on the *Soil Test Report* in Appendix A.

5.0 MATERIAL CONDITIONS

Because material sampling at the test borings was discontinuous, it was necessary to estimate conditions between sample intervals. Estimated conditions at the test boring locations are briefly discussed in this section and are described in more detail on the *Test Boring Logs*. The conclusions and recommendations in this report are only based on the estimated conditions shown on the *Test Boring Logs*.

5.1. Surface Materials

Topsoil that was about ±6 to ±14 inches thick was at the surface of the test borings, except at Test Boring 2. The topsoil mostly consisted of sandy clay with trace amount of organic material. Approximately ±3 inches of root material underlain by ±5 inched of crushed limestone gravel was encountered at the surface of Test Boring 2.

5.2. Fill Material

At Test Borings 1 and 2, fill material was below the topsoil and was encountered to ±2 feet below-ground. The fill material consisted of silty clay and sandy silt.

5.3. Native Soil

Native soil was below the materials described above and was encountered to the termination depths at the test boring locations. The native soil consisted of silty clay and lean clay with interbedded layers of sandy silt, sandy clay and silt. Based on laboratory testing, the native cohesive soil typically exhibited comparative consistencies of medium stiff and hard.

6.0 GROUNDWATER CONDITIONS

Based on the (gray) colors and moisture conditions of the soil samples that were retained from the test borings, it is estimated that the water table was typically about ±9 to ±14 feet below-ground at the test boring locations when the test borings were conducted. However, based on the encountered water at Test Borings 3 and 4, the site is estimated to be subject to perched

groundwater, where groundwater may exist above the water table. Perched groundwater is likely to be present within granular material overlying low-permeability cohesive soils. Groundwater conditions at the site will likely fluctuate.

The groundwater conditions discussed above are only an approximation based on the colors and moisture conditions of the retained soil samples and the groundwater encountered at some of the test borings. The water table could be shallower than estimated. If needed, groundwater observation wells can be installed and observed at the site to evaluate the water table depth more precisely. Giles can install and monitor observation wells.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1. Seismic Design Considerations

A soil Site Class D is recommended for seismic design, if needed. By definition, Site Class is based on the average properties of subsurface materials to 100 feet below-ground. Because a 100-foot test boring was not conducted, it was necessary to estimate Site Class based on the test borings, presumed area geology, and the International Building Code.

7.2. Foundation Recommendations

It is assumed that the proposed fence foundations will consist of cylindrical concrete piers that will be cast-in-place. Based on the test borings and from a geotechnical perspective, a concrete pier foundation system can be used to support the proposed structures. However, existing fill is unsuitable for direct or indirect support of the foundations. Each pier must, therefore, extend through existing fill and must bear on suitable native soil. Foundation excavations are recommended to be formed to prevent caving of subsurface materials. Sonotube® Commercial concrete forms (or equivalent) could possibly be used.

Assuming that each pier will be directly supported by suitable native soil, the piers are recommended to be designed using a 2,000 pound per square foot (psf) maximum, net, allowable soil bearing capacity. For geotechnical considerations and regardless of the calculated foundation-bearing stress, each pier is recommended to be at least 18 inches in diameter but might need to be larger depending on the structural requirements. A minimum 48-inch foundation-embedment depth is required by the building code. It is, therefore recommended that each pier bear at least 48 inches below the finished ground-grade at the foundation locations and for frost considerations. It is recommended that a structural engineer provide specific foundation details, including footing dimensions, reinforcing, etc.

Pier Foundation Side Resistance

Based on the soils encountered at the test borings, an average allowable side friction of 200 psf/foot may be used to for pier design for fence foundations. The side resistance, along with dead weight of the pier may also be used to determine the uplift resistance of the piers. Side resistance within the frost depth (4 feet) is recommended to be neglected.

Foundation Support Soil Requirements

Existing fill is unsuitable for direct or indirect support of the foundations. Each pier must, therefore, extend through existing fill and must bear on suitable native soil. Based on the recommended 2,000 psf maximum, net, allowable soil bearing capacity, the in-situ unconfined compressive strength of cohesive native soil, if any, within foundation influence zones is recommended to be at least 1.0 tons per square foot (tsf). Granular native soil, such as sandy silt, within foundation influence zones is recommended to have a corrected N-value (determined from SPTs and correlated from other in-situ tests) of at least 7, based on the recommended bearing capacity. It is further recommended that the strength characteristics of soil within all foundation influence zones (determined by a geotechnical engineer during construction) meet or exceed the recommended values unless Giles approves other values.

Evaluation of foundation-support soil by a geotechnical engineer during foundation excavation and immediately before foundation construction is recommended. The purpose of the recommended evaluation is (1) to confirm that the foundations will bear on suitable native soil, (2) to determine where over-excavation is needed, and (3) to confirm that the support soil is similar to the soil described on the *Test Boring Logs*. If a firm other than Giles performs the recommended support-soil evaluation, Giles must be notified if the composition or strength characteristics of foundation-support soil differ from those shown on the *Test Boring Logs*; revision of this report might be necessary. OSHA requirements must be strictly followed when evaluating foundation-support soil; excavations that do not meet OSHA safety guidelines must not be entered.

Where unsuitable soil is encountered at a planned foundation-bearing grade, the foundation excavation is recommended to be extended deeper until suitable native soil is reached.

Estimated Foundation Settlement

The post-construction total and differential settlements of a spread-footing (pier) foundation designed and constructed based on this report are estimated to be less than about 1 inch and ½ inch, respectively. Estimated settlements assume that the recommendations provided in this report will be followed and that foundation-support soil will be evaluated and approved by a geotechnical engineer during construction.

7.3. Pavement Recommendations

Because traffic-related information was not provided to us, recommendations are included herein for light-duty and moderate-duty pavement using assumed traffic conditions. The light-duty pavement section is for passenger-vehicle parking areas and is based on an assumed traffic condition of five 18-kip Equivalent Single Axle Loads (ESALs) per day. The moderate-duty pavement section is for drives that will be subject to buses and other heavy vehicles and is based on an assumed traffic condition consisting of fifteen 18-kip ESALs per day. The recommended pavement sections assume no increase in traffic volume and no changes in vehicle type or traffic pattern. Also, it is assumed that the ESALs noted above will be in one direction for each lane.

It is important that the project owner, developer, civil engineer, and other design professionals involved with the project confirm that the ESALs noted above are appropriate for the expected traffic conditions, vehicle types, and axle loadings. If requested, Giles can provide supplemental pavement recommendations based on other traffic conditions, vehicle types, and axle loads. The recommended pavement sections could underperform or fail prematurely if the design ESALs are exceeded.

Based on the test borings and with proper subgrade preparation, it is expected that pavement support materials will include lean clay and likely other cohesive soil. Therefore, the recommended pavement sections were developed based on a lean clay subgrade with an assumed field CBR value of 4 and a *Modulus of Subgrade Reaction* (K_{V1}) value of 100 psi/in. Engineered fill that is placed in proposed pavement areas is recommended to have a field CBR value and a *Modulus of Subgrade Reaction* (K_{V1}) value at least equal to these design values. Fill is recommended to be placed and compacted per this report.

The following table shows the recommended thicknesses for hot-mix asphalt (HMA) pavement with an aggregate base-course. State specifications are also included in the table. The recommended pavement sections are based on the traffic conditions described above.

TABLE 1
RECOMMENDED HMA PAVEMENT SECTION

Materials	Light Duty	Moderate Duty	Wisconsin DOT Standard Specifications
Hot-Mix Asphalt Surface Course	1.5 inches	1.5 inches	Section 460
Hot Mix Asphalt Binder Course	1.5 inches	2.5 inches	Section 460
Dense-Graded Aggregate Base Course	7.0 inches	8.0 inches	Section 305, 1¼-inch Crushed Stone

Portland cement concrete pavement is recommended in higher-stress areas, such as entrance and exit aprons, at refuse enclosures, and in areas where trucks will turn or will be parked. Based on the assumed ESALs, discussed above, concrete pavement is recommended to be at least 6 inches thick and is recommended to be underlain by a minimum 4-inch-thick aggregate base course. It is recommended that concrete pavement have load-transfer reinforcement, where appropriate. Control-joint spacing should be determined in accordance with the current ACI code. Expansion joints should be provided where pavement abuts fixed objects, such as the building and light poles. The 28-day compressive strength of concrete is recommended to be at least 4,000 psi, and the concrete should be properly air-entrained for durability. It is recommended and assumed that a civil engineer will provide specific recommendations for concrete pavement, including reinforcing details and control-joint spacing. Materials and construction procedures for concrete pavement and the aggregate base are recommended to be in accordance with Wisconsin DOT specifications.

7.4. Preliminary Stormwater Infiltration Screening

A stormwater management area is planned to be constructed in the area of Test Boring 7. Additional details regarding the proposed management device were unknown at the time of this report, therefore, it is assumed that the bottom of the proposed device will be several feet below the existing ground surface. Considering the silty clay loam and clay loam soils that were encountered at Test Boring 7, the proposed site stormwater area is considered **unsuitable** for infiltration of stormwater through the use of an infiltration device. The proposed stormwater area is considered by Giles to be exempt from stormwater infiltration requirements per section NR 151.12(5)(c)6.a of the Wisconsin Administrative Code and WDNR 1002 guidelines.

7.5. Generalized Construction Considerations

Adverse Weather

Site soil is sensitive to moisture and will likely become unstable when exposed to adverse weather, such as rain, snow, and freezing temperatures. The upper 6 to 12 inches (or more) of soil might need to be replaced or stabilized due to adverse weather, which commonly occurs during late fall, winter, and early spring. At least some over-excavation or stabilization of unstable soil should be expected if construction is during or after adverse weather. Because site preparation is weather-dependent, bids for site preparation and other earthwork activities should consider the time of year that construction will be conducted.

To protect soil from adverse weather, the site is recommended to be smoothly graded and contoured to divert surface water away from construction areas. Contoured subgrades are recommended to be rolled with a smooth-drum compactor before precipitation to “seal” the surface. Furthermore, construction traffic should be restricted to certain areas to control traffic-

related soil disturbance. Foundation and floor slab construction should begin immediately after suitable support is confirmed.

Removal and Stripping

Pavement, surface vegetation, trees and bushes (including root-balls), topsoil, and other unsuitable materials are recommended to be removed from the proposed development area. Stripping should extend at least several feet beyond the development area, where feasible.

Dewatering

Filtered sump pumps, drawing water from sump pits excavated in the bottom of construction trenches, are expected to be adequate to remove water that collects in shallow excavations. Excavated sump pits should be lined with geotextile and filled with open-graded, free-draining aggregate, such as crushed stone that meets the gradation requirements of ASTM No. 57 aggregate. It is recommended that a geotechnical engineer monitor and approve dewatering.

Excavation Stability

Excavations are recommended to be made in accordance with current OSHA excavation and trench safety standards and other applicable safety requirements. Sides of excavations might need to be sloped, benched, or braced to develop and maintain a safe work environment. Temporary shoring must be designed according to applicable regulatory requirements. Contractors are responsible for excavation safety. Excavations will be susceptible to caving, especially excavations within granular soil.

Existing Utilities

All existing utilities are recommended to be identified and located, and any planned to be maintained should be relocated outside the proposed building and foundation areas. Utilities that are not reused should be capped-off and removed in accordance with local codes and ordinances. Excavations for the removal of utilities are recommended to be backfilled with engineered fill placed under engineering-controlled conditions. Grading operations must be done carefully so that existing utilities are not damaged or disturbed. Utility elevations, locations, and types should be checked relative to the planned construction to identify any concerns.

7.6. Recommended Construction Materials Testing Services

This report was prepared assuming that a geotechnical engineer will perform Construction Materials Testing (“CMT”) services during construction of the proposed improvements. It might be necessary for Giles to provide supplemental geotechnical recommendations based on the results of CMT services and specific details of the project not known at this time.

8.0 BASIS OF REPORT

This report is strictly based on the project description given in Section 2.0. Giles must be notified if the project description or our assumptions are not accurate so that this report can be amended, if needed. This report assumes that the improvements will be designed and constructed according to the codes that govern construction at the site.

The conclusions and recommendations in this report are based on the estimated subsurface conditions shown on the *Test Boring Logs*. Giles must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Test Boring Logs*; this report might need to be revised. General comments and limitations of this report are given in the appendix.

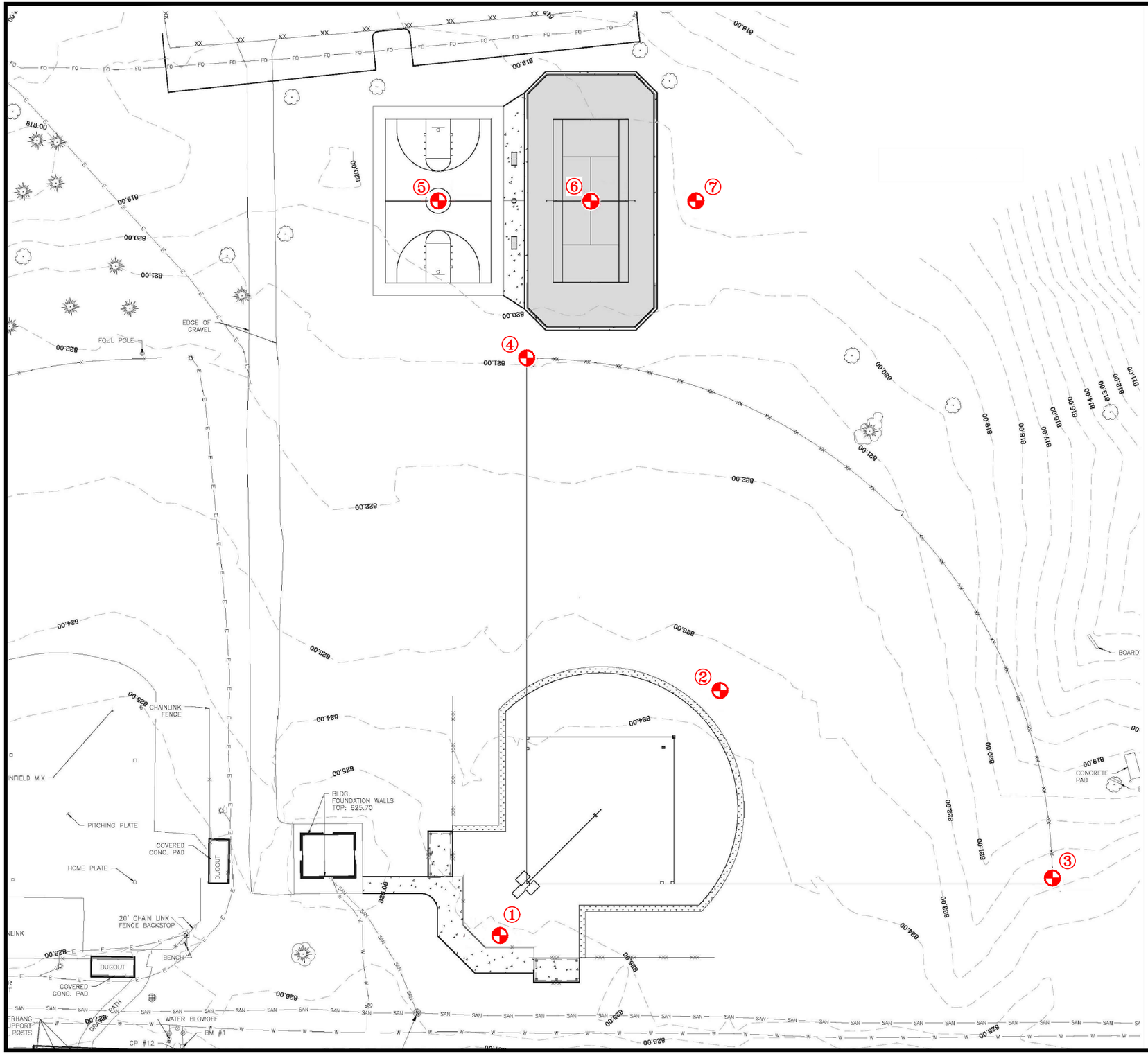
The conclusions and recommendations in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

APPENDIX A

FIGURES AND TEST BORING LOGS

The Test Boring Location Plan contained herein was prepared based upon information supplied by *Giles'* client, or others, along with *Giles'* field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.



NOTES:

1.) TEST BORING LOCATIONS ARE APPROXIMATE.

2.) BASE MAP IS DEVELOPED FROM THE "SOIL BORING LAYOUT MAP", UNDATED, PREPARED BY RETTLER CORP.

N

W E

S

0 25' 50'

APPROXIMATE SCALE

LEGEND:

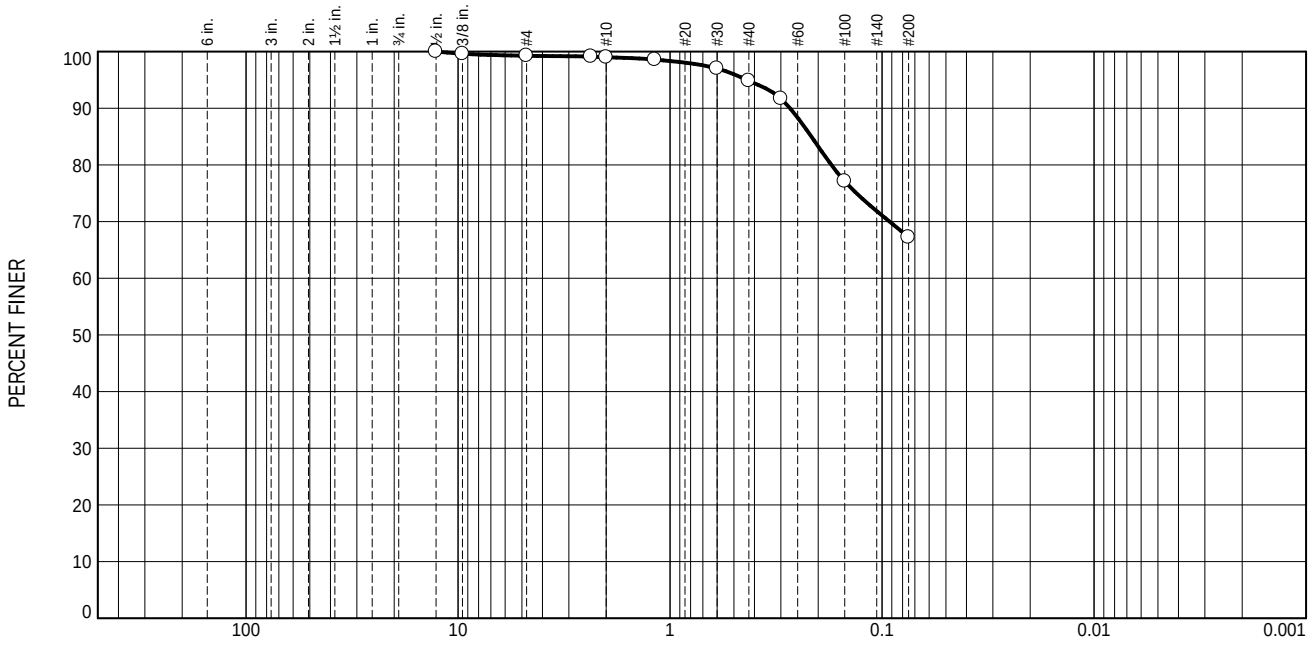
① GEOTECHNICAL TEST BORING

GILES ENGINEERING ASSOCIATES, INC.
N8 W22350 JOHNSON DRIVE, SUITE A1
WAUKESHA, WI 53186 (262)544-0118
www.gilesengr.com

FIGURE 1
TEST BORING LOCATION PLAN
PROPOSED PLAMANN PARK REDEVELOPMENT
1375 E. BROADWAY DR.
APPLETON, WISCONSIN

DESIGNED	DRAWN	SCALE	DATE	REVISED
ERA	Jdid	approx. 1"=50'	01-02-24	--
PROJECT NO.: 1G-2312007			CAD No.	1g2312007-blp

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.7	0.3	4.2	27.6	67.2

Test Results (ASTM D6913)			
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)
1/2	100.0		
3/8	99.6		
#4	99.3		
#8	99.1		
#10	99.0		
#16	98.6		
#30	97.0		
#40	94.8		
#50	91.7		
#100	77.1		
#200	67.2		

* (no specification provided)

Source of Sample: Boring No. 1 Depth: 0
Sample Number: 1-BS

Material Description
Topsoil: Dark brown Sandy Clay

Sieve Test (ASTM D6913)

Test Date: 1/10/24 Technician: Sean Clarke

Test Notes

Hydrometer Test

Test Date: _____ Technician: _____

Test Notes

Atterberg (ASTM D4318)

PL= LL= PI=

Coefficients

D_{90}= 0.2715 D_{85}= 0.2155
D_{60}= D_{50}=
D_{30}= D_{15}=
D_{10}=
C_u= C_c=

USCS (ASTM D2487)

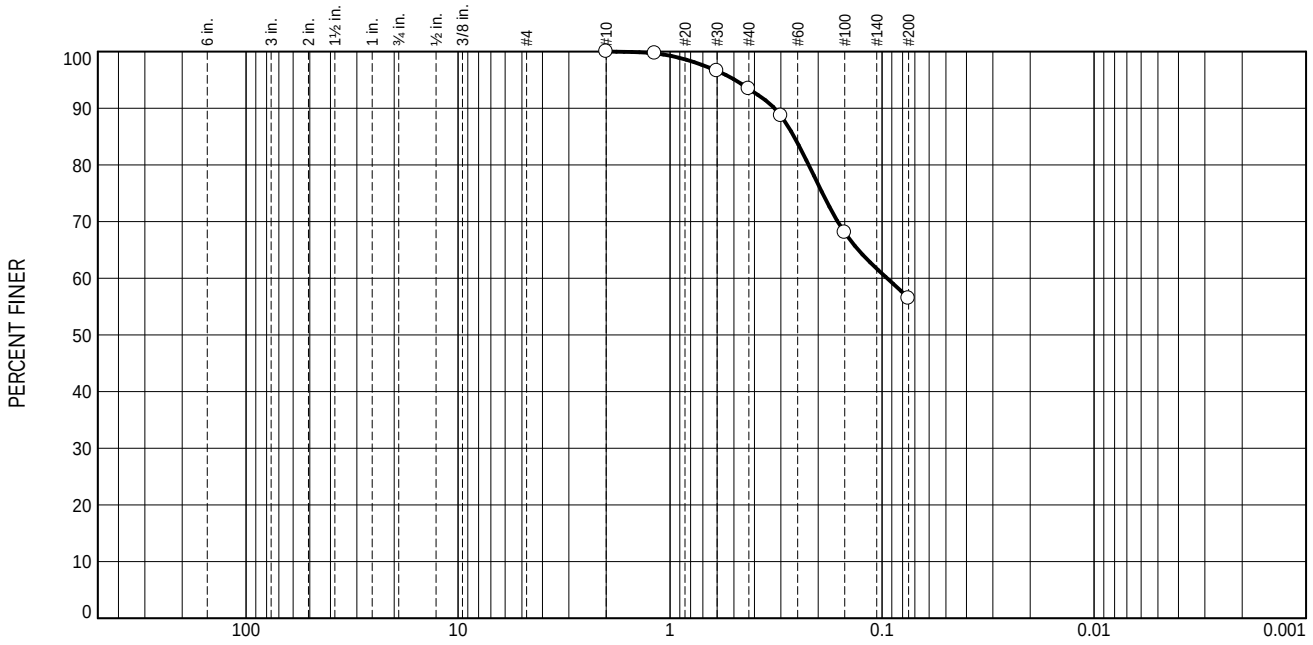
Date Sampled: _____
Date Received: _____
Checked By: _____
Title: _____

GILES
ENGINEERING ASSOC., INC.
Waukesha, Wisconsin

Client: Outagamie County Parks System
Project: Proposed Plamann Park Redevelopment, Appleton, WI

Project No: 1G-2312007 Figure 2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.0	0.0	6.6	37.0	56.4

Test Results (ASTM D6913)			
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)
#10	100.0		
#16	99.7		
#30	96.6		
#40	93.4		
#50	88.7		
#100	68.1		
#200	56.4		

* (no specification provided)

Source of Sample: Boring No. 3 Depth: 0
Sample Number: 1-BS

Material Description
Topsoil: Dark brown Sandy Clay

Atterberg (ASTM D4318)
PL= LL= PI=

Coefficients
D_{90}= 0.3216 D_{85}= 0.2601
D_{60}= 0.0946 D_{50}=
D_{30}= D_{15}=
D_{10}=
C_u= C_c=

Sieve Test (ASTM D6913)

Test Date: 1/10/24 Technician: Sean Clarke

Test Notes

Hydrometer Test

Test Date: _____ Technician: _____

Test Notes

USCS (ASTM D2487)

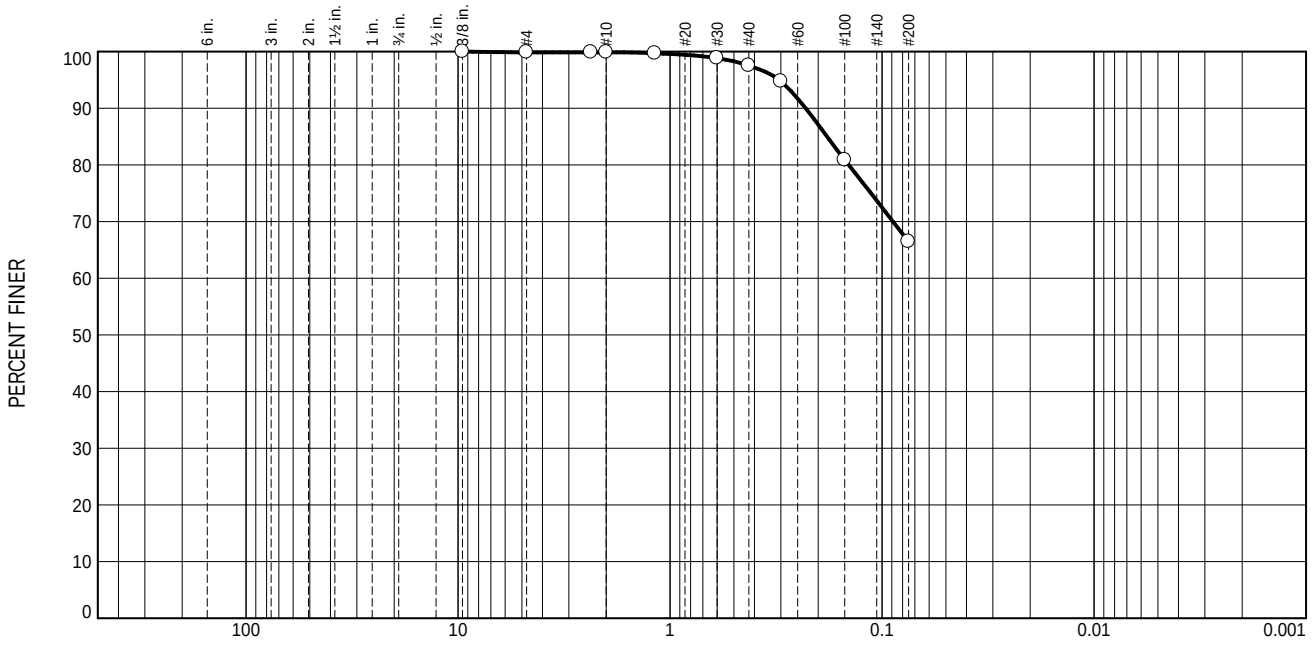
Date Sampled: _____
Date Received: _____
Checked By: _____
Title: _____

GILES
ENGINEERING ASSOC., INC.
Waukesha, Wisconsin

Client: Outagamie County Parks System
Project: Proposed Plamann Park Redevelopment, Appleton, WI

Project No: 1G-2312007 Figure 3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	0.1	0.0	2.4	31.0	66.5

Test Results (ASTM D6913)			
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)
3/8	100.0		
#4	99.9		
#8	99.9		
#10	99.9		
#16	99.7		
#30	98.8		
#40	97.5		
#50	94.7		
#100	80.9		
#200	66.5		

* (no specification provided)

Source of Sample: Boring No. 4 Depth: 0
Sample Number: 1-BS

Material Description
Topsoil: Dark brown Sandy Clay

Sieve Test (ASTM D6913)

Test Date: 1/10/24 Technician: Sean Clarke

Test Notes

Hydrometer Test

Test Date: _____ Technician: _____

Test Notes

Atterberg (ASTM D4318)

PL= LL= PI=

Coefficients

D_{90}= 0.2293 D_{85}= 0.1818
D_{60}= D_{50}=
D_{30}= D_{15}=
D_{10}=
C_u= C_c=

USCS (ASTM D2487)

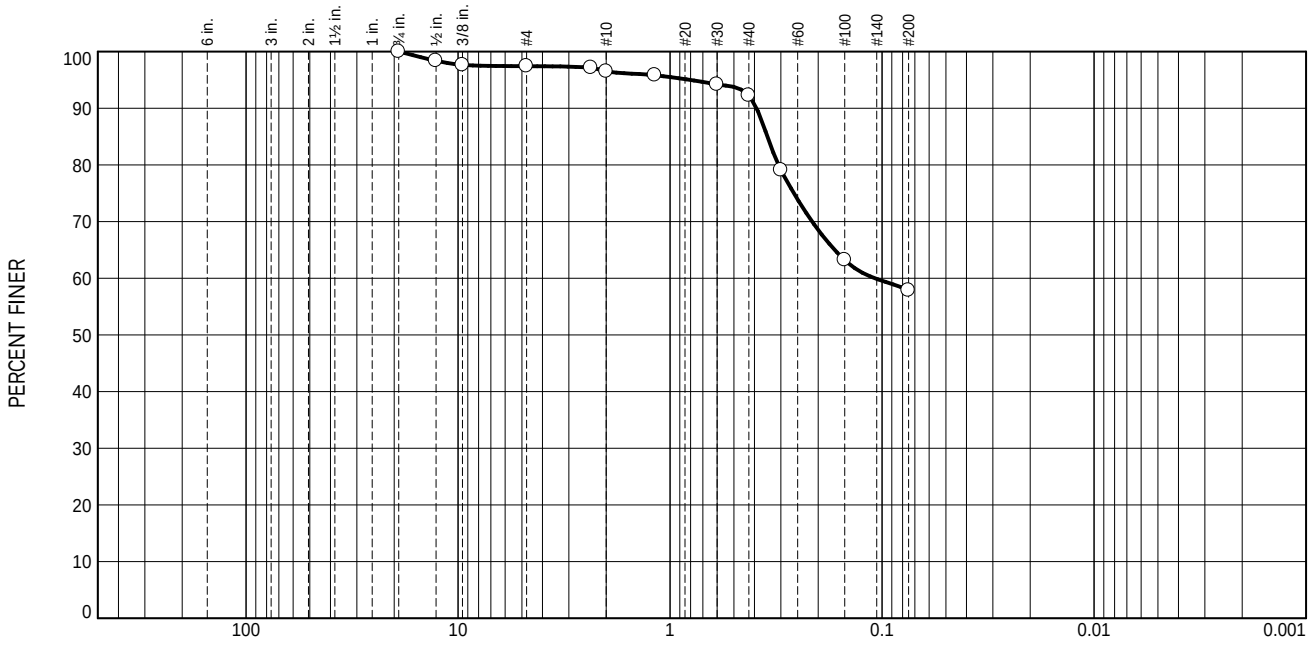
Date Sampled: _____
Date Received: _____
Checked By: _____
Title: _____

GILES
ENGINEERING ASSOC., INC.
Waukesha, Wisconsin

Client: Outagamie County Parks System
Project: Proposed Plamann Park Redevelopment, Appleton, WI

Project No: 1G-2312007 Figure 4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	2.6	0.9	4.2	34.4	57.9

Test Results (ASTM D6913)			
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)
3/4	100.0		
1/2	98.4		
3/8	97.6		
#4	97.4		
#8	97.2		
#10	96.5		
#16	95.8		
#30	94.2		
#40	92.3		
#50	79.1		
#100	63.2		
#200	57.9		

* (no specification provided)

Source of Sample: Boring No. 5 Depth: 0
Sample Number: 1-BS

Material Description
Topsoil: Dark brown Sandy Clay

Sieve Test (ASTM D6913)

Test Date: 1/10/24 Technician: Sean Clarke

Test Notes

Hydrometer Test

Test Date: _____ Technician: _____

Test Notes

Atterberg (ASTM D4318)

PL= LL= PI=

Coefficients

D_{90}= 0.3908 D_{85}= 0.3473
D_{60}= 0.1083 D_{50}=
D_{30}= D_{15}=
D_{10}=
C_u= C_c=

USCS (ASTM D2487)

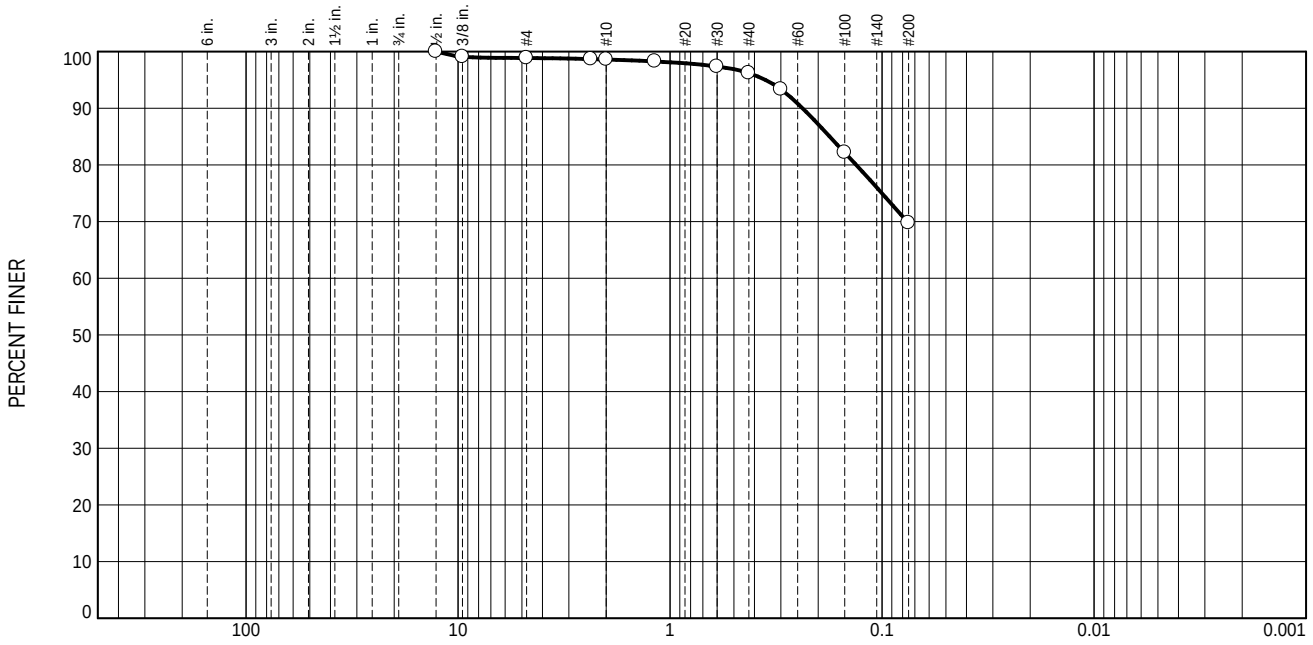
Date Sampled: _____
Date Received: _____
Checked By: _____
Title: _____

GILES
ENGINEERING ASSOC., INC.
Waukesha, Wisconsin

Client: Outagamie County Parks System
Project: Proposed Plamann Park Redevelopment, Appleton, WI

Project No: 1G-2312007 Figure 5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0	1.1	0.3	2.4	26.4	69.8

Test Results (ASTM D6913)			
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)
1/2	100.0		
3/8	99.1		
#4	98.9		
#8	98.7		
#10	98.6		
#16	98.3		
#30	97.4		
#40	96.2		
#50	93.3		
#100	82.2		
#200	69.8		

* (no specification provided)

Source of Sample: Boring No. 6 Depth: 0
Sample Number: 1-BS

Material Description
Topsoil: Dark brown Sandy Clay

Atterberg (ASTM D4318)
PL= LL= PI=

Coefficients
D_{90}= 0.2371 D_{85}= 0.1766
D_{60}= D_{50}=
D_{30}= D_{15}=
D_{10}=
C_u= C_c=

Sieve Test (ASTM D6913)
Test Date: 1/10/24 Technician: Sean Clarke
Test Notes

Hydrometer Test
Test Date: _____ Technician: _____
Test Notes

USCS (ASTM D2487)

Date Sampled: _____
Date Received: _____
Checked By: _____
Title: _____

GILES
ENGINEERING ASSOC., INC.
Waukesha, Wisconsin

Client: Outagamie County Parks System
Project: Proposed Plamann Park Redevelopment, Appleton, WI
Project No: 1G-2312007 Figure 6

BORING NO. & LOCATION: 1	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 825.1 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±12" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	5						
Fill: Brown Sandy Silt-Moist										
Brown Silty Clay, trace Sand-Moist			2-SS	12		3.5		15		
	5	820	3-SS	17		4.5+		16		
			4-SS	20	3.2	4.0		15		
Gray lean Clay-Moist	10	815	5-SS	27		1.75		16		
Gray Sandy Silt-Moist			6-SS	41						
	15	810	7-SS	24						
Boring Terminated at about 16 feet (EL. 809.1')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 2	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 823.5 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±3" Root Material										
±5" Crushed Limestone Base Course			1-SS	10		4.5		16		
Fill: Dark Brown Silty Clay-Moist										
Brown lean Clay, trace Gravel-Moist			2-SS	13	1.5	2.0		20		
		820								
	5		3-SS	13	1.7	2.0		21		
			4-SS	14	1.5	1.5		19		
		815								
	10		5-SS	18	3.3	3.3		18		
Boring Terminated at about 11 feet (EL. 812.5')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 3	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 822.8 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±13" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	4						
Dark Brown lean Clay-Moist										
Brown Silty Clay, trace Sand and Gravel-Very Moist		820	2-SS	5		1.3		23		
Brown Sandy Silt, trace Gravel-Very Moist	▽ 5		3-SS	7		1.5		23		
		815	4-SS	14	0.4	0.8		20		
	10		5-SS	17		1.8		17		
Brown lean Clay, trace Sand-Moist		810	6-SS	48						
Gray Sandy Silt-Moist	15		7-SS	28						
Boring Terminated at about 16 feet (EL. 806.8')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling: 5 ft.	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 4	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 820.9 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±14" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist		820	1-SS	4		1.5		21		
Brown Sandy Silt-Moist to Very Moist at 5 feet			2-SS	16		1.0		17		
	▽ 5		3-SS	16		0.8		20		
		815	4-SS	34		1.0		21		
Gray Silt-Moist	10		5-SS	20	1.0	1.0		19		
		810								
Gray Silty Clay, trace Gravel-Moist	15		6-SS	14		2.0		14		
		805								
Boring Terminated at about 16 feet (EL. 804.9')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling: 5 ft.	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 5	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 819.6 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±13" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	4		2.0		20		
Brown lean Clay-Moist			2-SS	6	2.6	3.3		17		
Brown lean Clay, trace Sand-Moist	5	815	3-SS	10		2.5		19		
			4-SS	17	3.5	2.3		19		
Gray lean Clay-Moist	10	810	5-SS	11	1.0	1.0		19		
	15	805	6-SS	12	1.6	1.5		19		
Boring Terminated at about 16 feet (EL. 803.6')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 6	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 819.5 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±6" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	4		2.0		18		
Brown lean Clay, trace Sand-Moist										
Brown Sandy Clay, trace Gravel-Moist			2-SS	14	3.1	3.5		17		
Brown lean Clay, trace Gravel-Moist	5	815	3-SS	17		4.5+		16		
			4-SS	11						
Gray lean Clay, trace Gravel-Moist to Very Moist at 13 feet	10	810	5-SS	13						
	15	805	6-SS	10						
Boring Terminated at about 16 feet (EL. 803.5')										

Water Observation Data	Remarks:
Water Encountered During Drilling:	
Water Level At End of Drilling:	
Cave Depth At End of Drilling:	
Water Level After Drilling:	
Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

BORING NO. & LOCATION: 7	TEST BORING LOG	GILES ENGINEERING ASSOCIATES, INC.
SURFACE ELEVATION: 818.8 feet	PROPOSED PLAMANN PARK REDEVELOPMENT	
COMPLETION DATE: 12/27/23	1375 EAST BROADWAY DRIVE APPLETON, WISCONSIN	
FIELD REP: KEITH FLOWERS	PROJECT NO: 1G-2312007	

MATERIAL DESCRIPTION	Depth (ft)	Elevation	Sample No. & Type	N	Q_u (tsf)	Q_p (tsf)	Q_s (tsf)	W (%)	PID	NOTES
±8" Topsoil: Dark Brown Sandy Clay, little Organic Matter-Moist			1-SS	5						
Brown lean Clay, trace Sand and Gravel-Moist			2-SS	9		4.0		20		
		815								
	5		3-SS	10		3.8		21		
			4-SS	10		2.0		19		
		810								
Brown Silty Clay, trace Gravel-Moist	10		5-SS	8		3.0		17		
Brown lean Clay-Moist			6-SS	17		2.0		18		
		805								
Gray lean Clay-Moist to Very Moist at 19 feet	15		7-SS	12		2.0		18		
			8-SS	8		1.0		21		
		800								
	20		9-SS	9						
Boring Terminated at about 21 feet (EL. 797.8')										

	Water Observation Data	Remarks:
▽	Water Encountered During Drilling:	
▼	Water Level At End of Drilling:	
	Cave Depth At End of Drilling:	
▼	Water Level After Drilling:	
	Cave Depth After Drilling:	

GILES LOG REPORT 1G2312007.GPJ GILES.GDT 1/15/24

Changes in strata indicated by the lines are approximate boundary between soil types. The actual transition may be gradual and may vary considerably between test borings. Location of test boring is shown on the Boring Location Plan.

1002-CPS-23
Division of Industry Services
P. O. Box 2658
Madison, Wisconsin 53701

Attachment 2:

SOIL AND SITE EVALUATION – STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

Attach a complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM referenced to nearest road

Please print all information

Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]

County: Outagamie

Parcel I.D.:

Reviewed by:
Date:

Property Owner	Property Location
Outagamie County	NE ¼ NW ¼ S1 T21N R17E Govt. Lot

Property Owner' Mail Address	Lot #	Block #	Subd. Name or CSM #
320S. Walnut St.			

City	State	Zip Code	Phone Number	x City	Village	Town	Nearest Road
Appleton	WI	54611		Appleton			Broadway Dr.

Drainage area sq. ft. acres

Test site suitable for (check all that apply) [ ] Site not suitable:

[ ] Bioretention [ ] Subsurface Dispersal System:

[ ] Reuse: [ ] Irrigation: [ ] Other:

Hydraulic Application Test Method

- [x] Morphological Evaluation
- [ ] Double Ring Infiltrometer
- [ ] Other: (specify)

Soil Moisture
Date of soil borings:
USDA-NRCS WETS Value:

- [ ] Dry = 1;
- [ ] Normal = 2;
- [ ] Wet = 3

7 #OBS. [ ] Pit [x] Boring Ground surface elevation 818.8 ft. Elevation of limiting factor _____ ft.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate inches/Hr
A	0-8	10 YR 3/3		CL	1,VF,ABK	M, Fr	A,S	<5	65	0.03
B	8-108	10 YR 4/5		SiCL	1,F,SBK	M, Fi	C,W	10	85	0.04
B	108-138	10 YR 4/5		CL	1,F,SBK	M, Fi	C,W	10	75	0.03
B	138-168	10 YR 4/5		SiCL	MA	M, Fi	G,W	<5	85	0.04
C	168-252	10 YR 6/1		SiCL	MA	M, Fi	--	<5	85	0.04

Comments:

Name (Please Print)	Signature	Credential Number
Kevin T. Bugel, P.G.		P.G. No.: 178-13
Address	**Date Evaluation Conducted**	**Telephone Number**
N8 W22350 Johnson Drive, Waukesha, WI	December 27, 2023	262-544-0118

Soil Test Report - Field: SB-1

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

Account: 541
Giles Engineering Association, Inc.
N8 W22350 Johnson Drive
Waukesha, WI 53186

Report For:
Plamann Park

1375 East Broadway Drive
Appleton, WI 54913

Lab #281722
County
Received 1/3/2024
Field SB-1

Acres
Plow Depth 7.0
Soil Name Kewaunee
Previous Crop

Nutrient Recommendations (lbs/acre)

Cropping Sequence	Yield Goal (per acre)	Crop Nutrient Need			Legume N Credit	Apply		
		N	P2O5	K2O		N	P2O5	K2O
Corn, grain	170	165	100	90	0	165	100	90
Soybean, grain	60	0	90	130	0	0	90	130
Alfalfa, seeding	3.5	0	80	235	0	0	80	235
Alfalfa, established	6	0	120	415	0	0	120	415

There is no lime recommendation

Laboratory Analysis for Field SB-1, Lab No 281722

Sample Num	Soil pH	Om %	P ppm	K ppm	60-69 Lime Req(T/a)	Ca ppm	Mg ppm	Est Cec	B ppm	Mn ppm	Zn ppm	Sulfate-S ppm	Sample Density	Buffer Code
1	7.2	4.8	9	73		2815	458	21					1.01	N.R.

Sample Num	Cu ppm	Fe ppm	Al ppm	Salt mmhos /cm	Na ppm	NO3 ppm	NH4 ppm	Olsen P ppm
1						23.50	14.80	

Base Saturation

Est CEC	Ca %	Mg %	K %
21	78.1	20.8	1.0

Test Interpretation for Field SB-1, Lab No 281722

Crop Name	Very Low	Low	Optimum	High	Very High	Excessive	Very Low	Low	Optimum	High	Very High	Excessive
Alfalfa, seeding	P						K					

Additional Information, Secondary & Micronutrient Recommendations

All:At least one map unit for the soil has a different interpretation for soil group and/or soil yield potential. The interpretations presented are based on the interpretation of the majority of the map units. For more detailed information about individual map units see: SnapPlus nutrient management software or https://snapplus.wisc.edu/planning/soil-details/.
All:If a legume crop preceeds the first crop listed on the sample submission form, N credits should be subtracted from the N recommendation for the first crop listed. See Chapter 9 in UWEX Publication A2809 for more details.
All:If manure, biosolids, septage or other waste materials have been applied to this field, be sure to take nutrient credits and adjust fertilizer rate. See Chapter 9 in UWEX Publication A2809 for more details.
All:No crops were provided, a default rotation with nutrient application rate guidelines is provided.
All:Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.
All:Buffer pH not required for calculation of lime requirement when soil pH is 6.6 or higher.
Corn:Nitrogen application rates for grain and silage corn reflect the maximum return to N (MRTN) at a 0.10 N:corn price ratio (eg. $0.30/lb N and $3.00/bu; or $0.40/lb N and $4.00/bu) and the range of rates that produce profitability within $1/a of the MRTN rate. N application rates can be adjusted to reflect different prices for N and grain. See Chapter 6 in UWEX Publication A2809 for more details.
Corn:Starter fertilizer may accelerate early season corn development, which may not always translate into increased yield. Corn will benefit more from a complete starter fertilizer (e.g. 10+20+20 lbs N+P2O5+K2O/a) when grown on soils testing optimum or less in P and K.
Corn, grain:If corn is harvested for silage instead of grain add extra 30 lbs P2O5 per acre and 90 lbs K2O per acre to next crop.
Alfalfa:If alfalfa will be maintained for more than three years, increase recommended K2O by 20% each year.
All:Ca test average value of 2815.257 is in High category.
All:Mg test average value of 457.959 is in Optimum category.

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

Account: 541
Giles Engineering Association, Inc.
N8 W22350 Johnson Drive
Waukesha, WI 53186

Report For:
Plamann Park

1375 East Broadway Drive
Appleton, WI 54913

Lab #281722
County
Received 1/3/2024
Field SB-3
Acres
Plow Depth 7.0
Soil Name Kewaunee
Previous Crop

Nutrient Recommendations (lbs/acre)

Cropping Sequence	Yield Goal (per acre)	Crop Nutrient Need N	Crop Nutrient Need P2O5	Crop Nutrient Need K2O	Legume N Credit	Apply N	Apply P2O5	Apply K2O
Corn, grain	170	165	100	75	0	165	100	75
Soybean, grain	60	0	90	115	0	0	90	115
Alfalfa, seeding	3.5	0	80	220	0	0	80	220
Alfalfa, established	6	0	120	400	0	0	120	400

The lime required for this rotation to reach pH 6.8 is 4 T/a of 60-69 lime or 3 T/a of 80-89 lime.

Laboratory Analysis for Field SB-3, Lab No 281722

Sample Num	Soil pH	Om %	P ppm	K ppm	60-69 Lime Req(T/a)	Ca ppm	Mg ppm	Est Cec	B ppm	Mn ppm	Zn ppm	Sulfate-S ppm	Sample Density	Buffer Code
3	6.1	6.3	9	104	4.0	2314	418	19					0.95	6.8

Sample Num	Cu ppm	Fe ppm	Al ppm	Salt mmhos /cm	Na ppm	NO3 ppm	NH4 ppm	Olsen P ppm
3						7.76	14.61	

Base Saturation

Est CEC	Ca %	Mg %	K %
19	75.8	22.4	1.7

Test Interpretation for Field SB-3, Lab No 281722

Crop Name	Very Low	Low	Optimum	High	Very High	Excessive	Very Low	Low	Optimum	High	Very High	Excessive
Alfalfa, seeding	P						K					

Additional Information, Secondary & Micronutrient Recommendations

All:At least one map unit for the soil has a different interpretation for soil group and/or soil yield potential. The interpretations presented are based on the interpretation of the majority of the map units. For more detailed information about individual map units see: SnapPlus nutrient management software or https://snapplus.wisc.edu/planning/soil-details/.
All:If a legume crop preceeds the first crop listed on the sample submission form, N credits should be subtracted from the N recommendation for the first crop listed. See Chapter 9 in UWEX Publication A2809 for more details.
All:If manure, biosolids, septage or other waste materials have been applied to this field, be sure to take nutrient credits and adjust fertilizer rate. See Chapter 9 in UWEX Publication A2809 for more details.
All:No crops were provided, a default rotation with nutrient application rate guidelines is provided.
All:Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.
All:If lime has been applied in the last two years, more lime may not be needed due to incomplete reaction.
Corn:Nitrogen application rates for grain and silage corn reflect the maximum return to N (MRTN) at a 0.10 N:corn price ratio (eg. $0.30/lb N and $3.00/bu; or $0.40/lb N and $4.00/bu) and the range of rates that produce profitability within $1/a of the MRTN rate. N application rates can be adjusted to reflect different prices for N and grain. See Chapter 6 in UWEX Publication A2809 for more details.
Corn:Starter fertilizer may accelerate early season corn development, which may not always translate into increased yield. Corn will benefit more from a complete starter fertilizer (e.g. 10+20+20 lbs N+P2O5+K2O/a) when grown on soils testing optimum or less in P and K.
Corn, grain:If corn is harvested for silage instead of grain add extra 30 lbs P2O5 per acre and 90 lbs K2O per acre to next crop.
Alfalfa:If alfalfa will be maintained for more than three years, increase recommended K2O by 20% each year.
All:Ca test average value of 2314.094 is in High category.
All:Mg test average value of 417.813 is in Optimum category.

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

Account: 541
Giles Engineering Association, Inc.
N8 W22350 Johnson Drive
Waukesha, WI 53186

Report For:
Plamann Park

1375 East Broadway Drive
Appleton, WI 54913

Lab #281722
County
Received 1/3/2024
Field SB-4

Acres
Plow Depth 7.0
Soil Name Kewaunee
Previous Crop

Cropping Sequence	Yield Goal (per acre)	Nutrient Recommendations (lbs/acre)						
		Crop Nutrient Need			Legume N Credit	Apply		
		N	P2O5	K2O		N	P2O5	K2O
Corn, grain	170	165	100	90	0	165	100	90
Soybean, grain	60	0	90	130	0	0	90	130
Alfalfa, seeding	3.5	0	80	235	0	0	80	235
Alfalfa, established	6	0	120	415	0	0	120	415

There is no lime recommendation

Laboratory Analysis for Field SB-4, Lab No 281722

Sample Num	Soil pH	Om %	P ppm	K ppm	60-69 Lime Req(T/a)	Ca ppm	Mg ppm	Est Cec	B ppm	Mn ppm	Zn ppm	Sulfate-S ppm	Sample Density	Buffer Code
4	7.4	3.4	7	45		2469	436	18					1.07	N.R.

Sample Num	Cu ppm	Fe ppm	Al ppm	Salt mmhos /cm	Na ppm	NO3 ppm	NH4 ppm	Olsen P ppm
4						3.37	15.19	

Base Saturation

Est CEC	Ca %	Mg %	K %
18	77.0	22.3	0.7

Test Interpretation for Field SB-4, Lab No 281722

Crop Name	Very Low	Low	Optimum	High	Very High	Excessive	Very Low	Low	Optimum	High	Very High	Excessive
Alfalfa, seeding	P						K					

Additional Information, Secondary & Micronutrient Recommendations

All:At least one map unit for the soil has a different interpretation for soil group and/or soil yield potential. The interpretations presented are based on the interpretation of the majority of the map units. For more detailed information about individual map units see: SnapPlus nutrient management software or https://snapplus.wisc.edu/planning/soil-details/.
All:If a legume crop preceeds the first crop listed on the sample submission form, N credits should be subtracted from the N recommendation for the first crop listed. See Chapter 9 in UWEX Publication A2809 for more details.
All:If manure, biosolids, septage or other waste materials have been applied to this field, be sure to take nutrient credits and adjust fertilizer rate. See Chapter 9 in UWEX Publication A2809 for more details.
All:No crops were provided, a default rotation with nutrient application rate guidelines is provided.
All:Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.
All:Buffer pH not required for calculation of lime requirement when soil pH is 6.6 or higher.
Corn:Nitrogen application rates for grain and silage corn reflect the maximum return to N (MRTN) at a 0.10 N:corn price ratio (eg. $0.30/lb N and $3.00/bu; or $0.40/lb N and $4.00/bu) and the range of rates that produce profitability within $1/a of the MRTN rate. N application rates can be adjusted to reflect different prices for N and grain. See Chapter 6 in UWEX Publication A2809 for more details.
Corn:Starter fertilizer may accelerate early season corn development, which may not always translate into increased yield. Corn will benefit more from a complete starter fertilizer (e.g. 10+20+20 lbs N+P2O5+K2O/a) when grown on soils testing optimum or less in P and K.
Corn, grain:If corn is harvested for silage instead of grain add extra 30 lbs P2O5 per acre and 90 lbs K2O per acre to next crop.
Alfalfa:If alfalfa will be maintained for more than three years, increase recommended K2O by 20% each year.
All:Ca test average value of 2469.158 is in High category.
All:Mg test average value of 436.486 is in Optimum category.

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

Account: 541
Giles Engineering Association, Inc.
N8 W22350 Johnson Drive
Waukesha, WI 53186

Report For:
Plamann Park

1375 East Broadway Drive
Appleton, WI 54913

Lab #281722
County
Received 1/3/2024
Field SB-5
Acres
Plow Depth 7.0
Soil Name Kewaunee
Previous Crop

Cropping Sequence	Yield Goal (per acre)	Nutrient Recommendations (lbs/acre)						
		Crop Nutrient Need			Legume N Credit	Apply		
		N	P2O5	K2O		N	P2O5	K2O
Corn, grain	170	165	100	90	0	165	100	90
Soybean, grain	60	0	90	130	0	0	90	130
Alfalfa, seeding	3.5	0	80	235	0	0	80	235
Alfalfa, established	6	0	120	415	0	0	120	415

There is no lime recommendation

Laboratory Analysis for Field SB-5, Lab No 281722

Sample Num	Soil pH	Om %	P ppm	K ppm	60-69 Lime Req(T/a)	Ca ppm	Mg ppm	Est Cec	B ppm	Mn ppm	Zn ppm	Sulfate-S ppm	Sample Density	Buffer Code
5	7.3	3.3	6	34		2325	412	17					1.05	N.R.

Sample Num	Cu ppm	Fe ppm	Al ppm	Salt mmhos /cm	Na ppm	NO3 ppm	NH4 ppm	Olsen P ppm
5						2.75	14.90	

Base Saturation			
Est CEC	Ca %	Mg %	K %
17	77.0	22.4	0.6

Test Interpretation for Field SB-5, Lab No 281722

Crop Name	Very Low	Low	Optimum	High	Very High	Excessive	Very Low	Low	Optimum	High	Very High	Excessive
Alfalfa, seeding	P						K					

Additional Information, Secondary & Micronutrient Recommendations

All:At least one map unit for the soil has a different interpretation for soil group and/or soil yield potential. The interpretations presented are based on the interpretation of the majority of the map units. For more detailed information about individual map units see: SnapPlus nutrient management software or https://snapplus.wisc.edu/planning/soil-details/.
All:If a legume crop preceeds the first crop listed on the sample submission form, N credits should be subtracted from the N recommendation for the first crop listed. See Chapter 9 in UWEX Publication A2809 for more details.
All:If manure, biosolids, septage or other waste materials have been applied to this field, be sure to take nutrient credits and adjust fertilizer rate. See Chapter 9 in UWEX Publication A2809 for more details.
All:No crops were provided, a default rotation with nutrient application rate guidelines is provided.
All:Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.
All:Buffer pH not required for calculation of lime requirement when soil pH is 6.6 or higher.
Corn:Nitrogen application rates for grain and silage corn reflect the maximum return to N (MRTN) at a 0.10 N:corn price ratio (eg. $0.30/lb N and $3.00/bu; or $0.40/lb N and $4.00/bu) and the range of rates that produce profitability within $1/a of the MRTN rate. N application rates can be adjusted to reflect different prices for N and grain. See Chapter 6 in UWEX Publication A2809 for more details.
Corn:Starter fertilizer may accelerate early season corn development, which may not always translate into increased yield. Corn will benefit more from a complete starter fertilizer (e.g. 10+20+20 lbs N+P2O5+K2O/a) when grown on soils testing optimum or less in P and K.
Corn, grain:If corn is harvested for silage instead of grain add extra 30 lbs P2O5 per acre and 90 lbs K2O per acre to next crop.
Alfalfa:If alfalfa will be maintained for more than three years, increase recommended K2O by 20% each year.
All:Ca test average value of 2324.897 is in High category.
All:Mg test average value of 412.43 is in Optimum category.

Soil Test Report - Field: SB-6

ROCK RIVER LABORATORY, INC.
AGRICULTURAL ANALYSIS

Account: 541
Giles Engineering Association, Inc.
N8 W22350 Johnson Drive
Waukesha, WI 53186

Report For:
Plamann Park

1375 East Broadway Drive
Appleton, WI 54913

Lab #281722
County
Received 1/3/2024
Field SB-6
Acres
Plow Depth 7.0
Soil Name Kewaunee
Previous Crop

Nutrient Recommendations (lbs/acre)

Cropping Sequence	Yield Goal (per acre)	Crop Nutrient Need			Legume N Credit	Apply		
		N	P2O5	K2O		N	P2O5	K2O
Corn, grain	170	165	100	90	0	165	100	90
Soybean, grain	60	0	90	130	0	0	90	130
Alfalfa, seeding	3.5	0	80	235	0	0	80	235
Alfalfa, established	6	0	120	415	0	0	120	415

There is no lime recommendation

Laboratory Analysis for Field SB-6, Lab No 281722

Sample Num	Soil pH	Om %	P ppm	K ppm	60-69 Lime Req(T/a)	Ca ppm	Mg ppm	Est Cec	B ppm	Mn ppm	Zn ppm	Sulfate-S ppm	Sample Density	Buffer Code
6	7.4	3.6	5	54		2889	494	20					1.07	N.R.

Sample Num	Cu ppm	Fe ppm	Al ppm	Salt mmhos /cm	Na ppm	NO3 ppm	NH4 ppm	Olsen P ppm
6						2.23	14.25	

Base Saturation

Est CEC	Ca %	Mg %	K %
20	77.5	21.7	0.7

Test Interpretation for Field SB-6, Lab No 281722

Crop Name	Very Low	Low	Optimum	High	Very High	Excessive	Very Low	Low	Optimum	High	Very High	Excessive
Alfalfa, seeding	P						K					

Additional Information, Secondary & Micronutrient Recommendations

All:At least one map unit for the soil has a different interpretation for soil group and/or soil yield potential. The interpretations presented are based on the interpretation of the majority of the map units. For more detailed information about individual map units see: SnapPlus nutrient management software or https://snapplus.wisc.edu/planning/soil-details/.
All:If a legume crop preceeds the first crop listed on the sample submission form, N credits should be subtracted from the N recommendation for the first crop listed. See Chapter 9 in UWEX Publication A2809 for more details.
All:If manure, biosolids, septage or other waste materials have been applied to this field, be sure to take nutrient credits and adjust fertilizer rate. See Chapter 9 in UWEX Publication A2809 for more details.
All:No crops were provided, a default rotation with nutrient application rate guidelines is provided.
All:Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.
All:Buffer pH not required for calculation of lime requirement when soil pH is 6.6 or higher.
Corn:Nitrogen application rates for grain and silage corn reflect the maximum return to N (MRTN) at a 0.10 N:corn price ratio (eg. $0.30/lb N and $3.00/bu; or $0.40/lb N and $4.00/bu) and the range of rates that produce profitability within $1/a of the MRTN rate. N application rates can be adjusted to reflect different prices for N and grain. See Chapter 6 in UWEX Publication A2809 for more details.
Corn:Starter fertilizer may accelerate early season corn development, which may not always translate into increased yield. Corn will benefit more from a complete starter fertilizer (e.g. 10+20+20 lbs N+P2O5+K2O/a) when grown on soils testing optimum or less in P and K.
Corn, grain:If corn is harvested for silage instead of grain add extra 30 lbs P2O5 per acre and 90 lbs K2O per acre to next crop.
Alfalfa:If alfalfa will be maintained for more than three years, increase recommended K2O by 20% each year.
All:Ca test average value of 2889.131 is in High category.
All:Mg test average value of 493.713 is in Optimum category.

APPENDIX B

FIELD PROCEDURES

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D

420 entitled “Standard Guide for Sampling Rock and Rock” and/or other relevant specifications. Soil samples were preserved and transported to *Giles'* laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled “Standard Practice for Preserving and Transporting Soil Samples.” Brief descriptions of the sampling, testing and field procedures commonly performed by *Giles* are provided herein.

GENERAL FIELD PROCEDURES

Test Boring Elevations

The ground surface elevations reported on the Test Boring Logs are referenced to the assumed benchmark shown on the Boring Location Plan (Figure 1). Unless otherwise noted, the elevations were determined with a conventional hand-level and are accurate to within about 1 foot.

Test Boring Locations

The test borings were located on-site based on the existing site features and/or apparent property lines. Dimensions illustrating the approximate boring locations are reported on the Boring Location Plan (Figure 1).

Water Level Measurement

The water levels reported on the Test Boring Logs represent the depth of "free" water encountered during drilling and/or after the drilling tools were removed from the borehole. Water levels measured within a granular (sand and gravel) soil profile are typically indicative of the water table elevation. It is usually not possible to accurately identify the water table elevation with cohesive (clayey) soils, since the rate of seepage is slow. The water table elevation within cohesive soils must therefore be determined over a period of time with groundwater observation wells.

It must be recognized that the water table may fluctuate seasonally and during periods of heavy precipitation. Depending on the subsurface conditions, water may also become perched above the water table, especially during wet periods.

Borehole Backfilling Procedures

Each borehole was backfilled upon completion of the field operations. If potential contamination was encountered, and/or if required by state or local regulations, boreholes were backfilled with an "impervious" material (such as bentonite slurry). Borings that penetrated pavements, sidewalks, etc. were "capped" with Portland Cement concrete, asphaltic concrete, or a similar surface material. It must, however, be recognized that the backfill material may settle, and the surface cap may subside, over a period of time. Further backfilling and/or re-surfacing by *Giles'* client or the property owner may be required.

FIELD SAMPLING AND TESTING PROCEDURES

Auger Sampling (AU)

Soil samples are removed from the auger flights as an auger is withdrawn above the ground surface. Such samples are used to determine general soil types and identify approximate soil stratifications. Auger samples are highly disturbed and are therefore not typically used for geotechnical strength testing.

Split-Barrel Sampling (SS) – (ASTM D-1586)

A split-barrel sampler with a 2-inch outside diameter is driven into the subsoil with a 140-pound hammer free-falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12-inches of an 18-inch sample interval is defined as the "Standard Penetration Resistance" or N-value is an index of the relative density of granular soils and the comparative consistency of cohesive soils. A soil sample is collected from each SPT interval.

Shelby Tube Sampling (ST) – (ASTM D-1587)

A relatively undisturbed soil sample is collected by hydraulically advancing a thin-walled Shelby Tube sampler into a soil mass. Shelby Tubes have a sharp cutting edge and are commonly 2 to 5 inches in diameter.

Bulk Sample (BS)

A relatively large volume of soils is collected with a shovel or other manually-operated tool. The sample is typically transported to *Giles'* materials laboratory in a sealed bag or bucket.

Dynamic Cone Penetration Test (DC) – (ASTM STP 399)

This test is conducted by driving a 1.5-inch-diameter cone into the subsoil using a 15-pound steel ring (hammer), free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density, and is defined as "N". The Dynamic Cone Penetration test is commonly conducted in hand auger borings, test pits and within excavated trenches.

- Continued -

Ring-Lined Barrel Sampling – (ASTM D 3550)

In this procedure, a ring-lined barrel sampler is used to collect soil samples for classification and laboratory testing. This method provides samples that fit directly into laboratory test instruments without additional handling/disturbance.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e. N-values) are reported on the Test Boring Logs. Explanations of the terms and symbols shown on the logs are provided on the appendix enclosure entitled “General Notes”.

APPENDIX C

LABORATORY TESTING AND CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory tests commonly performed by *Giles* are provided herein.

LABORATORY TESTING AND CLASSIFICATION

Photoionization Detector (PID)

In this procedure, soil samples are "scanned" in *Giles'* analytical laboratory using a Photoionization Detector (PID). The instrument is equipped with an 11.7 eV lamp calibrated to a Benzene Standard and is capable of detecting a minute concentration of **certain** Volatile Organic Compound (VOC) vapors, such as those commonly associated with petroleum products and some solvents. Results of the PID analysis are expressed in HNu (manufacturer's) units rather than actual concentration.

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Unconfined Compressive Strength (qu) (ASTM D 2166)

An axial load is applied at a uniform rate to a cylindrical soil sample. The unconfined compressive strength is the maximum stress obtained or the stress when 15% axial strain is reached, whichever occurs first.

Calibrated Penetrometer Resistance (qp)

The small, cylindrical tip of a hand-held penetrometer is pressed into a soil sample to a prescribed depth to measure the soils capacity to resist penetration. This test is used to evaluate unconfined compressive strength.

Vane-Shear Strength (qs)

The blades of a vane are inserted into the flat surface of a soil sample and the vane is rotated until failure occurs. The maximum shear resistance measured immediately prior to failure is taken as the vane-shear strength.

Loss-on-Ignition (ASTM D 2974; Method C)

The Loss-on-Ignition (L.O.I.) test is used to determine the organic content of a soil sample. The procedure is conducted by heating a dry soil sample to 440°C in order to burn-off or "ash" organic matter present within the sample. The L.O.I. value is the ratio of the weight loss due to ignition compared to the initial weight of the dry sample. L.O.I. is expressed as a percentage.

Particle Size Distribution (ASTB D 421, D 422, and D 1140)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a “sieve analysis,” which is conducted by passing the sample through a series of nested sieves. The distribution of fine-grained soil particles (silt and clay) is determined from a “hydrometer analysis” which is based on the sedimentation of particles suspended in water.

Consolidation Test (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. During each load increment, vertical compression (consolidation) of the sample is measured over a period of time. Results of this test are used to estimate settlement and time rate of settlement.

Classification of Samples

Each soil sample was visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D-2488-75). The classifications are reported on the Test Boring Logs.

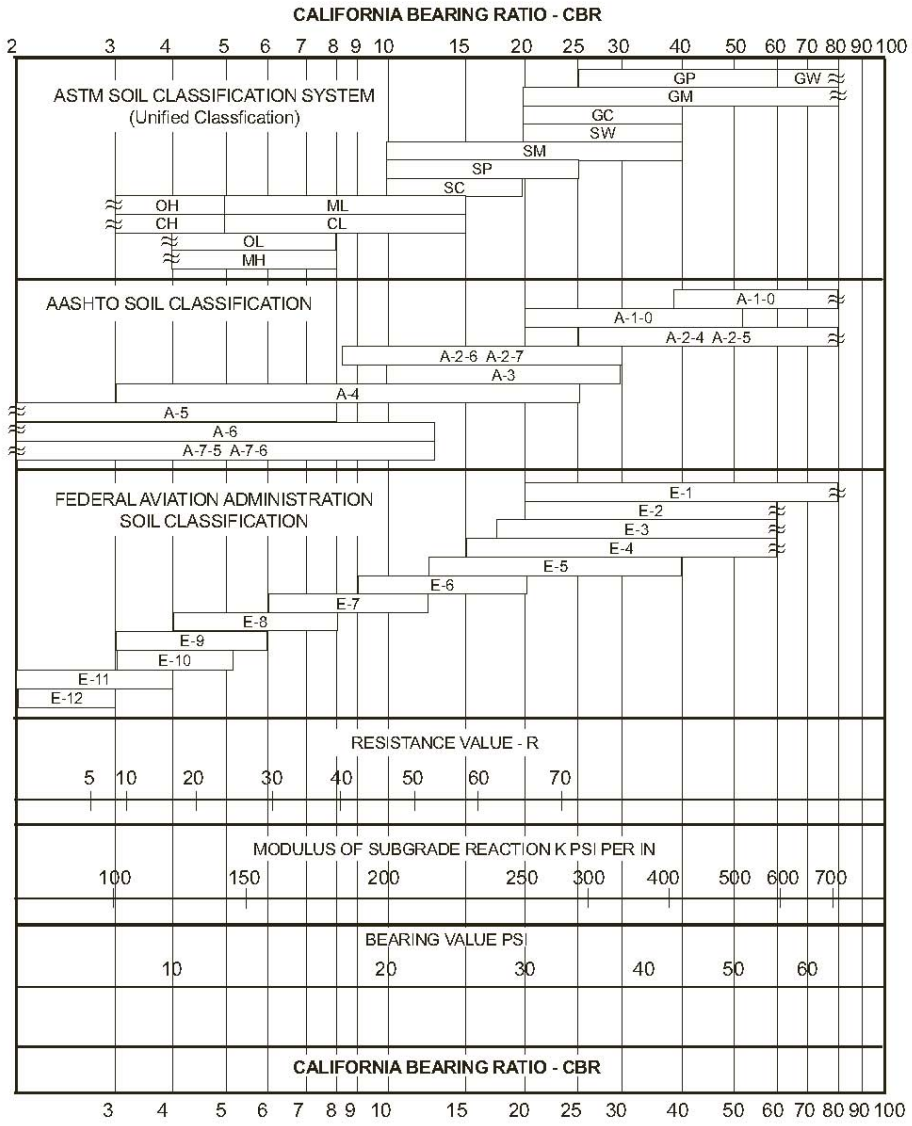
Laboratory Testing

The laboratory testing operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the laboratory tests are provided on the Test Boring Logs or other appendix enclosures. Explanation of the terms and symbols used on the logs is provided on the appendix enclosure entitled “General Notes.”

California Bearing Ratio (CBR) Test ASTM D-1833

The CBR test is used for evaluation of a soil subgrade for pavement design. The test consists of measuring the force required for a 3-square-inch cylindrical piston to penetrate 0.1 or 0.2 inch into a compacted soil sample. The result is expressed as a percent of force required to penetrate a standard compacted crushed stone.

Unless a CBR test has been specifically requested by the client, the CBR is estimated from published charts, based on soil classification and strength characteristics. A typical correlation chart is below.



APPENDIX D

GENERAL INFORMATION

AND
IMPORTANT INFORMATION ABOUT
THIS GEOTECHNICAL REPORT

GENERAL COMMENTS

The soil samples obtained during the subsurface exploration will be retained for a period of thirty days. If no instructions are received, they will be disposed of at that time.

This report has been prepared exclusively for the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. Copies of this report may be provided to contractor(s), with contract documents, to disclose information relative to this project. The report, however, has not been prepared to serve as the plans and specifications for actual construction without the appropriate interpretation by the project architect, structural engineer, and/or civil engineer. Reproduction and distribution of this report must be authorized by the client and *Giles*.

This report has been based on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the architect, civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. The project plans and specifications may also be submitted to *Giles* for review to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted.

The analysis of this site was based on a subsoil profile interpolated from a limited subsurface exploration. If the actual conditions encountered during construction vary from those indicated by the borings, *Giles* must be contacted immediately to determine if the conditions alter the recommendations contained herein.

The conclusions and recommendations presented in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

GUIDE SPECIFICATIONS FOR SUBGRADE AND GRADE PREPARATION FOR FILL, FOUNDATION, FLOOR SLAB AND PAVEMENT SUPPORT; AND SELECTION, PLACEMENT AND COMPACTION OF FILL SOILS USING STANDARD PROCTOR PROCEDURES

1. Construction monitoring and testing of subgrades and grades for fill, foundation, floor slab and pavement; and fill selection, placement and compaction shall be performed by an experienced soils engineer and/or his representatives.

2. All compaction fill, subgrades and grades shall be (a) underlain by suitable bearing material; (b) free of all organic, frozen, or other deleterious material, and (c) observed, tested and approved by qualified engineering personnel representing an experienced soils engineer. Preparation of subgrades after stripping vegetation, organic or other unsuitable materials shall consist of (a) proof-rolling to detect soil, wet yielding soils or other unstable materials that must be undercut, (b) scarifying top 6 to 8 inches, (c) moisture conditioning the soils as required, and (d) recompaction to same minimum in-situ density required for similar materials indicated under Item 5. Note: compaction requirements for pavement subgrade are higher than other areas. Weather and construction equipment may damage compacted fill surface and reworking and retesting may be necessary to assure proper performance.

3. In overexcavation and fill areas, the compacted fill must extend (a) a minimum 1 foot lateral distance beyond the exterior edge of the foundation at bearing grade or pavement subgrade and down to compacted fill subgrade on a maximum 0.5(H):1(V) slope, (b) 1 foot above footing grade outside the building, and (c) to floor subgrade inside the building. Fill shall be placed and compacted on a 5(H):1(V) slope or must be stepped or benched as required to flatten if not specifically approved by qualified personnel under the direction of an experienced soil engineer.

4. The compacted fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated", and shall be low-expansive with a maximum Liquid Limit (ASTM D-423) and Plasticity Index (ASTM D-424) of 30 and 15, respectively, unless specifically tested and found to have low expansive properties and approved by an experienced soils engineer. The top 12 inches of compacted fill should have a maximum 3-inch-particle diameter and all underlying compacted fill a maximum 6-inch-diameter unless specifically approved by an experienced soils engineer. All fill materials must be tested and approved under the direction of an experienced soils engineer prior to placement. If the fill is to provide non-frost susceptible characteristics, it must be classified as a clean GW, GP, SW or SP per the Unified Soil Classification System (ASTM D-2487).

5. For structural fill depths less than 20 feet, the density of the structural compacted fill and scarified subgrade and grades shall not be less than 95 percent of the maximum dry density as determined by Standard Proctor (ASTM-698) with the exception of the top 12 inches of pavement subgrade which shall have a minimum in-situ density of 100 percent of maximum dry density, or 5 percent higher than underlying fill materials. Where the structural fill depth is greater than 20 feet, the portions below 20 feet should have a minimum in-place density of 100 percent of its maximum dry density of 5 percent greater than the top 20 feet. The moisture content of cohesive soil shall not vary by more than -1 to +3 percent and granular soil ±3 percent of the optimum when placed and compacted or recompacted, unless specifically recommended/approved by the soils engineer monitoring the placement and compaction. Cohesive soils with moderate to high expansion potentials (PI>15) should, however, be placed, compacted and maintained prior to construction at a moisture content 3±1 percent above optimum moisture content to limit further heave. The fill shall be placed in layers with a maximum loose thickness of 8 inches for foundations and 10 inches for floor slabs and pavement, unless specifically approved by the soils engineer taking into consideration the type of materials and compaction equipment being used. The compaction equipment should consist of suitable mechanical equipment specifically designed for soil compaction. Bulldozers or similar tracked vehicles are typically not suitable for compaction.

6. Excavation, filling, subgrade and grade preparation shall be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs and seepage water encountered shall be pumped or drained to provide a suitable working platform. Springs or water seepage encountered during grading/foundation construction must be called to the soil engineer's attention immediately for possible construction procedure revision or inclusion of an underdrain system.

7. Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below-grade walls (i.e. basement walls and retaining walls) must be properly tested and approved by an experienced soils engineer with consideration for the lateral pressure used in the wall design.

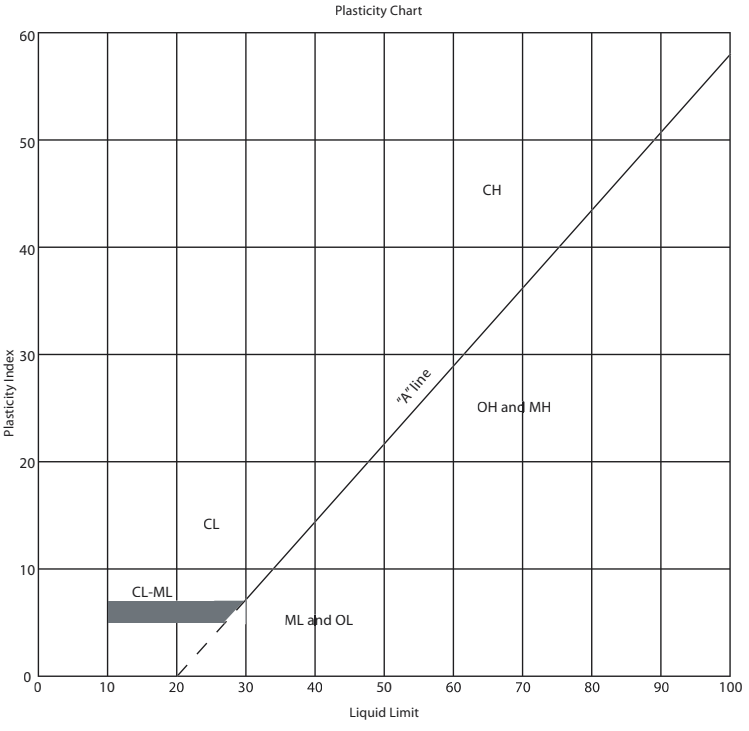
8. Whenever, in the opinion of the soils engineer or the Owner's Representatives, an unstable condition is being created either by cutting or filling, the work shall not proceed into that area until an appropriate geotechnical exploration and analysis has been performed and the grading plan revised, if found necessary.

CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *									
Class	**Compaction Characteristics**	**Max. Dry Density Standard Proctor (pcf)**	**Compressibility and Expansion**	**Drainage and Permeability**	**Value as an Embankment Material**	**Value as Subgrade When Not Subject to Frost**	**Value as Base Course**	**Value as Temporary Pavement**	
								With Dust Palliative	**With Bituminous Treatment**
GW	Good: tractor, rubber-tired, steel wheel or vibratory roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to poor	Excellent
GP	Good: tractor, rubber-tired, steel wheel or vibratory roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
GM	Good: rubber-tired or light sheepsfoot roller	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
GC	Good to fair: rubber-tired or sheepsfoot roller	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
SW	Good: tractor, rubber-tired or vibratory roller	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
SP	Good: tractor, rubber-tired or vibratory roller	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SM	Good: rubber-tired or sheepsfoot roller	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SC	Good to fair: rubber-tired or sheepsfoot roller	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
ML	Good to poor: rubber-tired or sheepsfoot roller	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
CL	Good to fair: sheepsfoot or rubber-tired roller	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
OL	Fair to poor: sheepsfoot or rubber-tired roller	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
MH	Fair to poor: sheepsfoot or rubber-tired roller	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Not suitable
CH	Fair to poor: sheepsfoot roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
OH	Fair to poor: sheepsfoot roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
Pt	Not suitable		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

* "The Unified Classification: Appendix A - Characteristics of Soil, Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments and Foundations," Technical Memorandum 357, U.S. Waterways Ixperiment Station, Vicksburg, 1953.

** Not suitable if subject to frost.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils (more than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP. More than 12 percent: GM, GC, SM, SC. 5 to 12 percent: *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtrues, little or no fines		Not meeting all gradation requirements for GW
		Gravels with fines (appreciable amount of fines)	GM[a] d	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GM[a] u			
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM[a] d	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SM[a] u			
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		

[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits, suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u is used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group sympols. For example GW-GC, well-graded gravel-sand mixture with clay binder.

GENERAL NOTES

SAMPLE IDENTIFICATION

All samples are visually classified in general accordance with the Unified Soil Classification System (ASTM D-2487-75 or D-2488-75)

DESCRIPTIVE TERM (% BY DRY WEIGHT)

Trace:	1-10%
Little:	11-20%
Some:	21-35%
And/Adjective	36-50%

PARTICLE SIZE (DIAMETER)

Boulders:	8 inch and larger
Cobbles:	3 inch to 8 inch
Gravel:	coarse - ¾ to 3 inch
	fine – No. 4 (4.76 mm) to ¾ inch
Sand:	coarse – No. 4 (4.76 mm) to No. 10 (2.0 mm)
	medium – No. 10 (2.0 mm) to No. 40 (0.42 mm)
	fine – No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt:	No. 200 (0.074 mm) and smaller (non-plastic)
Clay:	No 200 (0.074 mm) and smaller (plastic)

SOIL PROPERTY SYMBOLS

Dd:	Dry Density (pcf)
LL:	Liquid Limit, percent
PL:	Plastic Limit, percent
PI:	Plasticity Index (LL-PL)
LOI:	Loss on Ignition, percent
Gs:	Specific Gravity
K:	Coefficient of Permeability
w:	Moisture content, percent
qp:	Calibrated Penetrometer Resistance, tsf
qs:	Vane-Shear Strength, tsf
qu:	Unconfined Compressive Strength, tsf
qc:	Static Cone Penetrometer Resistance (correlated to Unconfined Compressive Strength, tsf)
PID:	Results of vapor analysis conducted on representative samples utilizing a Photoionization Detector calibrated to a benzene standard. Results expressed in HNU-Units. (BDL=Below Detection Limit)

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon
ST:	Shelby Tube – 3 inch O.D. (except where noted)
CS:	3 inch O.D. California Ring Sampler
DC:	Dynamic Cone Penetrometer per ASTM Special Technical Publication No. 399
AU:	Auger Sample
DB:	Diamond Bit
CB:	Carbide Bit
WS:	Wash Sample
RB:	Rock-Roller Bit
BS:	Bulk Sample
Note:	Depth intervals for sampling shown on Record of Subsurface Exploration are not indicative of sample recovery, but position where sampling initiated

N: Penetration Resistance per 12 inch interval, or fraction thereof, for a standard 2 inch O.D. (1⅜ inch I.D.) split spoon sampler driven with a 140 pound weight free-falling 30 inches. Performed in general accordance with Standard Penetration Test Specifications (ASTM D-1586). N in blows per foot equals sum of N-Values where plus sign (+) is shown.

Nc: Penetration Resistance per 1¾ inches of Dynamic Cone Penetrometer. Approximately equivalent to Standard Penetration Test N-Value in blows per foot.

Nr: Penetration Resistance per 12 inch interval, or fraction thereof, for California Ring Sampler driven with a 140 pound weight free-falling 30 inches per ASTM D-3550. Not equivalent to Standard Penetration Test N-Value.

SOIL STRENGTH CHARACTERISTICS

COHESIVE (CLAYEY) SOILS

COMPARATIVE CONSISTENCY	BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
Very Soft	0 - 2	0 - 0.25
Soft	3 - 4	0.25 - 0.50
Medium Stiff	5 – 8	0.50 - 1.00
Stiff	9 – 15	1.00 - 2.00
Very Stiff	16 – 30	2.00 - 4.00
Hard	31+	4.00+

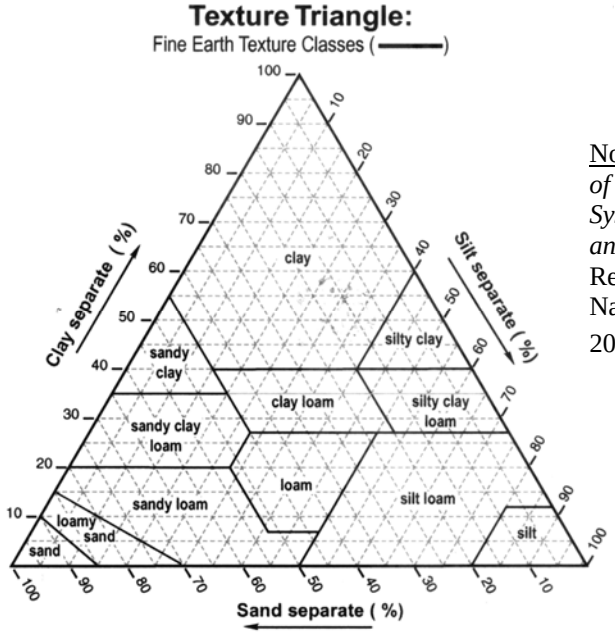
NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	BLOWS PER FOOT (N)
Very Loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	51+

DEGREE OF PLASTICITY	PI
None to Slight	0 - 4
Slight	5 - 10
Medium	11 - 30
High to Very High	31+

DEGREE OF EXPANSIVE POTENTIAL	PI
Low	0 - 15
Medium	15 - 25
High	25+

SOIL CLASSIFICATION NOTES



Note: *Texture Triangle* and *Comparison of Particle Size Classes in Different Systems* from *Field Book for Describing and Sampling Soil*, USDA Natural Resources Conservation Service National Soil Survey Center (September 2002).

Comparison of Particle Size Classes in Different Systems

	FINE EARTH									ROCK FRAGMENTS					
										channers			flagst.	stones	boulders
USDA [1]	Clay [2]		Silt		Sand					Gravel			Cobbles	Stones	Boulders
	fine	co.	fine	co.	v.fi.	fi.	med.	co.	v. co.	fine	medium	coarse			
millimeters:	0.0002	.002 mm		.02	.05	.1	.25	.5	1	2 mm	5	20	76	250	600 mm
U.S. Standard Sieve No. *(opening)*:					300 [3]	140	60	35	18	10	4	*(3/4")*	*(3")*	*(10")*	*(25")*

International [4]	Clay	Silt	Sand		Gravel	Stones
			fine	coarse		
millimeters:	.002 mm	.02	.20		2 mm	20 mm
U.S. Standard Sieve No. *(opening)*:					10	*(3/4")*

Unified [5]	Silt or Clay	Sand			Gravel		Cobbles	Boulders
		fine	medium	co.	fine	coarse		
millimeters:	.074	.42	2 mm	4.8	19	76	300 mm	
U.S. Standard Sieve No. *(opening)*:	200	40	10	4	*(3/4")*	*(3")*		

AASHTO [6,7]	Clay	Silt	Sand		Gravel or Stones			Broken Rock (angular), or Boulders (rounded)
			fine	coarse	fine	med.	co.	
millimeters:	.005 mm	.074	.42	2 mm	9.5	25	75 mm	
U.S. Standard Sieve No.:		200	40	10	*(3/8")*	*(1")*	*(3")*	

phi #:	12	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-12
Modified Wentworth [8]	clay			silt				sand					pebbles						Cobbles	boulders			
millimeters:	.002	.004	.008	.016	.031	.062	.125	.25	.5	1	2 mm	8	16	32	64		256			4092 mm			
U.S. Standard Sieve No.:						230	120	60	35	18	10	5											

1. Soil Survey Staff. 1995. Soil survey Laboratory information manual. USDA, Natural Resources Conservation Service, Soil Survey Investigations Report No. 45, Version 1.0, National Soil Survey Center, Lincoln, NE. 305 p.
2. Soil Survey Staff. 1995. Soil Survey Lab information manual. USDA-NRCS, Soil Survey Investigation Report #45, version 1.0, National Soil Survey Center, Lincoln, NE. Note: Mineralogy studies may subdivide clay into three size ranges; fine (<0.08µm), medium (0.08-0.2µm), and coarse (0.2-2µm); Jackson, 1969.
3. The Soil Survey Lab (Lincoln, NE) uses a no. 300 sieve (0.047 mm opening) for the USDA-sand/silt measurement. A no. 270 sieve (0.053 mm opening) is more readily available and widely used.
4. International Soil Science Society. 1951. *In*: Soil Survey Manual. Soil Survey Staff, USDA-Soil Conservation Service, Agricultural Handbook No. 18, U.S. Gov. Print. Office, Washington, D.C. 214 p.
5. ASTM. 1993. Standard classification of soils for engineering purposes (Unified Soil Classification System). ASTM designation D2487-92. *In*: Soil and rock; dimension stone; geosynthetics. Annual book of ASTM standards-Vol. 04.08.
6. AASHTO. 1986a. Recommended practice for the classification of soils and soil-aggregate mixtures for highway construction purposes. AASHTO designation M145-82. *In*: Standard specifications for transportation materials and methods of sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
7. AASHTO. 1986b. Standard definitions of terms relating to subgrade, soil-aggregate, and fill materials. AASHTO designation M146-70 (1980). *In*: sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
8. Ingram, R.L. 1982. Modified Wentworth scale. *In*: Grain-size scales. AGI Date Sheet 29.1. *In*: Dutro, J.T., Dietrich, R.V., and Foose, R.M. 1989. AGI data sheets for geology in the field, laboratory, and office, 3rd edition. American Geological Institute, Washington, D.C.

GILES ENGINEERING ASSOCIATES, INC.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Geotechnical, Environmental & Construction Materials Consultants

GILES

ENGINEERING ASSOCIATES, INC.

www.gilesengr.com

SECTION 02 41 13 - DEMOLITION

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for demolition of site work and such features as required in these specifications and on the drawings. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- References
- Submittals
- Record Drawings
- Safety
- Permits
- Disconnection of Services
- Removal/Salvaging of Items
- OWNER Salvaged or Removed Materials

PART TWO - PRODUCTS
- Equipment

PART THREE - EXECUTION
- Protection of Existing Work and Facilities
- Demolition
- Demolition Below Grade
- Demolition Backfill
- Drain Tile
- Transportation and Disposal of Demolition Waste
- Sawcutting

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 02 05 00	Common Work Results for Existing Conditions
Section 31 20 00	Earthmoving
Section 31 23.16.13	Trenching
Section 31 25 00	Erosion Control

REFERENCES

State Specifications" - Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2024 edition.

Wisconsin Administrative Code

SUBMITTALS

For utilities or other services requiring removal or abandonment in-place, submit materials documenting completion of such work.

Submit record drawings.

Submit copies of records documenting recycling or disposal of demolition materials from site.

RECORD DRAWINGS

Maintain record drawings showing actual locations of utilities and other features encountered, and any deviations from the original design. Show actual limits of removal and demolition.

SAFETY

Verify all gas and electrical utilities have been abandoned, disconnected and/or relocated and associated hazards mitigated, prior to beginning any demolition.

Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other explosive or toxic fluids or gases. Purge lines and contain materials in accordance with all applicable regulations. Store such piping outdoors until fumes are removed.

Maintain a clean and orderly site. Remove debris at end of each workday.

Burning of debris is not permitted.

If hazardous materials are not anticipated, but encountered, terminate operations and contact LA/E immediately. Follow all applicable local, state and federal regulations pertaining to hazardous materials.

PERMITS

Unless otherwise noted, CONTRACTOR responsible for obtaining and paying for all permits necessary to complete demolition work.

If necessary, file and maintain Notification of Demolition and/or Renovation and Application for Permit Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter NR447.

DISCONNECTION OF SERVICES

Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all existing utilities, communication systems, alarm systems and other services.

Disconnect all services in manner, which ensures continued operation in facilities not scheduled for demolition.

Disconnect all services in a manner, which allows for future connection to that service.

Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.

REMOVAL/SALVAGING OF ITEMS

Carefully remove all items that are scheduled to be salvaged.

Secure salvaged items to allow for future movement; provide pallets, skids and other devices as necessary. Secure all loose parts.

Provide crates, padding, tarps and other measures necessary to protect salvaged items during storage. Store items in secure location, safe from vandalism, weather, dust and other adverse elements.

Where salvaged items are indicated to be turned over to OWNER, deliver to location on property where designated by OWNER.

Where indicated to be incorporated into new work, store the salvaged item in secure location until trade responsible for re-installation mobilizes equipment and storage facilities to site, or otherwise accepts responsibility for salvaged item.

OWNER SALVAGED OR REMOVED MATERIALS

OWNER will remove items on drawings indicated “removed by OWNER” or “removed by Other”. Verify OWNER’S removal activities are complete prior to initiating work.

PART TWO - PRODUCTS

EQUIPMENT

Use CONTRACTOR’S normal equipment for demolition purposes and which meets all safety requirements imposed on such equipment.

PART THREE - EXECUTI0N

PROTECTION OF EXISTING WORK AND FACILITIES

Take all measures necessary to safeguard all existing work and facilities, which are outside the limits of work.

Furnish and install fencing or other barriers as shown on drawings or as otherwise necessary to protect existing features.

Verify locations of, and protect, any buildings, structures, utilities, paved surfaces, signs, streetlights, utilities, landscaping and all other such facilities that are intended to remain or be salvaged.

Make such explorations and probes as necessary to ascertain any required protection measures that shall be used before proceeding with demolition.

Provide and maintain adequate catch platforms, warning lights, barricades, guards, weather protection, dust protection, fences, planking, bracing, shoring, piling, signs, and other items required for proper protection.

Provide protection for workers, public, adjacent construction and occupants of existing building(s).

Report damage of any facilities or items scheduled for salvaging to the LA/E.

Repair or replace any damaged facilities that are not scheduled for demolition.

Explosives shall not be used for demolition.

Keep streets, walks and all other adjacent paved areas clean and swept clear of dirt, mud and debris deposited as a result of this operation.

Protect surrounding area from dust. Control rodents, and other vermin associated with demolition operations.

DEMOLITION

Comply with Section 204 of “State Specifications.”

Remove all equipment, fixtures and other materials scheduled for salvage prior to beginning demolition operations.

If necessary, abandon gas, electric and communication utilities in accordance with local utility company requirements, or applicable substantive requirements if considered private.

Carry out vehicle loading as necessary within project limits or as defined or indicated on drawings, but not in locations that block vehicular traffic on streets or pedestrian traffic on adjacent public walks.

Dismantle each structure in an orderly manner to provide complete stability of structure at all times. Provide bracing and shoring where necessary to avoid premature collapse of structure.

Conduct demolition operations and removal of rubbish and debris in such a way that a minimum of nuisance dust is caused. Constantly sprinkle rubbish and debris with water if necessary to keep nuisance dust to a minimum.

Where necessary to prevent collapse of any construction, install temporary shores, underpinning, struts or bracing. Do not commence demolition work until all temporary construction is complete.

During the execution of work, provide, operate, and maintain all pumping equipment, suction and discharge lines in a number of capacity as required to keep all cellars and pits free of water from any source whatsoever at all times.

Masonry and concrete shall be demolished in small sections. Use braces and shores as necessary to support the structure of the building or structure and protect it from damage. Where limits of demolition are exposed in the finished work, cutting shall be made with saws, providing an absolutely straight line, plumb, true and square.

Operate equipment so as to cause a minimum of damage to plaster which is to remain, and so as to keep dust and dirt to a minimum.

DEMOLITION BELOW GRADE

When applicable, demolish foundation walls and other below grade features in accordance with the plans. Unless otherwise noted, remove all below grade features to a point 4’ below adjoining existing grade, or proposed grade, whichever is lower. Basement and/or lowest level floors more than 4’ below existing grade need not be removed, but must be broken up to permit drainage.

DEMOLITION BACKFILL

Backfill and compact below grade areas and voids resulting from demolition of structures and other abandonment and demolition.

Backfilling shall not begin until demolition and abandonment has been approved and documented by the LA/E.

Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, trash and debris.

Backfill type, lift thickness and compaction requirements shall be in accordance with Section 31 20 00 – Earthmoving.

DRAIN TILE

Carefully protect and/or replace drain tiles encountered during demolition, which are necessary to maintain site drainage conditions. Immediately repair or replace any drain tiles not scheduled for demolition, but damaged. Report damage to LA/E.

Repairs to drain tile or replacement drain tile shall be comparable or better than the existing drain tile system.

Test drain lines with water to assure free flow before covering. Remove all obstructions, which may be found, retest until satisfactory.

TRANSPORTATION AND DISPOSAL OF DEMOLITION WASTE

Transport and dispose all demolition waste in accordance with local, state, and federal guidelines.

Whenever possible, or otherwise required by the Contract Documents, recycle demolition waste.

Demolition waste shall be disposed of at a landfill or dumpsite designed and approved to accept given waste.

Maintain records documenting recycling and disposal of demolition waste. Record description of material, date removed, quantity removed, method of transport and recycling/disposal destination.

SAWCUTTING

Provide saw cuts where necessary to accomplish work as indicated on drawings.

End of Section

Intentionally left blank

SECTION 03 00 00 – SITE CONCRETE

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete formwork, reinforcement, accessories, cast-in-place concrete, finishing and curing as required in these specifications and on Drawings for all EXTERIOR concrete. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Quality Assurance
- Construction Layout
- Record Drawings
- Coordination

PART TWO – PRODUCTS
- Concrete Mix Design
- Liquid Curing Compound
- Isolation (Expansion) Joint Material

PART THREE – EXECUTION
- Concrete Curb and Gutter
- Concrete Pavement/Concrete Sidewalk and Colored Concrete
- Isolation (Expansion) Joint Material
- Pavement Penetrations
- Jointing
- Finishing Concrete
- Liquid Curing Compound
- Concrete Truck Wash-Out

RELATED WORK

Applicable provisions of Division 01 and the following Sections:

Section 02 41 00	Demolition
Section 31 20 00	Earthmoving
Section 31 22 16.15	Roadway Subgrade Preparation
Section 32 10 00	Hard Surface Base and Paving
Section 32 31 13	Chain Link Fence and Gates

REFERENCE STANDARDS

State Specifications: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2025 edition. Comply with reference sections including but not limited to:

Section 301	Base, Subbase and Subgrade Aggregate
Section 415	Concrete Pavement
Section 501	Concrete
Section 505	Steel Reinforcement
Section 601	Concrete Curb and Gutter
Section 602	Concrete Sidewalks, Loading Zones, Safety Island, and Steps

PAL = Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website. American Concrete Institute (ACI):

301	Specifications for Structural Concrete
305	Specification for Hot Weather Concreting
306	Standard Specification for Cold Weather Concreting
315	Details and Detailing of Concrete Reinforcement
318	Building Code Requirements for Reinforced Concrete

Concrete Reinforcing Steel Institute (CRSI)

63 Recommended Practice for Placing Reinforcing Bars

American Society for Testing and Materials (ASTM):

C 31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C33	Standard Specification for Concrete Aggregates
C 39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C94	Standard Specification for Ready-Mixed Concrete
C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
C150	Standard Specification for Portland Cement
C172	Standard Practice for Sampling Freshly Mixed Concrete
C231	Standard Test Method for Air Content of freshly Mixed Concrete by the Pressure Method
C260	Standard Specification for Air-Entraining Admixtures for Concrete
C494/494M	Standard Specification for Chemical Admixtures for Concrete
C615	Standard Specification for Granite Dimension Stone
C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
C1116	Standard Specification for Fiber-Reinforced Concrete

American Association of State Highway and Transportation Officials (AASHTO)

M 148	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

SUBMITTALS

Submit shop drawings documenting materials of construction, installation requirements and conformance with WIAA and NFHS (National Federation of State High School Associations) requirements for all athletic equipment.

Shop Drawings: Indicate pertinent dimensioning, methods of construction, form materials, arrangement of joints and ties, location of bracing and temporary supports, schedule of erection.

Indicate reinforcement sizes, spacing, locations, and quantities, bending and cutting schedules, supporting and spacing devices.

Product Data: Provide concrete mix designs indicating mix proportions and materials sources including cement, fly ash, admixtures, and aggregates. Also provide documentation for surface treatments, and anchors.

Provide copies of material testing reports.

QUALITY ASSURANCE

Construct and erect concrete formwork in accordance with ACI 301.

Perform concrete reinforcing work in accordance with ACI 301, ACI 315, ACI 318, CRSI 63 and CRSI Manual of Practice.

Perform cast-in-place concrete work in accordance with ACI 301, ACI 305, and ACI 306.
Coordinate CONTRACTOR'S construction materials ENGINEER or TECHNICIAN to provide three concrete test cylinders taken for every 75 C.Y. or less of each class of concrete placed. Also provide one slump and air entrainment test for each set of test cylinders taken.

CONSTRUCTION LAYOUT

CONTRACTOR to provide all necessary construction layout.

RECORD DRAWINGS
Maintain as-built drawings showing actual locations of utilities and other features encountered, modifications to proposed grades and site features, and other deviations from the original design.

COORDINATION
Contractor shall coordinate with all trades to ensure proper access, construction sequence, and quality work to be completed.

PART TWO – PRODUCTS

CONCRETE MIX DESIGN
Comply with State Specifications Sections 415 Concrete Pavement, 501 Concrete, 601 Concrete Curb and Gutter, and 602 Concrete Sidewalks, Loading Zones, Safety Islands, except as modified:

1. Provide concrete materials used to prepare mixture proportions that are listed on the WisDOT PAL, and meet the following requirements:
   a. Portland Cement: ASTM C 150, Type IL.
   b. Fly Ash (optional): ASTM C 618 "Standard Specifications for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete" Class C.
   c. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when approved by LA/E. Normal weight coarse aggregate to be crushed stone or gravel. Fine aggregate shall be natural sand. Coarse aggregate shall contain less than 1% Chert.
   d. Air-Entraining Admixture: ASTM C 260.
   e. Water-Reducing Admixture: Comply with ASTM C 494/C494M. Type A.
   f. Synthetic Fiber Reinforcement: Provide fibrillated polypropylene fiber reinforcement at a dosage rate of 1.5 lbs/cy engineered and designed for use in slab on grade, complying with ASTM C 1116; 4.1.3, Type III. Burn off any standing fibers. Preapproved products that do not require review by the LA/E are limited to following:
   g. MasterFiber F70, BASF Corporation.
   h. Water: Potable (drinkable).
   i. Deformed Reinforcing Bars: Clean, free of loose rust, mill scale, dirt, ice, etc., meeting ASTM A 615, Grade 60, unless otherwise indicated.
2. Provide Grade A or Grade AFA air entrained concrete with maximum water-cementitious ratio of 0.45 and a minimum 28-day compressive strength 4,000 pounds per square inch (psi).
3. Class C Fly Ash may be used to replace cement on a 1.0 to 1.0 basis up to 25% of total cementitious materials content. The use of mixes containing fly ash is prohibited after October 15th unless prior written permission is received from LA/E.
4. Ternary mixes will not be accepted at this time.
5. Exterior flatwork shall be cast of concrete from the same mix proportions.
6. The slump of all concrete mixtures shall not exceed 4" or as outlined by State Specifications.
7. Air content of all exterior concrete shall be 6.5% ± 1.5%.
8. Air content of interior concrete except garage floors shall not exceed 3.0%.
9. Fibrillated polypropylene fiber reinforcement shall be provided in all concrete placed in exterior flatwork at the minimum dosage rate recommended by the product manufacturer
10. Submit proposed mix designs and minimum of fifteen (15) test results (two cylinders per test) per mix type at least seven (7) days prior to placing concrete.
11. Ready-Mixed Concrete shall be measured, mixed and delivered in accordance with ASTM C 94.

LIQUID CURING COMPOUND
Apply liquid concrete curing materials in accordance with application rates and procedures outlined in State Specification Section 415 on all exterior concrete flatwork and curb & gutter. Use a liquid curing compound identified on the PAL that meets AASHTO M 148 (or ASTM C309), Type 2, Class A. Better quality curing compounds may be used as approved by LA/E. **Do not apply curing compound to concrete that shall be coated with tennis surfacing.**

ISOLATION (EXPANSION) JOINT MATERIAL
Provide isolation joint material made of asphalt-impregnated fiberboard or polyethylene foam material in lengths equal to the pavement lane, back of curb length, or sidewalk width and of thicknesss varying from

1/8" to 3/4". Where dowel bars are required as indicated on the Drawings, utilize Speed Dowels - PSD09/#5TX. Isolation joint material placed where sidewalks meet the front of buildings shall be 6 mil or heavier plastic sheeting mounted on the building to a height that prevents concrete splatter on the building.

PART 3 – EXECUTION

CONCRETE PAVEMENT / CONCRETE SIDEWALKS

Comply with Sections 405, 415 and 602 of State Specification. Grade A or Grade AFA concrete shall be used. All Concrete shall be at the depth as shown on Drawings and shall be placed on depth dense graded base course as shown on Drawings. Synthetic reinforcing fibers shall be used as indicated on the Drawings. Subgrade preparation, placing, concrete, broomed surface (not artificial turf drag), jointing and joint spacing shall be in accordance with the State Specifications.

ISOLATION (EXPANSION) JOINT MATERIAL

Form isolation joints by placing preformed isolation joint material next to any column, wall, standpipe, back of curb, and at locations where contraction joints do not meet between adjacent concrete placements. Joint material shall be placed prior to casting the slab. An isolation (expansion) joint shall be placed every 96 lineal feet of sidewalk, curb & gutter, or roadway pavement in any direction.

PAVEMENT PENETRATIONS

At locations where fence posts, sign posts or other objects penetrate through concrete pavement, four 12-inch long #4 reinforcing bars shall be placed around each penetration in a direction parallel to the edges of the pavement. Reinforcing bars are not located where either a construction or contraction joint intersects the penetration. Penetrations shall be wrapped with a thin plastic sheet prior to concrete placement to prevent the concrete from bonding to the penetration.

JOINTING

Provide hand-tooled or saw-cut contraction joints at the locations identified for each on the Drawings. CONTRACTOR shall propose additional joints as necessary to provide spacing in two directions not exceeding 24 to 36 times the depth of the concrete. The aspect ratio of length to width of the panels after jointing shall not exceed 1.5 to 1.0. Joints shall not deviate more than ½-inch in 10 feet from the required line. Hand-tooled joints shall have a ¼-inch radius and shall be smooth and true to line.

Joints in concrete supporting trench drains shall be hand-tooled at a maximum spacing of 10 feet. The depth of all joints shall be at least one-fourth the depth of the concrete element being jointed.

FINISHING CONCRETE

During concrete placement, Contractor shall protect adjacent structures such as buildings, decorative pavement, paving stones, and landscape elements. Screed or strike off, bullfloat or darby concrete surfaces prior to the onset of bleed water collection. Do not work bleed water into the surface of the concrete.

Complete initial edging and hand tool jointing prior to floating or brooming. Re-edge or re-tool joints as necessary to receive uniform finish as specified by LA/E or project plans as finishing progresses.

Once bleed water has evaporated and the concrete can sustain foot pressure, complete edging/jointing, floating, and brooming as appropriate.

Do not add water or dry cement to any concrete surface to modify conditions.

Unless otherwise indicated, sidewalks and concrete pavement areas shall be provided with a medium broomed finish. Broom slabs transverse to the main direction of traffic. During the first concrete flatwork placement, LA/E will review and approve the broom finish texture.

LIQUID CURING COMPOUND

As final finishing operations have been completed, Liquid Concrete Curing Agents shall be applied as at a minimum rate of one gallon per 200 square feet of surface or at the manufacturer's recommended rate

whichever is greater. Contractor shall protect adjacent structures such as, but not limited to, buildings, decorative pavement, paving stones, and landscape elements.

Do not apply curing compound to concrete that shall be coated with track surfacing or tennis surfacing.

CONCRETE TRUCK WASH-OUT AREA

The CONTRACTOR shall follow the Erosion Control Plan (ECP) designed for this project site. This includes, but is not limited to, directing concrete trucks to wash concrete residue into the area identified as “Concrete Truck Wash-Out Area” on the Erosion Control Plan.

End of Section

Intentionally Left Blank

SECTION 11 68 33 – ATHLETIC FIELD EQUIPMENT

PART ONE – GENERAL

SCOPE

This section states requirements for athletic equipment. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Submittals
- Quality Assurance
- Product Delivery and Storage

PART TWO – PRODUCTS
- Tennis Net and Post System
- Pickleball Net and Post System
- Basketball Hoop
- Dugout Roof Structures
- Baseball In Line Backstop Netting System
- Premium Fence Guard

PART THREE – EXECUTION
- Installation
- Net Post Foundation and Center Net Strap Anchor Foundation
- Basketball Hoop
- Dugout Roof Structures
- Baseball In Line Backstop Netting System
- Premium Fence Guard
- Clean Up

RELATED WORK

Applicable provisions of Division 01 govern work under this section.

SUBMITTALS

Submit detailed shop drawings documenting materials of construction, installation requirements and conformance with USTA (United States Tennis Association) and NFHS (National Federation of State High School Associations) requirements.

QUALITY ASSURANCE

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

PRODUCT DELIVERY AND STORAGE

Receive and examine materials delivered to the site, inspect for damage or defects during shipping. Note and report any defects to LA/E. Re-order necessary replacements immediately to minimize any conflict with construction schedule. Store materials above ground under protective cover or indoors to provide proper protection.

PART TWO – PRODUCTS

TENNIS NET AND POST SYSTEM

System shall meet USTA requirements and shall consist of the following components:

Color:	Black
Manufactures:	Douglas or equal
Model:	Douglas premier RD Tennis Post 3” OD
Contact:	John Moynihan, Keeper Goals, 800-594-5126

Net Posts and Net Tensioning System:

Galvanized Steel Ground Sleeves in concrete footing
3” OD round galvanized steel SS40 ground sleeves for post tensioned expansion and contraction.
Complete with welded lacing rods, cast aluminum alloy caps and gear housings
Baked-on polyester powder coat finish; Black
Chrome plated handle protection
Internally wound with self-locking gear
Plated steel gears
Case hardened small gear
30:1 gear ratio
Removable handle
5 year warranty

Center Net Anchor:

Galvanized 2” steel pipe anchor set in concrete foundation per detail on Drawing
9” minimum length one anchor at center of each net

Net:

Douglas TN-45 Tennis Net or equal
One net per court
Meet USTA requirements for official size (42’ x 3’6”)
1-3/4” x 3.5mm square mesh braided solid core polyethylene
325 lb. break strength
½” dia. fiberglass side dowels; 2 per net
5 Year Warranty

Provide one adjustable center strap per net:

Strap material: heavy-duty 2” polyester white web
Nickel plated web slides and snaps
2” cam buckle, with swivel loop bolt snap

Headband:

Vinyl Coated Polyester
2-ply, 48 oz.
Lock-sewn with four rows of 32# white polyester thread
Side and bottom tapes double lock-stitched with black polyester thread

PICKLEBALL NET AND POST SYSTEM

Conform to USAPA, USTA and ASBA requirements

Color:	Black
Manufactures:	Douglas, or equal
Model:	Douglas Premier RD-36 Pickleball Posts, Center Strap Anchor & Net
Contact:	John Moynihan, Keeper Goals, 800-594-5126

Net Posts and Net Tensioning System:
3" OD Round 11 Gauge Steel
Internal Wind 30:1 Self Locking Gears
Welded Lacing Rods
Die-Cast Zinc Caps and Gear Housings
Polyester Powder Coat Finish, Available Forest Green #63070, and Black #63071 (Color to be selected by Owner)
Galvanized Steel Ground Sleeves in concrete footing. 3” OD round galvanized steel SS40 ground sleeves for post tensioned expansion and contraction.

Center Net Anchor:
Galvanized 2” steel pipe anchor set in concrete foundation per detail on Drawing
9” minimum length one anchor at center of each net

Net:
Douglas PN-30 Pickleball Net, One (1) net per court
3.0mm Solid Core Knotted Braided Polyethylene with 285 lb. Break Strength
Single Ply Vinyl Coated Polyester Headband 32 oz./sq. yd.
Black Vinyl Side Pockets with Fiberglass Dowels
Net Dimensions: 31" high X 21'9" long

BASKETBALL HOOP
In accordance with details on drawings. Drill footing hole with casing.

DUGOUT ROOF STRUCTURES
3” O.D. galvanized support posts with 3/8”x8”x8” base plate. 29-guage corrugated pre-cut roof sheeting. Powder coated 8” deep x 14-guage channel girts roof framing.

Manufacturers:	Keeper Goals, or equal
Model:	DC-10-20
Post Color:	Black
Girts and Frame Color:	Black
Top Roof Color:	Regal Blue, Owner to Approve
Contact:	John Moynihan, Keeper Goals, 800-594-5126

BASEBALL IN LINE BACKSTOP NETTING SYSTEM
In Line Post to Post Tension Backstop System – 30-foot height. Connect to top of 3.5’ backstop fence under fence guard (bottom cable of netting to be at 3.25’ above grade).

Manufacturers:	Keeper Goals, or equal
Model:	In line post to post tension backstop system (19’x19’x19’ – See layout plan). All poles to have a powder coated black finish.
Net:	Black #36 nylon net – N-361 FR, 340 lb. break strength
Basis of Design:	Netting system posts and foundations designed to withstand 105 mph wind event with net (ASCE 7-10 Per IBC 2015), Exposure C, Risk Category I
Minimum Post Size:	6” Sch. 40 (6.625” O.D.) Steel Pipe – Direct Buried
Minimum Footing Size:	36” diameter x 7’-6” deep concrete footing (top of footing to be held 5” below grade). Drill footing hole with casing.
Contact:	John Moynihan, Keeper Goals, 800-594-5126

Complete system of protective netting and associated hardware to suspend from backstop net posts creating backstop net system including connecting to chain link fences, all-weather hardware for hoisting, deploying and stabilizing net from backstop posts.

PREMIUM FENCE GUARD
Top of chain link fence, guard system

Manufacturers: Keeper Goals, or equal
Color: Royal Blue, color to be approved by Owner.
Location: All proposed chain link fence heights.
Material: UV resistant polyethylene (Match existing baseball fence guard product)
Contact: John Moynihan, Keeper Goals, 800-594-5126

PART THREE – EXECUTION

INSTALLATION
In accordance with Manufacturer's recommendations.

Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

NET POST AND CENTER NET STRAP ANCHOR FOUNDATIONS
Contractor shall provide Portland cement concrete foundations using concrete meeting the requirements of Section 03 00 00, Concrete. Concrete footings shall be circular-shaped with sides that are a minimum of 24" in diameter. Install tennis court net posts and foundations in accordance with manufacturer's recommendations and details on Drawings.

BASKETBALL HOOP
Contractor shall provide Portland cement concrete foundations using concrete meeting the requirements of Section 03 00 00.

Install post, backboard and hoop in accordance with manufacture's recommendations and details on Drawings.

DUGOUT ROOF STRUCTURES
Install dugout roof structures in accordance with manufacture's recommendations and in the locations on Drawings.

BASEBALL IN LINE BACKSTOP NETTING SYSTEM
Contractor shall provide Portland cement concrete foundations using concrete meeting the requirements of Section 03 00 00.

Install baseball in line backstop netting system in accordance with manufacture's recommendations and details on Drawings.

PREMIUM FENCE GUARD
Install premium fence guards in accordance with manufacture's recommendations and in the locations on Drawings.

CLEAN UP
Dispose of excessive material.
All pipe, concrete, fabric and miscellaneous parts shall be removed from site.
Grade subgrade to within 1" of finish subgrade after work is completed.

End of Section

SECTION 26 05 00 - ELECTRICAL CONTRACT REQUIREMENTS

PART ONE - GENERAL

APPLICABLE PROVISIONS

Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work under this Section.

APPLICABLE PUBLICATIONS

Publications, standards and listing requirements called out in the Sections of this Division of Labor shall form a part of these specifications as if contained herein.

The requirements of the Contract Documents, including the General Conditions, and Supplementary Conditions, and Division 01 - General Requirements, apply to this section except as modified herein.

DESCRIPTION OF WORK

Sections Included:

Section 26 05 00 - ELECTRICAL CONTRACT REQUIREMENTS
Section 26 05 01 - PROJECT SPECIAL CONDITIONS
Section 26 05 04 - DOCUMENTATION
Section 26 05 19 - WIRE AND CABLE
Section 26 05 26 - GROUNDING
Section 26 05 29 - SUPPORTING DEVICES
Section 26 05 34 - RACEWAYS
Section 26 05 35 - ELECTRICAL BOXES
Section 26 05 53 - ELECTRICAL IDENTIFICATION
Section 26 24 16 - PANELBOARDS
Section 26 27 26 - WIRING DEVICES
Section 26 56 00 - ATHLETIC FIELD LIGHTING

Work Included:

The work covered by this Division of the specifications includes the furnishing of all labor, materials, tools, equipment, permits, certificates and temporary protection necessary for or incidental to executing and completing the electrical work, communications work, and work on related systems.

All work shall be as specified and indicated on the drawings unless specifically excepted on the drawings or herein.

Read all other Divisions of the Specifications which are applicable to this work, including the General Conditions section applicable to all bidders.

The Electrical Contract Requirements section is a supplement to and not a replacement for the project General Conditions section.

In cases of conflict with information in the General Conditions, the more stringent of the contract requirements shall be considered applicable.

Prior to submitting bid, call to the attention of the Electrical Engineer any material or apparatus believed to be inadequate or any necessary items or work omitted.

Address any questions regarding the interpretation of the plans and/or specifications at least 12 days before the bid opening.

The Electrical Engineer reserves the right to interpret his own specifications and plans after bids are received, and to demand that the installation conform to his intent.

Failure to become acquainted with existing conditions at the site shall in no way relieve the responsibility for making installation in conformance with plans and specifications without additional cost to the owner.

Examination of Plans, Specifications and Site:

Before submitting a bid, the bidder shall familiarize himself with all features of the building and site which may affect the execution of his work.

No extra payment will be allowed for the failure to obtain this information.

If there are omissions or errors in the plans or specifications, they shall be clarified with the architect prior to submitting bid.

For all remodeling projects, a site visit to the premises, for the purpose of the noting of all existing conditions which may affect work is required.

Knowledge of all existing conditions, which may affect work in a renovation project, shall be included in the preparation of bid.

Lack of information on existing conditions shall not be allowed for a valid cause for additional compensation.

Codes, Permits, and Inspection Fees:

All work and materials shall conform in every respect to the current rules and requirements of the National Fire Protection Association, National and State Electrical Codes, Local Codes and Ordinances, Local Utility Regulations and OSHA.

Give to the proper authorities all required notices relating to the project, obtain all official permits and licenses required, pay all fees incidental thereto, deliver upon completion of the work and without cost to the Owner all required certificates of inspection and approval.

RELATED WORK ELSEWHERE

Applicable provisions of Division 01: General Conditions shall govern work in this section.

All other Divisions of the Specifications which are applicable to or interface with work in Division 26 05 00.

SHOP DRAWINGS

Submit shop drawings in accordance with Section 26 05 04.

Submit shop drawings following Section specific Shop drawing submittal guidelines.

OPERATION & MAINTENANCE MANUALS

Submit operation and maintenance manuals in accordance with Section 26 05 04.

Submit operation and maintenance manuals following Section specific shop drawing submittal guidelines.

QUALITY ASSURANCE

Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

Acknowledge acquaintance with the plans and specifications and their respective requirements.

Guarantee that the electrical system has been installed strictly in accordance with the electrical plans and specifications using only the best of materials available, installed in a substantial manner by experienced labor.

Various components of the electrical system shall be placed in service prior to completion date as instructed by Owner. This shall not change the guarantee period which shall be one year after acceptance by Owner.

Replace and/or repair any items failing from causes of faulty workmanship, materials or design without cost to Owner at any time within one year from date of final acceptance.

WARRANTY

Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship. This does not apply to the Musco or alternate sports lighting products.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART TWO - PRODUCTS

GENERAL

It is the intent of these specifications that all the necessary material, apparatus, and devices to complete the installation as specified herein, except such parts as are specifically excepted, shall be provided.

If an item is either shown on the plan or called for in these specifications, it shall be considered sufficient of said item in this contract.

All sizes given are as minimum.

Material and labor shall be first class and workmanlike and to the satisfaction of the Electrical Engineer and shall be subject to inspection test and approval at all times from commencement until acceptance of completed work.

Manufacturers shall be responsible for providing material listed by U.L. or other approved agencies, and all governing codes and ordinances.

All material must bear U.L. and/or other approved labels where possible.

Items specified by catalog number or brand name and approval of shop drawings will not relieve the manufacturer of this responsibility.

MATERIALS: ALTERNATE MATERIALS

Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type of catalog number such designation is to establish standards of desired quality and style and shall be the basis of the bid.

Substitutions shall not be made unless there are "equals" listed in the specifications or on the plan.

Substitutions may be bid as alternates.

Burden of proof that materials are equal shall be upon bidder requesting their use; therefore, bidder shall furnish, with their request for approval all supporting data.

Assume responsibility for substituted material and state name of manufacturer, type or brand or equipment and addition to or deduction from base bid.

Materials and equipment must meet all requirements as to type, quality, function, appearance and physical dimensions shown.

Assume responsibility for any costs to other Divisions as a result of the use of alternate materials.

Submit supporting data to Architect/Electrical Engineer within 15 days after the bid date.

PART THREE - EXECUTION

EXAMINATION

Equipment Submittal Drawings:

Within 45 days after a notice to proceed and prior to ordering equipment, furnish to the Electrical Engineer submittal drawings for review (see section 26 05 04).

Review of any submittal drawings does not waive any condition of the specifications unless specifically noted thereon.

No fabrication or ordering of equipment shall be started until reviewed drawings are returned.

FIELD MEASUREMENTS

Job Drawings:

Maintain, at the job site, one (1) complete set of up-to-date plans and written specifications, complete with all addenda items.

This complete plan and specification set shall be reserved for all field markings to show minor revisions and detailed construction notes.

These marked plans shall be returned to the Electrical Engineer prior to contract completion and final payment.

Assist the Electrical Engineer in transferring applicable field notes to the project drawings for record purposes.

DELIVERY, STORAGE AND HANDLING

Material on Site and Storage:

Maintain proper care and storage of material and equipment on site.

Any material damaged by rust corrosion, warping, breakage, finish damage, etc. shall be replaced by the Contractor to the satisfaction of the Engineer.

INSTALLATION

Field Change Orders:

No revisions to the contract price shall be allowed unless such revisions have been authorized in writing by both Owner and the change order submitter.

All work completed prior to completion of a written contract change order will not be compensated for by the Owner.

Any work item that is proposed to perform, on the basis of a proposed contract adder, must be announced in advance such that time is available for the Architect, Owner and the Electrical Engineer to determine if a change in contract price is allowable.

Change Orders:

Change orders may be requested as a part of this project.

Assume the following in regard to change orders:

Work and equipment associated with change orders shall be installed per the specified equipment on this project.

All change orders shall be accounted for on as-built drawings.

Change order additions to special systems where riser diagrams have been furnished, shall be included as a part of the riser diagram.

A breakdown of all costs associated with the change order is required.

The cost breakdown shall be as follows:

Itemized list of all materials.

Materials shall be priced at Best Column in a national pricing service book.

Cost for subcontractor services.

Subcontractor services shall be shown as actual costs from subcontractor.

Material mark-up.

Maximum allowed is 8%.

Number of hours of labor at standard charge out rate.

Tax on material.

Total change order cost.

If equipment or materials are deducted as a part of this change order, credit shall also be shown on change order.

Installation: General

Connections to Equipment Furnished By Others.

Included in Division 26 are electrical connections to equipment provided by others.

Refer to final shop drawings for equipment provided by other divisions for exact location of electrical outlets and the connections required.

Provide energization to the equipment furnished by other Divisions only at the request of the providing party.

Assume that once the equipment has been started up, that it shall be shut off unless it is requested that it be left on by the providing party.

Only start up and turn on equipment if requested so by the party providing said equipment.

If required, power shall not be activated to the equipment until qualified starting personnel are on site.

After making a permanent power connection, the breaker shall be left in an off position and a "hold" tag or some other device be utilized to keep the power turned off to the equipment.

Equipment Access & Location.

All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance.

Any relocation of conduits, equipment, or accessories required to provide maintenance access shall be accomplished at no additional cost.

Equipment shall be installed with ample space allowed for removal, repair or changes to the equipment.

Ready accessibility to equipment and wiring shall be provided without moving other equipment which is to be installed or which is already in place.

Locate electrical outlets and equipment to fit the details, panels, decorating or finish at the space.

The Architect shall reserve the right to make minor position changes up to 10' of the outlets before the work has been installed.

Verify door swings before installing room lighting switch boxes, and install boxes on the latch side of door unless noted otherwise.

Furnish information as to exact location and size of sleeves for openings for new construction.

Provide and set in place all required sleeves, inserts, forms, etc. and coordinate this work with all other divisions of work.

Cutting and patching.

Beams or columns shall not be pierced without permission of the Architect and then only as directed.

If any openings are required through walls or floors where no sleeve has been provided, the hole for the sleeve shall be core drilled to avoid all unnecessary damage and structural weakening.

Provide all cutting and patching required for complete installation of systems unless specifically noted elsewhere.

All new or existing work cut or damaged shall be patched and restored to its original condition.

Coordinate the location of sleeves, openings, chases, furred spaces, etc.

Provide during the progress of construction all sleeves, hangers and inserts that are to be built into the structure.

Provide sleeves for cables passing through masonry, concrete or other similar construction.

Sleeves shall be of metal conduit and shall extend completely through the construction.

Conduits or cables penetrating smoke or fire barriers must not destroy the barrier's integrity.

Grout openings between sleeves and concrete or masonry walls and floors.

Pack annular space between sleeves and conduits with fiberglass.

Where penetrations occur through fire rated walls or floors, fill space with fire resistive caulk.

Wherever cables must pass through fire or smoke rated walls or floors, provide approved, sleeved, foam filled fire stops around cables as manufactured by O.Z., Dow, Square D, or equal.

Provide all materials required for patching unless otherwise noted.

Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished and left in the condition existing prior to commencement of work.

Excavation and backfill.

Lines passing under foundation walls shall have a minimum of 1 1/2 inch clearance.

Care shall be taken to insure no disturbance of bearing soil under foundations.

Attachments and supports.

Be responsible for proper fittings and support for each item of equipment and materials installed under Division 26.

Be responsible for the proper application, installation and location of all necessary and required inserts, supports and anchor bolts.

Where same are to be installed by other Divisions of work, supply same to the contractor in whose work they occur with instructions for placement and proper installation.

Establish the method and nature and select accessories necessary for proper support appropriate to item and point of attachment with due consideration given to ambient/environmental conditions and service duty.

Attachments, supporting devices and accessories shall be specifically designed for the application, suitable for the duty imposed in service and acceptable to the Architect.

Attachments shall be made to structural components of the structure in such manner not to jeopardize the integrity of the structure and otherwise consistent with trade practices.

Generally, anchors shall be concrete insert type in poured concrete and drilled expansion type in precast concrete.

Powder actuated anchors shall not be used in concrete work.

Provide all mounting backboards as required to mount electrical and electronic equipment.

That equipment which is normally assumed to be mounted on some type of a backboard shall be mounted on backboards provided by Division 26.

All mounting backboards used by the contractor shall be 3/4" AC grade marine duty plywood.

All plywood shall be painted on both sides and edges with two coats of fire resistant gray enamel paint.

Provide back mounting panels to meet this specification.

Steel channel interior to be painted or galvanized.

Exterior conduit mounting channel shall be stainless steel.

All sleeves to be furnished and installed by Division 26.

Installation: Trial Usage of Electrical Systems

The Electrical Engineer has the privilege of the trial usage of electrical systems or parts thereof for the purpose of testing under load the new installation and learning the operational procedures.

The trial usage shall be continued for a length of time as deemed reasonable by the Electrical Engineer and all related costs shall be included in the bid, with the exception of the electrical power cost which will be paid by the Owner.

The operations shall be carried out only with the express knowledge and under supervision of the responsible sub-trade who shall not waive any responsibility because of trial usage.

While trial usage will be kept to a minimum, it shall not be construed as acceptance by the Electrical Engineer.

Installation: Cooperation/Coordination

Coordinate and cooperate with other Divisions of work and Owner by scheduling and installing work to facilitate the construction progresses and the Owners use of the building.

Any deviation from contract plans shall be approved by the Electrical Engineer before proceeding.

Study the plans of other trade divisions of work and to fit work into the work of others in a coordinated manner.

Lay out work and be responsible for measurements.

Check facilities provided by others which require electrical connections and provide outlets suitably located for them.

Take such measurements as may be necessary to assure approved fitting and proper installation of his work and all other work depending thereon.

Cooperate with other contractors to avoid complications between the installation of electrical equipment and equipment installed by others.

Installation: Finish and Painting

Equipment and materials such as transformers, panels and switches, shall be furnished with the manufacturer's standard finishes, consisting of a prime coat and baked enamel finish coat, unless otherwise noted.

Roof mounted equipment and other exterior materials including support hardware shall have a factory or field applied prime coat and finish coat of color selected by the Owner's Representative.

In general painting will be done by other trades. Assume responsibility to coordinate work with the painters so that all equipment is installed prior to painting.

Assume responsibility for additional expense required to paint support channels, panel trims, flush junction box covers, fixture hangers and other electrical devices not in place prior to normal routine painting.

An undamaged finish is required on all equipment.

If finish becomes rusted, corroded, scratched, or flaked during storage or installation, be responsible for refinishing the equipment to the satisfaction of the Architect.

Finish painting on the job site is not required by the electrical contractor, except where noted.

Refer to other areas of this Division 26 for painting of equipment furnished by the Division 26.

Where painting is required to be done by the electrical contractor, the painting shall be done in accordance with the painting portion of the general specification.

Installation: Damage to Other Work

Assume responsibility for all damages resulting from the execution of work under Section 26 05 00.

Assume responsibility to adequately protect Division 26 work at all times.

All damages resulting from their operations shall be repaired, or the damaged portions replaced by the party originally performing the work (to the entire satisfaction of the Architect), and all cost thereof shall be borne by those responsible for the damage.

Installation: Clean-Up

At all times, keep the premises free from excessive accumulation of waste materials or rubbish resulting from work, including tools, scaffolding, and surplus materials and leave work room or its equivalent, clean.

In case of dispute, the Architect may order the removal of such rubbish and charge the cost to the responsible Division of work as determined by the Architect.

At the time of final clean-up, all fixtures and equipment shall be thoroughly cleaned and left in proper conditions for their intended use.

Installation: Drawing Schedules and Details

The electrical drawings include a number of standard and job specific details.

These details may or may not be specifically referenced on the drawings and in the specification.

Assume that even if the detail is not specifically referenced, that it shall apply to this project. (As an example, if a detail is shown for the exterior mounted receptacles, but the detail is not referenced from the plan sheets, the contractor shall assume that all exterior mounted receptacles shall be installed per the detail.)

Details and schedules are shown as a means to aid the electrical contractor and are not meant to be all inclusive of all devices.

Assume responsibility for making takeoff of equipment required, (i.e., additional circuit breakers, motor connections, etc.) and ancillary equipment and appurtenances for a complete connection or circuit.

Verify all sizes of electrical equipment with shop drawings and nameplate rating of the equipment it serves.

Installation: Coordination Drawings

Prepare coordination drawings to a scale of ¼" = 1'0 or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components.

Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the work, including, (but not limited to) the following:

Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:

Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.

Exterior wall and foundation penetrations.

Fire-rated wall and floor penetrations.

Equipment connections and support details.
Sizes and location of required concrete pads and bases.

Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

Locations include, but are not limited to, electrical rooms and other specialty electrical and communication rooms where equipment is being provided.

Installation: Bid Drawings

It must be understood that electrical drawings and details bid drawings are diagrammatic.

Electrical drawings and details bid drawings are not intended to be shop drawings.

It is expected that it may be necessary to move conduit, outlets and/or equipment in some cases to get coordinated installation and such changes are considered a part of the Contract obligation without cost to the Owner.

No outlets or equipment shall be located where the usefulness and/or operation will be affected by the work of other trades, door swing, counter, equipment, etc.

Installation: Contract Termination Requirements

Furnish Owner with service manuals for all items furnished under this Contract.

Service manuals shall be complete with drawings, diagrams, operations and installation instructions and parts lists.

OWNER TRAINING

Provide as outlined per section.

SPARE EQUIPMENT

Provide as outlined per section.

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 01 - PROJECT SPECIAL CONDITIONS

PART ONE - GENERAL

APPLICABLE PROVISIONS
This specification covers those conditions that are particular to this project. This section further explains and outlines other portions of these specifications.

PART TWO - PRODUCTS

ELECTRIC UTILITIES
Electrical Service:
WE Energies
ATTN: Molly Kocken
Office: 920-380-3277
Email: molly.kocken@we-energies.com

Service cost included as part of the EC bid; See Allowances.

METER CENTER W/ MAIN SERVICE DISCONNECTS
Provided per Division 26.

Provide a meter center with a 400-amp bus, 2-sockets and (2) 200-amp main disconnect switches. Provide per utility requirements.

CONCRETE BASES AND PADS
Provided per Division 26.

MULTI-POLE CIRCUITS
Multi-pole circuits are not allowed for single-phase line to neutral loads.

ALLOWANCES
All handling costs, profit margin, overhead, and taxes are assumed to be included in the contract, and thus the allowance cost is the actual contractor cost. If the allowance amount indicated is more than the actual cost, deduct this cost from the allowance amount, and the balance shall be deducted from the electrical contract by change order. In similar fashion, any costs above that shown on the allowance, shall be reimbursed to the contractor at his cost and will be added to the contract by change order.

For those items which require material and labor, the material and labor will be priced per the change order method listed in specification section 26 05 00.

Provide the following allowances:

Electrical utility allowances for new electric service: $20,000

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 04 - DOCUMENTATION

PART ONE - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

FINAL TESTS AND DEMONSTRATIONS

Test all work and all equipment installed to ensure its proper and safe operation. Check all interlocking and automatic control sequences and test the operation of all safety and protective devices. Rectify all defects. Coordinate this work with the Power Company, supplier's representative and all other persons as directed by the OWNER or his representatives, in order to achieve the proper and intended operation of all equipment.

Test, adjust and record operating voltages at each system level before energizing branch circuits. Transformer taps must be adjusted to obtain as near as possible nominal system voltage. Where transformer is under Utility jurisdiction, obtain services of Utility to correct voltage. Be responsible for replacement of all devices and equipment damaged due to failure to comply with this requirement.

Balance load among feeder conductors at each panelboard and reconnect loads as may be necessary to obtain a reasonable balance of load on each phase. Electrical unbalance shall not exceed 10%.

Provide all instruments and equipment necessary to perform required tests.

All checks and tests shall be permanently recorded and made available to the OWNER or his representatives. The tests shall include:

System grounding

Fuses:

Equipment nameplate requirement

Actual fuse rating

Breakers:

Nameplate

Actual rating

The above reading shall be made for all fuses, breakers, and parallel cables installed as part of this contract and connected to by Division 26. This testing shall be for all new equipment, whether furnished by the electrical contractor or not.

Upon request, demonstrate proper operation of all electrical systems and equipment in the presence of the Architect’s Consulting Electrical Engineer and/or other designated persons.

PROJECT CLOSEOUT CHECKLIST

Submit the following:

ITEM	SUPPLIED TO:	CHECK OFF
Accounting of all cash allowances as detailed in spec section 26 05 01. Submit invoices from utilities.	ENGINEER	_____
Letter stating all specified spare equipment was delivered to owner. The letter should list the equipment supplied.	ENGINEER	_____
O&M Manual	ENGINEER	_____
Certificate from systems suppliers stating that the system was started up, tested and owner's instructions were given. Certificate shall have date of instructions and test and shall have the owner's representative's signature.	ENGINEER	_____
Copy of marked up record drawing.	ENGINEER	_____
Provide warranty for all equipment.	ENGINEER	_____

End of Section

SECTION 26 05 19 - WIRE AND CABLE

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

NFPA 70 – National Electrical Code.

ANSI/TIA/EIA-568-B.2.

National Electrical Contractors Association (NECA), Standard of Installation, current edition.

National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.

Underwriters Laboratories, Inc. (UL).

DESCRIPTION OF WORK
Furnish and install a complete and operable wire and cable system as indicated on the drawings and as specified herein.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

OPERATION & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

The following information shall be submitted in addition to the items listed above:

Manufacturer literature in scope to demonstrate compliance with the requirements of this specification.

Clearly identify the types of wire and cable proposed.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

Wire and cable manufacturers shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development and production in accordance with ISO 9001.

All materials, equipment, and parts shall be new and unused of current manufacture.

Provide all necessary accessories required for a complete and operable system.

WARRANTY

Wire and cable shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL

Approved manufacturer:

Contractor's option.

All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

WIRE AND CABLE – GENERAL PURPOSE (600V)

General:

THWN or THHN general purpose building wire insulated with polyvinyl chloride (PVC) and covered with protective sheath of nylon intended for lighting and power circuits at 600 volts or less, in residential, commercial, and industrial buildings.

The wire shall be suitable for 90ºC maximum continuous conductor temperature in dry locations and 75ºC in wet locations and listed by Underwriters Laboratories for use in accordance with Article 310 of the National Electrical Code.

Conductors:

Class B or Class C stranded, annealed uncoated copper per UL Standard 83 or 1063.

Insulation:

Each conductor shall be insulated with PVC and sheathed with nylon complying with the requirements of UL Standard 83 for Types THHN or THWN and UL Standard 1063 for Type MTW and CSA C22.2 No. 75 for T90 Nylon.

Types THWN or THHN shall comply with the optional Gasoline and Oil Resistance rating of UL Standard 83. The insulation shall also comply with UL requirements for 105ºC Appliance Wiring Material.

The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL Standard 83 for TWHN or THHN. The minimum thickness at any point, of the PVC insulation, shall be not less than 90 percent of the specified average thickness.

The minimum thickness at any point of the nylon sheath shall be as specified in UL Standard 83 for Types THWN or THHN.

The PVC insulation shall be applied tightly to the conductor and shall be free-stripping

Identification:

The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations, and optional ratings. The wire shall also be identified as C (UL) Type T90 Nylon or TWN 75, FT1.

Tests:

Wire shall be tested in accordance with the requirements of UL Standard 83 for Types THWN or THHN wire and for the optional Gasoline and Oil Resistance listing; as Type MTW to UL Standard 1063 (stranded items): as AWM to UL Standard 758 (stranded items); and as C(UL) Type T90 Nylon or TWN75.

Usage:

General use power wiring, minimum size No. 12 AWG.

General use control wiring, minimum size No. 14 AWG.

WIRE AND CABLE – UNDERGROUND (600V)

General:

USE-2 or XHHW-2, cross linked, polyethylene insulated cables for use in circuits; not exceeding 600 volts. Cables listed by UL as Type USE-2 and recognized for underground use in wet locations at a maximum continuous conductor temperature of 90ºC in accordance with Article 338 of the National Electric Code.

Installed in air, conduit, or other recognized raceways in accordance with Article 310 of the National Electric Code.

Conductors:

Conductors shall be Class B stranded annealed uncoated copper per UL Standard 854 and 44.

A suitable separator over the conductor may be used at the option of the manufacturer.

Insulation:

Each conductor shall be insulated by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, and type designations.

Tests:

Wire shall be tested in accordance with the requirements of UL Standard 8654 for Type USE-2, UL Standard 44 for Types XHHW-2.

Usage:

Underground power wiring, minimum size No. 12 AWG.

WIRING CONNECTORS

Polaris Type Mechanical Connectors:

8 AWG and larger wire for all motor connections.

Spring Wire Connectors:

10 AWG and smaller wire.

Compression Connectors (T&B Sta-Kon or equal):

For those devices that are not rated to accept stranded wire.

PART THREE - EXECUTION

EXAMINATION

Verify that wire is in compliance with specifications.

Verify that interior of building has been protected from weather.

Verify that mechanical work likely to damage wire and cable has been completed.

Inspect wire for physical damage and proper connection.

Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

Verify continuity of each conductor.

Feeder or branch circuits with ampacity greater than 100 amperes shall be tested after installation to measure insulation resistance of each conductor.

All equipment shall be disconnected and the wire ends shall be cleaned and dried.

Connect Megohmeter between conductor and a grounded point in the enclosure and energize until the reading stabilizes.

The Megohmeter reading for each conductor shall not be less than 10,000 Megohoms.

FIELD MEASUREMENTS

Field verify all measurements. Do not base on contract drawings.

Identify conflicts with the work of other trades prior to installation of work.

Adjust system to satisfy field requirements.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Maintain original quality and condition of wire while it is in storage.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

Pre-Installation:

Verify that interior of building has been protected from weather.

Verify that mechanical work likely to damage wire has been completed.

Completely and thoroughly swab raceway prior to installation.

Verify that field measurements are as shown on drawings.

Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable to satisfy project conditions.

Where wire and cable routing are not shown, and destination only is indicated, determine exact routing and lengths required.

Determine required separation between cable and other work.

Determine cable routing to avoid interference with other work.

Conductor Sizing:

Conductor sizes are based on copper.

Use conductor not smaller than No.12 AWG for power and lighting circuits.

Use No.10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.

Use No. 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.

Where circuit wiring length exceeds 100 feet, increase wire size as needed to maintain a maximum voltage drop of three percent.

Use conductor not smaller than No.14 AWG for control circuits.

Wire and cable size shall be increased from size indicated or required by code to meet the following voltage drop requirements:

3% drop for branch circuits.

5% drop for motor circuits.

Wire Pulling:

Pull all conductors into raceway at same time.

No.4 AWG and larger wire and power cables shall be lubricated with pulling lubricant to reduce pulling tension and abrasion damage. The lubricant shall be water or wax based containing no oils or greases that may adversely affect cable jackets.

The minimum bend radius and maximum pulling tension ratings of the wire and cable shall not be exceeded.

Splices and Terminations:

Splices and terminations shall not be made within raceways.

Clean conductor surfaces before splicing or terminating.

Make splices, taps, and terminations to carry full amp capacity of conductors with no perceptible temperature rise.

Wire nuts, “ScotchLocks”, and similar devices may be used to splice 120V power circuits.

Control, communication, and data transmission wire and cable shall not be spliced.

Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels or support for the ceiling suspension system per NEC.

Neatly train and lace wiring inside boxes, equipment, and panelboards.

Clean conductor surfaces before installing lugs and connectors.

Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Use polaris type mechanical connectors for copper conductor splices and taps, 8 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

Wire Marking:

The ends of each conductor shall be marked with circuit number, motor number, wire or terminal number.

Labels shall be typed in black lettering with indelible ribbons on a white, heat shrink sleeve. Markers shall be shrunk around the wire to provide a tight, non-slip bond with a compatible heat gun.

Heat shrink wire markers shall be Brady Bradysleeve Type B-321 or B-322

Ground Wire Color Coding:

Provide green insulated ground wire for #8 and smaller. #6 wire shall have green band per code.

End of Section

SECTION 26 05 26 – GROUNDING

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

Conform to current Underwriters Laboratories (UL) Specifications and Standards.

Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

Product specific standards and requirements are included in product specifications.

DESCRIPTION OF WORK
Furnish and install a complete and operable grounding and bonding system as indicated on drawings and specified herein.

Ground and bond all equipment required per all applicable codes whether or not specifically shown on drawings.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

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

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

Submit a written warranty executed by the installer indicating ground test was completed.

PART TWO - PRODUCTS

GENERAL
All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

Provide a complete and fully functional grounding system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

GROUND RODS

Material: Copper-clad steel.

Diameter: 3/4" minimum.

Length: 10' minimum. Rod shall be driven at least 9'5" deep.

MECHANICAL CONNECTORS

The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lock washers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two bolt type.

Split bolt connector types are not allowed.

The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

COMPRESSION CONNECTORS

The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent.

The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

The connectors shall be clearly marked with the manufacturer, catalog number, conductor size, and the required compression tool settings.

Each connector shall be factory filled with an oxide-inhibiting compound.

EXOTHERMIC CONNECTIONS

Select the appropriate kit for specific types, sizes, and combinations of conductors and other items to be connected. Field personnel shall be trained in execution of welds.

WIRE

Material: Stranded copper

Grounding Electrode Conductor: Size as shown on drawings, specifications, or required by NFPA 70, whichever is larger.

PART THREE - EXECUTION

EXAMINATION

Inspect grounding and bonding system conductors and connections for tightness and proper installation.

FIELD MEASUREMENTS

Field verify exact routing of all backbone cable.

Adjust grounding system installation to satisfy field requirements.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

INSTALLATION

General:

Provide a separate, insulated equipment grounding conductor in all raceways.

Receptacle grounding:

For all receptacle circuits, provide separate green ground wire in raceway system.

Standard receptacles may be used, and green wire shall be directly connected to receptacle or to pigtail.

Provide #12 pigtail to ground all metal boxes.

Stranded wire twisted on ground terminal on device is not allowed.

Ground Rod Installation:

Install ground rods to be 10’ 6” deep.

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 29 - SUPPORTING DEVICES

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

Conform to current American National Standards Institute (ANSI) standards.

Conform to current American National Standards Institute ANSI B31.1 standards.

Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

DESCRIPTION OF WORK
Furnish and install complete and operable support devices as required.

Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

Equipment and materials shall be supported with devices designed for such purpose. Wire or plastic ty-raps area not acceptable.

Where so specified on the drawings, provide stainless steel, PVC covered, or hot dipped galvanized.

Refer to drawings or other portions of the specifications for particular pieces of equipment which may require more stringent equipment specifications than listed in this specification.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

WARRANTY
Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL

All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

SUPPORTING STRUCTURES

Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.

Weld sections, do not use bolts.

CONDUIT SUPPORTS

1- hole galvanized steel straps for EMT, 2-hole galvanized steel straps for all other conduits. Do not use perforated hanger iron.

PART THREE - EXECUTION

EXAMINATION

Verify locations prior to rough in.

Verify mounting details

FIELD MEASUREMENTS

Verify that field measurements are as shown on Drawings.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Accept equipment on site. Inspect for damage.

Protect equipment from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

Do not fasten supports to pipes, ducts, mechanical equipment, or other conduit.

Do not use spring steel clips on ceiling support wires.

Do not use powder actuated anchors.

Obtain permission from Architect before drilling or cutting structural members.

Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present a neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

Install surface mounted cabinets and panelboards with minimum of four anchors.

In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

Use steel metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

Degrease and clean surfaces to receive nameplates and labels.

Install nameplate and label parallel to equipment lines.

Secure nameplates to equipment fronts using screws if so specified on drawings.

Anchors:

Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and transfer of loading and stresses to connected equipment.

Installation methods shall be in conformity with manufacturer's recommendations for maximum holding power.

Conduit Supports:

Support conduit as follows:

Vertical Surfaces: Galvanized, heavy-duty, sheet steel straps.

Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required; supported with threaded hanger rods.

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 34 – RACEWAYS

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

Conform to current National Electrical Manufactures Association (NEMA) Standards.

Conform to current Underwriters Laboratories (UL) Specifications and Standards.

Conform to current Telecommunication Industry Association (TIA/EIA).

Conform to current American National Standards Institute (ANSI) standards.

Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

Product specific standards and requirements are included in Product Specifications.

DESCRIPTION OF WORK
Furnish and install a complete and operable conduit/raceway system as indicated on the drawings and as specified herein.

All wire shall be in conduit or surface raceway.

Materials Included:

- Metal conduit.
- Flexible metal conduit.
- Liquidtight flexible metal conduit.
- Electrical metallic tubing.
- Nonmetallic conduit.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

OPERATION & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

WARRANTY

Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL

All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

CONDUIT GENERAL REQUIREMENTS

Minimum Size: 1/2 inch.

Conduit types not listed below are prohibited.

Rigid heavy wall galvanized steel conduits:

Are to be used in the following locations:

Outdoors.

Underground, unless PVC is shown on drawings or called out in other portions of this specification.

In and under ALL concrete slabs, except for where PVC is allowed as stated in nonmetallic conduit portion of this specification.

In areas having moisture, dust or gases.

Exposed conditions where such mechanical protection is required.

Manufacturer:

CONTRACTOR option.

Conduit:

Impact and crush resistant mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.

Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.

Top-coated with a compatible organic layer to inhibit white rust and increase corrosion resistance.

Factory cut threads, 0.75-inch taper per foot, protected after cutting with an application of molten zinc.

Conduit Bodies:

Ferrous metal construction electro-galvanized inside and out and coated with aluminum acrylic paint.

Tapered, threaded hubs with integral bushing.

Stainless steel hardware.

Cover constructed of same material with solid gasket.

Fittings:

Ferrous metal construction electro-galvanized inside and out.

Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

Nonmetallic Conduit (PVC):

Where indicated on drawings.

Underground

Where PVC conduit penetrates floor, it must be installed per conduit installation detail.

Manufacturer:

Carlon.

Or equal.

Conduit:

Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.

Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-2.

The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables.

Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.

Conduit Bodies:

Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.

Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

Stainless steel hardware.

Cover constructed of same material with solid gasket.

Fittings:

Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.

Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

METAL CONDUIT

Rigid Steel Conduit: ANSI C80.1.

Intermediate Metal Conduit (IMC): Rigid steel.

Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit all steel fittings.

FLEXIBLE METAL CONDUIT

Description: Interlocked steel construction.

Fittings: ANSI/NEMA FB 1.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT

Description: Interlocked steel construction with PVC jacket.

Fittings: ANSI/NEMA FB 1 with insulated throats.

NONMETALLIC CONDUIT

Description: NEMA TC 2; Schedule 40 PVC.

Fittings and Conduit Bodies: NEMA TC 3.

PART THREE - EXECUTION

EXAMINATION

Verify routing and termination locations of conduit prior to rough in.

Verify conduit routing. Routing as shown on Drawings is in approximate locations unless dimensioned. Route as required to complete wiring system.

FIELD MEASUREMENTS

Field verify all measurements. Do not base conduit rough-in or equipment locations on dimensions obtained from the contract drawings.

Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

Adjust conduit system installation to satisfy field requirements.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Accept conduit on site. Inspect for damage.

Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

Protect PVC conduit from sunlight.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

All conduit shall be installed in building unless indicated otherwise.

All conduits stubbed into ceiling shall have end bushings.

Install conduit in accordance with NECA "Standard of Installation."

Install nonmetallic conduit in accordance with manufacturer's instructions.

Arrange supports to prevent misalignment during wiring installation.

Support conduit using coated steel or malleable iron straps, lay in adjustable hangers, clevis hangers, and split hangers.

Group related conduits: support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

Fasten conduit supports to building structure and surface under provisions of Section 26 05 29.

Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

Do not attach conduit to ceiling support wires.

Arrange conduit to maintain headroom and present neat appearance.

Route exposed conduit parallel and perpendicular to walls.

Route conduit in and under slab from point to point.

Do not cross conduits in slab.

Maintain adequate clearance between conduit and piping.

Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

Cut conduit square using saw or pipecutter; de burr cut ends.

Bring conduit to shoulder of fittings; fasten securely.

Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cleaner and cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Hydraulic one-shot bender may be used to fabricate factory elbows.

Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.

Provide suitable pull string in each empty conduit, except sleeves and nipples.

Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Ground and bond conduit under provisions of Section 26 05 26.

Identify conduit under provisions of Section 26 05 53.

Flexible metal conduit shall be used for connection to equipment subject to vibration and light fixture drops in all removable tile ceilings. Length shall not exceed 36" for equipment connections and 72" for light fixture connections. Minimum size 1/2", except 3/8" may be used for fixture drops. Install flexible conduit drops from independent junction box mounted above ceiling and accessible from below ceiling to recess ceiling mounted equipment. Allow for positioning of equipment to next tile increment.

Seal conduit with oakem or duct seal where they leave heated areas and enter unheated areas.

Surface raceway shall be installed to run parallel of all existing surfaces. Where raceway is used on ceiling, raceway shall be mounted at ceiling wall junction and extended from the junction box out to ceiling mounted device. Raceway shall be routed in corners and along moldings to be as least obtrusive as possible.

Exterior cable and conduit installation.

Layout in trench may be started at either end unless the drawings indicate that it is to pitch for drainage. In which case the layout should be started at the lowest end. The cable and conduit shall be pitched 1" per 100 feet.

Include all excavation and backfill.

Cable and conduit shall be a minimum of 30" deep.

Cable and conduit shall be laid in a 6" sand bed and covered with another 6" of sand before backfilling with earth.

Provide Brady identotape 12" above all buried conduits and cables.

Provide #12 pull wire in all empty or spare conduits.

Restore existing surface back to its original condition.

For all excavation, maintain erosion protection per Federal, State, and municipal requirements. All work associated with erosion control for excavation shall be done as per Federal, State and municipal requirements, as well as any plans, meetings, and other special conditions.

For all trenching that is under paved surfaces, backfill with structural material. Material shall be tapped in layers up to the point of the surface paving material.

For on-grade slabs, the conduit may be run in or under the slab. Verify with concrete installation prior to running conduits in slab to determine if that conduit coordinates with the slab reinforcing.

Exterior Wall Penetrations:

For all exterior wall penetrations, patch the wall with material to match the existing wall finish. The openings shall be as small as possible to minimize the impact on the existing wall finish. Install duct seal within the conduit to prevent air flow.

When conduits are rising from the ground to penetrate the walls, furnish rigid steel conduit where conduit is exposed, and deep-back LB's condulettes or NEMA 4X stainless steel junction box.

Interface with Other Products:

Install conduit to preserve fire resistance rating of partitions and other elements.

Route conduit through roof openings for piping and ductwork or through suitable roof jack. Coordinate location with roofing installation.

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 35 - ELECTRICAL BOXES

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

Conform to current National Electrical Manufactures Association (NEMA) Standards.

Conform to current Underwriters Laboratories (UL) Specifications and Standards.

Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

DESCRIPTION OF WORK
Furnish and install boxes as indicated on drawings and specified herein.

The intent of this section is to limit the use of sheet steel boxes to small circuit wiring in dry locations for installations of outlets, switches, exhaust fans, lights, unit heaters, small overhead door units, small power outlets, and limiting the general circuit capacity of 50 amps or less.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

OPERATION & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

WARRANTY
Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL

All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

BOXES

Pull boxes and junction boxes: Metal construction, conforming to National Electrical Code, with screw on or hinged cover.

Flush mounted pull boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

Small surface type junction boxes to be used in dry locations only for general purpose lighting and outlets shall conform to the following standard sizes and spec's:

All boxes and covers shall be made of stamped steel. (No sectional boxes allowed).

Minimum sizes:

Handy boxes	4 x 2-1/8 x 2-1/8
Octagon boxes	4 x 1-1/2
4" sq. boxes	4 x 1-1/2 or 4 x 2-1/8
4-11/16" sq. boxes	4-11/16 x 2-1/8

Flush mounted outlet boxes used in dry locations shall conform to the following standards:

All boxes and covers shall be made of stamped steel. No sectional boxes allowed.

Minimum sizes:

Note special requirements for flush boxes for outside receptacles. These boxes shall be 4-hole type or other type to properly patch the surface weather tight covers.

Junction and Splice Boxes:

Screw covers, galvanized after fabrication and not less than code dimensions.

Entry openings in boxes shall be made with knock-out punches or hole saws.

Burning of entry openings with a torch will not be acceptable.

Paint exposed ferrous surfaces, 2 coats rust resisting paint.

Provide outlet box divider barriers between 277/480 and 120/208 devices per N.E.C. and between switches for emergency and non-emergency circuits.

Flush interior devices shall utilize 4" square box with raised covers or deep masonry boxes as appropriate.

Raised covers to have square cut corners.

Where existing boxes are reused, provide add-a-depth device rings to devices installed without proper box depth to finish surface.

Box extensions will not be allowed.

Junction boxes and pull boxes shall not have knockouts. Enclosure type, material, and dimensions shall be as indicated on the drawings and as stated in these specifications. Where no type or size is indicated for junction boxes and pull boxes, they shall be one size larger than required by NEC.

For exterior outlets, such as receptacles, use FS type outlet box flush mounted.

Large junction boxes shall be constructed from steel in the following gauges:

Box Size	Minimum Steel Gauge
Up to 24" x 30" x 12"	14
24" x 36" x 8" to 36" x 36" x 16"	12
36" x 42" x 8" and larger	11

WET LOCATION JUNCTION BOXES

All deck junction boxes used in submersible and wet locations shall be cast bronze construction with navel brass cord seal, neoprene cover gasket and internal grounding lugs.

All conduit entries into the junction box shall be threaded into the junction box housing.

All conduit entries shall be sealed with a potting compound and caulking material.

Approved equipment.

Above grade double hub	Hydrel 1719
Flush double entry junction box	Hydrel 1703
Flush multiple entry junction box	Hydrel 1705

PART THREE - EXECUTION

EXAMINATION

Verify routing and termination locations of conduit prior to rough in.

FIELD MEASUREMENTS

Verify that field measurements are as shown on Drawings.

Mounting heights:

As shown on drawings and details.

Coordinate exact heights with specific manufacturer’s recommendations.

All mounting heights of keypads and pushbuttons to be ADA compliant.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Maintain original quality and condition of equipment while it is in storage.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.

Install all materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

Boxes that are being installed in rough masonry surfaces (such as split face block) shall be installed in such a manner to allow the wiring device or light fixture and the associated device plate to be seated squarely. Have the masonry opening cut to the size of the plate and then box grouted in, or the rough masonry around the box shall be chiseled away and mortar installed around the box to provide a flat finish.

Coordinate with the masonry installation all details of installation on rough masonry surfaces. Without coordination assume responsibility for all costs to provide the flat surface, which will require chiseling the surface of the rough masonry away and providing mortar to obtain this smooth finish.

Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

Install electrical boxes to maintain headroom and to present neat mechanical appearance.

Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods compatible with NFPA.

Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

Use flush mounting outlet boxes in finished areas.

Support boxes independently of conduit.

Use gang box where more than one device is mounted together. Do not use sectional box.

Use cast outlet box in exterior locations exposed to the weather and wet locations.

Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

Interior Dry Locations: Use hinged enclosure.

Other Locations: Use surface mounted cast metal box.

Grounding:

All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

Interface with Other Products:

Coordinate masonry cutting to achieve neat opening.

Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

End of Section

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

DESCRIPTION OF WORK
Furnish and install complete labeling as specified herein.

All major pieces of electrical equipment shall have engraved labels indicating their functions. This shall include the following:

All pushbuttons shall have labels that are engraved as to its function.

All panelboards, disconnects, contactors, and controls shall have engraved labels indicating their functions.

RELATED WORK ELSEWHERE
Division 26: Electrical.

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

OPERATIONS & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

WARRANTY
Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART TWO - PRODUCTS

GENERAL
All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

ENGRAVED LABELS

Where the words "provide engraved label" appears on the drawings or in the specifications, it shall mean that the label shall be an engraved 3-layer phenolic label with black letters on white material, unless other colors are called out on the drawings or details.

The label size shall be a minimum of 3/4" high and be 3" long. Labels may be attached with double backed adhesive tape unless indicated otherwise.

Where references are made on the drawings to provide engraved labels, engraved nameplate or engraved plates, these should be engraved phenolic labels.

ENGRAVED PLATES

Where references are made to engraved plates, this shall mean that the normal device plate shall have an engraving on it with black letters so as to indicate what this switch or device is used for.

BRANCH CIRCUIT OUTLETS: LABELING

Each branch circuit outlet, receptacles, lighting, and any other device requiring 120/208/277 or 480 volt power, the contractor shall:

Provide circuit, written in pencil or non-washable ink, inside of outlet box in an area that can be easily viewed when removing outlet faceplate.

Write circuit number in ink on device between receptacles under plate.

Optional: Provide typed label (not dyno label) for each circuit attached to device plate.

Label each junction box outlet cover in non-washable marker as to circuit number routed through junction box.

PANELBOARDS: LABELING

Panelboard Directory:

Prepare and affix a typewritten directory to the inside cover of each panelboard indicating loads controlled by each circuit.

Each distribution and lighting panelboard shall be equipped with a typewritten directory accurately indicating rooms and/or equipment being served.

Assume that originally directories will have to be developed based on the room numbers on the project drawings.

Near project completion, all directories will have to be changed to reflect actual room numbers as designated by the building occupant.

Include the cost of doing the original handwritten directory and revisions to the directory based on occupant room numbers.

Each existing panelboard that is revised, modified or has had circuits deleted or added to, shall have its directories retyped to reflect existing circuits and all modified circuits.

Each changed circuit on existing panelboards shall have an asterisk next to the revised or modified circuits.

Panelboard Identification:

Label per NEC 210.5.

Identify each panel with a suitably engraved nameplate mounted at the top of the front cover.

The nameplates shall be made of laminated black and white plastic with white on the outside.

The lettering shall be 1/4 inch high (minimum), engraved by cutting through the white outside layer so that the letters appear black.

Fasten nameplates with brass or stainless steel panhead screws.

Nameplate engraving shall match the numbers or letters shown on the drawings or assigned by the Owner's Representative.

Labels shall be engraved as to the function of the circuit breaker.

Labels shall also be engraved to indicate the load served by the circuit breaker.

Identify the source of the feeder circuit serving the panelboard.

MISCELLANEOUS

Branch Circuits:

On branch circuits, use shall be made of all standard wire insulation colors available.

Where wires of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.

PART THREE - EXECUTION

EXAMINATION

Verify surfaces are cleaned and ready to receive labels.

Verify labels are correct.

Verify that labels are installed as specified, level and plumb.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

INSTALLATION

General:

Degrease and clean surface prior to installing labels.

Install nameplate and label parallel to equipment lines.

Secure nameplates to equipment fronts using screws, if so specified on drawings.

End of Section

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 24 16 – PANELBOARDS

PART ONE - GENERAL

APPLICABLE PROVISIONS

Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS

American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

NFPA70 – National Electrical Code.

National Electrical Contractors Association (NECA), Standard of Installation, current edition.

National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.

NEMA PB 1 - Panelboards

NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

NEMA AB 1 - Molded Case Circuit Breakers.

NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:

UL 50 - Enclosures for Electrical Equipment

UL 67 - Panelboards.

UL 98 - Enclosed and Dead-front Switches

UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

Canadian Standards Association (CSA), Specifications and Standards, current edition:

CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards

CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers

Federal Specifications and standards, current edition:

W-P-115C - Type I Class 1

W-C-375B - Molded Case Circuit Breakers

W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.

W-P115C - Type 1 Class 2 Load Center

American Society of Testing Materials (ASTM), Specifications and Standards, current edition.

DESCRIPTION OF WORK

Furnish and install complete and operable Distribution and Branch Circuit Panelboards system as indicated on the drawings and as specified herein.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

The following information shall be submitted in addition to the above:

Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.

Overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. Illustrate one line diagrams with applicable voltage systems.

OPERATION & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

The panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

All panelboards provided under this section shall be the products of a single manufacturer specializing in manufacture of panelboard products with a minimum of fifty years documented experience.

Provide all necessary accessories required for a complete and operable system.

WARRANTY
Panelboards shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL
All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

Provide a complete and fully functional distribution system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

240VAC LIGHTING AND APPLIANCE PANELBOARDS

Manufacturers

Square D Company NQ – Class 1640

Cutler-Hammer

Interior:

Rated for 240 vac/48 VDC maximum. Continuous main current ratings, as indicated on the drawings, not to exceed 600 amperes maximum.

UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes.

Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.

All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.

A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the drawings.

Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200 percent rated solid neutrals shall have plated copper neutral bus for non-linear load applications where indicated on the drawings.

Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist-outs covering unused mounting space.

Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.

Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Interior leveling provisions shall be provided for flush mounted applications.

Main Circuit Breaker:

Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.

Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

Circuit breaker handle and faceplate shall indicate rated ampacity. Circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.

Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position where indicated on the drawings.

Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application. Lug body shall be bolted in place; snap-in designs are not acceptable.

The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

Branch Circuit Breakers:

Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.

Molded case branch circuit breakers shall have bolt-on type bus connectors.

Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.

The exposed faceplates of all branch circuit breakers shall be flush with one another.

Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application.

Breakers shall be UL Listed for use with the following accessories where indicated on the drawings: Shunt Trip, Auxiliary Switch, and Alarm Switch.

Enclosures:

Type 3R, 5, and 12:

Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59- inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

Maximum enclosure dimensions shall not exceed 21-inches wide and 6.5-inches deep.

PART THREE - EXECUTION

EXAMINATION

Verify equipment is in compliance with approved submittal drawings.

Examine area to receive panelboard to assure adequate clearance for panelboard installation.

Start work only after unsatisfactory conditions are corrected.

Inspect completed installation for physical damage, anchorage, and grounding.

Perform tests according to panelboard manufacturer's instructions.

Tighten bus connections and mechanical fasteners.

Touch-up scratched or marred surfaces to match original finish.

FIELD MEASUREMENTS

Field verify locations of panelboards with other trades. Adjust as required to meet field conditions and code requirements. Do not base exact panelboard locations on the contract drawings.

Identify conflicts with the work of other trades prior to installation of electrical equipment.

Adjust panelboard installation to satisfy field requirements.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Do not store exposed to weather.

Physically protect against damage from work of other trades.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

Cleaning:

Prior to turning the system over to the Owner, the system shall be physically cleaned.

All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.

At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

Grounding:

All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

Install panelboards so that circuit breakers are not more than 6 feet above the finished floor or grade.

Selectively connect branch circuits to equally balance currents in the panelboard busses.

See Section 26 05 29 for equipment mounting.

Install panelboards plumb and flush with wall finishes.

Install panelboards such that top of panel is located at an elevation of 6-feet above finished floor elevation.

Provide filler plates for unused spaces in panelboards.

Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads. See Section 26 05 53.

Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi wire branch circuits.

Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

Verify that bonding jumper is properly installed in service entrance rated panels.

Thoroughly clean and remove construction debris from panelboard interior and exterior.

OWNER TRAINING

Provide complete operator training for the Owner’s personnel.

Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

SPARE EQUIPMENT

As shown on panel schedules.

All spare breakers listed on panel schedules to be mounted in panelboards.

End of Section

SECTION 26 27 26 - WIRING DEVICES

PART ONE - GENERAL

APPLICABLE PROVISIONS
Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS
Conform to requirements of ANSI/NFPA 70 - National Electric Code.

Conform to current Underwriters Laboratories (UL) Specifications and Standards.

Device specific standards and requirements are included in device specifications.

DESCRIPTION OF WORK
Provide and install wiring devices as required on the drawings and as specified herein.

RELATED WORK ELSEWHERE
Division 26: Electrical

SHOP DRAWINGS
Submit shop drawings in accordance with Section 26 05 04.

OPERATION & MAINTENANCE MANUALS
Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

QUALITY ASSURANCE
Provide quality assurance in accordance with Section 26 05 04.

All materials, equipment and parts shall be new and unused of current manufacture.

Provide all necessary accessories required for a complete and operable system.

Store wiring devices and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

WARRANTY
Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

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

PART TWO - PRODUCTS

GENERAL
All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

RECEPTACLES

Receptacles shall be:

UL listed for current, uses and voltages indicated.

Shall comply with NEMA standard publication WD-1 and WD-6 standards.

Receptacles shall be specification grade unless noted.

Receptacles (with the exception of GFCI) shall have one piece brass strap.

Receptacles shall have provisions for back and side wiring, screw clamp type suitable for solid or stranded wire with separate green ground screw.

Receptacles shall be ivory unless noted.

Modular receptacles with pigtailed terminals are allowed.

Receptacles shall be made of nylon or high impact resistant material.

Receptacles installed in wet or damp locations shall be weather resistant.

Receptacles shall be supplied with non-breakable face plate.

Supply the following:

Weather Resistant GFCI Tamper-Resistant Duplex NEMA 5-20R receptacles with:

20 ampere, 125 volt rating.

Standard GFCI face.

GFCI compatible face plate.

Weather Resistant Construction

Tamper Resistant Shutter

2-pole, 3-wire grounding.

Color ivory.

Approved vendors are: Cooper, Hubbell Wiring, Leviton, Pass & Seymour.

PLATE COVERS

All plate covers shall be Stainless Steel.

Cast metal plates: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws.

Steel plates: Hot dip galvanized 1.25 oz /sq. ft. minimum.

Weatherproof receptacle plate shall be heavy duty type, cast aluminum with a deep cover hood to provide weatherproof protection while an attachment plug cap is inserted. Plate shall be code approved as "suitable for wet locations while in use". Weatherproof cover shall be provided with ¼"padlock hole. Plate must meet OSHA lockout/tagout requirements. Provide a padlock for each weatherproof receptacle cover installed on the project. All padlocks shall be keyed alike. Provide twenty spare keys for Owner's use.

Surface box plates: Beveled, steel, pressure formed for smooth edge to fit box.

Where two-gang boxes are required for single gang devices, provide special plates with device opening in one gang and second gang blank.

Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

PART THREE - EXECUTION

EXAMINATION

Verify outlet boxes are installed at proper height.

Verify wall openings are neatly cut and will be completely covered by wall plates.

Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

Inspect each wiring device for defects.

Verify that each receptacle device is energized.

Test each receptacle device for proper polarity.

Test each GFCI receptacle device for proper operation.

Test that each receptacle is properly grounded.

FIELD MEASUREMENTS

Field verify proper location of all wiring devices with field conditions and adjust accordingly.

DELIVERY, STORAGE AND HANDLING

Receive, sign for and store all equipment in this section.

Maintain original quality and condition of equipment while it is in storage.

INSTALLATION

General:

The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

Install products in accordance with manufacturer's instructions.

Install devices plumb and level.

Install vertical receptacles with grounding pole on top and horizontal receptacles with grounding pole to left.

Connect wiring device grounding terminal to outlet box with bonding jumper.

Connect wiring devices by wrapping solid conductor around screw terminal, or inserting into wire clamp. Wrapping conductor not allowed for stranded wire.

Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

End of Section

SECTION 26 56 00 – ATHLETIC FIELD LIGHTING
LIGHTING SYSTEM WITH LED LIGHT SOURCE

PART ONE - GENERAL

SUMMARY

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

The purpose of specification is to define the lighting system performance and design standards for a Baseball field, Multipurpose Court, and Pickleball Courts using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

The primary goals of this sports lighting project are:

Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore light levels are guaranteed to not drop below specified target values for a period of 25 years.

Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors. The LED design should provide better control than a good HID design.

Life-cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.

Control and Monitoring: To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Courts should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.

All lighting designs shall comply with Outagamie County, Wisconsin.

Musco Lighting, LLC, Light-Structure
ATTN: Greg Smidt
2282 Lamplighter Lane
Waupaca, WI 54981
Phone: 800-754-6025
Cell: 920-460-5879
Fax: 715-258-6984

LIGHTING PERFORMANCE

Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed, and field measurements taken on the grid spacing with the minimum number of grid points specified below.

Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will Incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Baseball	50 Footcandles (infield) 30 Footcandles (outfield)	2.0:1.0 (infield) 2.5:1.0 (outfield)	25 (infield) 119 (outfield)	20' x 20'
Basketball	50 Footcandles	2.5:1.0	72	10' x 10'
Pickleball	50 Footcandles	2.0:1.0	49	10' x 10'

Aiming diagram: The manufacturer of the luminaries shall provide a computer derived point-by-point and aiming diagram showing the aiming point on the field to facilitate the aiming of fixtures, showing the fixture arrangement as viewed from the rear, facing the playing field and aiming coordinates.

Color: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.

Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the Court angle is a minimum of 10 degrees below horizontal.

ENVIRONMENTAL LIGHT CONTROL

Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.

Glare Control: Maximum candela viewed from any one fixture shall not exceed 8,000 candela at a distance of 150 feet from the playing Court. Environmental glare impact scans must be submitted showing the maximum candela from the Court edge on a map of the surrounding area until 500 candela or less is achieved.

Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights. Illumination level shall be measured in accordance with the IESNA LM-5-04 after 1 hour warm up.

The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

LIFE-CYCLE COSTS

Manufacturer shall submit a 25-year life cycle cost calculation as outlined in the required submittal information.

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

PART TWO - PRODUCT

SPORTS LIGHTING SYSTEM CONSTRUCTION

Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.

Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

System Description: Lighting system shall consist of the following:

Galvanized steel poles and cross-arm assembly.

Non-approved pole technology:

Square static cast concrete poles will not be accepted.

Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.

Lighting systems shall use concrete foundations. See Section 2.4 for details.

For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.

For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or re-inforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.

Manufacturer will supply all drivers and supporting electrical equipment

Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.

Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2_2002.

Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.

All luminaires, visors, and cross-arm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment.

Control cabinet to provide remote on-off control and monitoring of the lighting system. See Section 2.3 for further details.

Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.

Integrated grounding via concrete encased electrode grounding system.

If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780.The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

Safety: All system components shall be UL listed for the appropriate application.

ELECTRICAL

Electric Power Requirements for the Sports Lighting Equipment:

Electric power: 240 Volt, Single Phase

Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage. Contractor must upsize wiring as required to not exceed the 3 percent per final routing and load.

STRUCTURAL PARAMETERS

Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, a design wind speed of 115 MPH, exposure category C and wind importance factor of 1.0.

Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).

Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report.

Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

CONTROL

Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.

Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match Court diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or Courts. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all Courts to only having permission to execute “early off” commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).

Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual Court usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the Court lighting system that is readily accessible to the owner.

Cumulative hours: shall be tracked to show the total hours used by the facility

Report hours saved by using early off and push buttons by users.

Push-button control unit shall be provided to allow players to turn the lighting system on or off during times allowed by the owner. Once a player pushes the “on” button, the lights will come on for a preset time of 1 minute to 160 minutes. At the end of the specified period, a strobe will start flashing for approximately 3 minutes. During this time, players will be able to push the “on” button again to continue play, or the lights will go off. Strobe to be mounted by Musco per the plans, and push button will be provided loose to be mounted on pedestal provided by contractor.

Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.

PART THREE - EXECUTION

SOIL QUALITY CONTROL

It shall be the Contractor’s responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner’s approval / payment for additional costs associated with:

Providing engineered foundation embedment design by a registered engineer in the State of Wisconsin for soils other than specified soil conditions;

Additional materials required to achieve alternate foundation;

Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

DELIVERY TIMING

Delivery Timing Equipment On-Site: The equipment must be on-site 10-12 weeks from receipt of approved submittals and receipt of complete order information.

COURT QUALITY CONTROL

Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.

Court Light Level Accountability

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

The contractor/manufacturer shall be responsible for an additional inspection one year from the date of commissioning of the lighting system and will utilize the owner's light meter in the presence of the owner.

The contractor/manufacturer will be held responsible for any and all changes needed to bring these Courts back to compliance for light levels and uniformities.
Contractor/Manufacturer will be held responsible for any damage to the Courts during these repairs.

Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

WARRANTY AND GUARANTEE

25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any Court is materially impacted. Owner agrees to check fuses in the event of a luminaire outage.

PART FOUR - DESIGN APPROVAL

PRE-BID SUBMITTAL REQUIREMENTS (NON-MUSCO)

Design Approval: The owner / engineer will review pre-bid submittals per section 4.1.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

Approved Product: Musco's Light-Structure System™ with TLC for LED™ is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.

All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. ***Submit checklist below with submittal.***

Yes / No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing Court layouts with pole locations
	C	On Court Lighting Design	Lighting design drawing(s) showing: a. Court Name, date, file number, prepared by b. Outline of Court(s) being lighted, as well as pole locations referenced to the center of the Court (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above Court surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor.
	D	Off Court Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	E	Environmental Light Control Design	Environmental glare impact scans must be submitted showing the maximum candela from the Court edge on a map of the surrounding area until 500 candela or less is achieved.
	F	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	G	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels

			must be guaranteed to not fall below target levels for warranty period.
	H	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Wisconsin if required by owner.
	I	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system to include monitoring. They will also provide ten (10) references of customers currently using proposed system in the state of Wisconsin.
	J	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Wisconsin.
	K	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of Wisconsin.
	L	Project References	Manufacturer to provide a list of 3 projects where the technology and specific fixture proposed for this project has been installed in the state of Wisconsin. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	M	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	N	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	O	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.

The information supplied herein shall be used for the purpose of complying with the specifications. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: _____ **Signature: _____**

Contact Name: _____ **Date: _____/_____/_____**

Contractor: _____ **Signature: _____**

SECTION 31 05 00 - COMMON WORK RESULTS FOR EARTHWORK

PART ONE - GENERAL

SCOPE

This section provides information common to two or more technical site work specification sections or items that are of a general nature, and not included in other sections. This section applies to ALL site work, as applicable. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Referenced Organizations
- Referenced Documents
- Quality Assurance
- Safety
- Permits
- Construction Limits
- Work by Others
- Dust Control
- Submittals
- Off Site Storage
- Codes
- Certificates and Inspections

PART TWO - PRODUCTS
- Barricades, Signs, and Warning Devices

PART THREE - EXECUTION
- Maintenance of Site and Building Access/Egress
- Continuity of Existing Traffic and Traffic Control
- Protection and Continuity of Existing Utilities
- Protection of Existing Work and Facilities
- Stormwater / Excavation Water Management
- Dust Control

RELATED WORK

Applicable provisions of the General Conditions govern work under this Section along with the following sections:

31 20 00	Earthmoving
31 22.16.15	Roadway Subgrade Preparation
31 23 16.13	Trenching
31 23 19	Dewatering
31 25 00	Erosion Control

REFERENCED ORGANIZATIONS

Applicable provisions of the General Conditions shall govern all work under this section.

Abbreviations of organizations referenced in these specifications are as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

AWWA	American Water Works Association
AWS	American Welding Society
FHA	Federal Highway Administration
EPA	Environmental Protection Agency
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
STI	Steel Tank Institute
UL	Underwriters Laboratories Inc.
WDNR	State of Wisconsin Department of Natural Resources
WisDOT	State of Wisconsin Department of Transportation

REFERENCED DOCUMENTS

Where reference is made to “State Specifications” it shall mean: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2024 edition.

Where reference is made to “Standard Specifications” it shall mean: “Standard Specifications for Sewer and Water Construction in Wisconsin,” Sixth Edition, December 22, 2003 and Addendum 1, December 22, 2004 and Addendum No. 2, April 22, 2008.

Incorporate following listing of correction of referenced chapters or sections contained within “Standard Specifications.”

Page	General Section	Noted Reference Section or Chapter	Correct Reference Section or Chapter
3-21	3.2.6(n)1	4.17.0	4.16.0

Where reference is made to “PAL” it shall mean Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website.

Where reference is made to “BMPH”, it shall mean the Wisconsin Construction Site Best Management Practice Handbook, current edition as published by the WDNR.

Method of measurement and basis of payment sections in referenced documents shall not apply.

QUALITY ASSURANCE

Provide materials and products as required by individual specification sections. Refer to Section GC - General Conditions of the Contract regarding substitutions.

CONTRACTOR shall provide quality assurance testing and reporting as required by individual specification sections.

SAFETY

CONTRACTOR is solely responsible for worksite safety.

Perform all work in accordance with applicable OSHA, state and local safety standards.

Contact Diggers Hotline at 1-800-242-8511 in accordance with statutory requirements. Request that non-member utilities and private utilities be located by the appropriate parties.

PERMITS
Unless otherwise noted in the Contract Documents, CONTRACTOR shall be responsible for obtaining and paying for all permits necessary to complete the work.

CONSTRUCTION LIMITS
Construction Limits are indicated on drawings. In absence of such a designation on drawings, confine work to the minimum area reasonably necessary to undertake work as determined by LA/E. In no case shall construction activities extend beyond state property lines or construction easements.

Restore all disturbed areas in accordance with drawings and specifications. If drawings and specifications do not address restoration of specific areas, these areas will be restored to pre-construction conditions as approved by LA/E.

WORK BY OTHERS
Coordinate work under this project with work by OWNER and other CONTRACTORS on the site.

DUST CONTROL
Provide equipment and water for dust control on an as needed basis for the duration of construction until surface restoration has been completed as part of common excavation bid item.

SUBMITTALS
Refer to Section GC - General Conditions of the Contract.

Submit manufacturer's shop drawings, product data, samples, substitutions and operation and maintenance (O&M) data for approval as required by individual specification sections.

Unless otherwise noted, submit electronically to Rettler Corporation unless otherwise directed by LA/E at the Pre-Construction Meeting.

OFF SITE STORAGE
Refer to the General Conditions.

In general, the payments for materials stored off site will only be considered in instances where there is limited space available for storage on site. Prior approval by LA/E, together with execution of a Storage Agreement will be required.

CODES
Comply with the requirements of all applicable, local, state and federal codes.

CERTIFICATIONS AND INSPECTIONS
Refer to Section GC - General Conditions.

Obtain and pay for all required sampling, testing, inspections, and certifications except those expressly listed as provided by the OWNER, LA/E or other third party in the Contract Documents. Deliver originals of certificates and documents to the LA/E w/i 3 days; provide copies to the OWNER. Include copies of the certifications and documents in the O&M Manual.

PART TWO - PRODUCTS

BARRICADES, SIGNS, AND WARNING DEVICES
Traffic barricades, traffic signs, and warning devices shall meet the requirements of applicable OSHA standards and the FHA Manual of Uniform Traffic Control Devices (MUTCD).

PART THREE - EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS

All construction access shall ingress and egress from location shown on drawings only.

Unless otherwise shown or directed, maintain existing access and egress to the school facility throughout construction. Maintain ANSI A117 compliant access for disabled persons, delivery access, emergency vehicle access, and emergency egress. Do not interrupt access and egress without prior written approval from LA/E.

CONTINUITY OF EXISTING TRAFFIC AND TRAFFIC CONTROL

Do not interrupt or change existing traffic circulation without prior written approval from LA/E.

When interruption of traffic is required, coordinate schedule with the OWNER to minimize disruptions. When working in public right-of-way, obtain all necessary approvals and permits from City of Appleton. Place traffic barriers and traffic control to protect the public, construction personnel, equipment, and structures.

When CONTRACTOR'S activities impede or obstruct traffic flow, provide traffic control devices, signs and flaggers in accordance with Contract Documents and the current version of the MUTCD, or as shown on the drawings.

PROTECTION AND CONTINUITY OF EXISTING UTILITIES

Verify the locations of any water main, sanitary sewer, storm sewer, drainage, gas, electric, telephone/communication, fuel, steam lines, or other utilities and site features which may be encountered in any excavations or other sitework. Properly underpin and support utilities to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from the LA/E, affected utilities and users. Notify all users impacted by outages a minimum of 48 hours in advance of outage. Provide notification in writing and describe the nature and duration of outages and provide the name and number of CONTRACTOR'S foreman or other contact.

Cut off and cap any service connections encountered which are to be removed at the limits of the excavation in accordance with the requirements of applicable codes and any specifications governing such removals.

PROTECTION OF EXISTING WORK AND FACILITIES

Verify the locations of, and protect, any signs, paved surfaces, buildings, structures, landscaping, streetlights, utilities, and all other such facilities that may be encountered or interfered with during the progress of the work. Take measures necessary to safeguard all existing work and facilities that are outside the limits of the work or items that are within the construction limits but are intended to remain. Report any damage to existing facilities to LA/E immediately. Correct and pay for all damages.

STORMWATER/EXCAVATION WATER MANAGEMENT

Control grading around structures, pitch ground to prevent water running into excavated areas.

Pits, trenches within building lines and other excavations shall be maintained free of water.

Provide trenching, pumping, other facilities required.

Notify LA/E if springs or running water is encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to LA/E of points

and areas that water will be discharged. At the LA/E's option, the CONTRACTOR shall drain the spring to the storm sewer system by the use of field tile. Follow practices outlined by BMPH for pretreatment of water discharged into waterways.

Be responsible for control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas.

DUST CONTROL

Provide water and operate water truck or other equipment to disperse water across site as required for dust control.

End of Section

Intentionally left blank

SECTION 31 10 00 - SITE CLEARING

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to clear and grub the site of existing vegetation as required in these specifications and on the drawings. Included are the following topics:

PART ONE -GENERAL
- Scope
- Related Work
- Clearing Limits

PART TWO - PRODUCTS
- Not Used

PART THREE - EXECUTION
- General
- Cutting
- Onsite Burning of Materials
- Onsite Burial of Materials
- Offsite Disposal of Materials
- Grubbing

RELATED WORK

Applicable provisions of the General Conditions govern work under this section.

CLEARING LIMITS

Confine clearing and grubbing operations to the limits as indicated on the drawings. In the absence of such a designation on the drawings, confine work to the minimum area reasonably necessary to undertake the work as determined by the OWNER'S Project Representative. Clearing and grubbing operations shall not extend past the property line or easement line without prior approval of the LA/E.

PART TWO - PRODUCTS

Not Used

PART THREE - EXECUTION

GENERAL

Limits of clearing and grubbing shall be as shown on drawings. When selective pruning and removal is specified, limit work to only those plants or limbs shown drawings or scheduled.

Trees scheduled for relocation are indicated on the drawings. Protect during clearing operations.

Remove trees, stumps, roots, brush, other vegetation, debris, and other items that interfere with new construction.

To minimize erosion, limit heavy equipment travel only to that necessary to complete clearing and grubbing.

Repair damaged erosion control features immediately.

CUTTING

Fell and prune trees in manner so as not to damage adjacent structures, site features or other plants not scheduled for removal. Use tag lines and other devices as necessary to control falling tree and limbs.

When pruning, limit removal only to those limbs shown on plans or that which is necessary to complete other sitework.

When pruning, make cuts near trunk, but beyond branch collar. If no branch collar is present, make a vertical cut near where the limb meets the trunk. Do not cut branch collar.

Use sharp tools and make clean cuts.

Application of wound paint is not necessary.

If trees scheduled to remain are injured notify LA/E. If a tree scheduled to remain is destroyed due to construction activity, the CONTRACTOR shall provide a tree of approved equal size and species or will be assessed a penalty not to exceed Two Thousand Dollars ($2,000.00). Any such assessment will be deducted from the Contract Sum by Change Order.

ONSITE BURNING OF MATERIALS

Onsite burning of materials is not permitted.

ONSITE BURIAL OF MATERIALS

Onsite burial of materials in borrow pits or other locations is not permitted.

OFFSITE DISPOSAL OF MATERIALS

Clearing and grubbing debris shall be disposed of at facilities designed to accept the material that is being disposed. Follow all local, state and federal regulations.

GRUBBING

Grubbing operations shall be completed by removal of stump section.

Remove stumps, logs, roots, other organic matter located within the project limits completely.

Depressions resulting from grubbing operations shall be backfilled in accordance with Section 31 20 00 – Earthmoving.

End of Section

SECTION 31 20 00 - EARTHMOVING

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete earthwork required in these specifications and on the drawings. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Quality Assurance
- Quantities
- Surveying and Staking
- Record Drawings

PART TWO - PRODUCTS
- Earth Fill
- Granular Fill
- Prepared Subgrade
- Breaker Run

PART THREE - EXECUTION
- General
- Topsoil Removal
- Excavation
- Placing and Compacting Material
- Waste Relocation
- Clean Up
- Tolerances

RELATED WORK

Applicable provisions of the General Conditions govern work under this Section and the following Sections:

Section 02 41 13	Demolition
Section 31 05 00	Common Work Results for Earthwork
Section 31 22 16.15	Roadway Subgrade Preparation
Section 31 23 16.13	Trenching
Section 31 25 00	Erosion Control

REFERENCE STANDARDS

Applicable provisions of the General Conditions shall govern all work under this section.

Current editions from ASTM International (ASTM):

D1140	Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve
C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
D4318	Liquid Limit, Plastic Limit and Plasticity Index of Soils
D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods
D2974	Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3017	Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods
E329	Standard Specifications for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

SUBMITTALS

Provide copies of record drawings.

Provide written materials management plan.

Provide copies of material testing reports.

QUALITY ASSURANCE

The CONTRACTOR shall retain the services of a geotechnical consulting ENGINEER or technician under supervision of an ENGINEER to conduct sampling testing and analysis as required by this section and elsewhere in the Contract Documents. The geotechnical consulting ENGINEER shall meet the requirements of ASTM E329-00b.

The CONTRACTOR'S geotechnical consulting ENGINEER shall complete material testing as outlined in Table 31 20 00 -1:

Material	Test Required	Test/Sample Frequency
Granular Fill	D1140-00 / C136-06	1 test/10,000 sf by 1 ft lift placed or 100 lineal ft
Structural Fill	D422-63(1998) Standard Test Method for Particle Size Analysis of Soils	1 test/500 cy placed
Earth Fill	D2922-01 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test/ 10,000 sf by 1 ft lift placed

Table 31 20 00 -1

QUANTITIES

Elevations provided on the drawings are finished elevations including topsoil, synthetic turf, or sidewalk thickness. Finish topsoil depth shall be as shown on the drawings.

CONTRACTOR shall be solely responsible for determining all earthwork quantities based on the existing and proposed elevations provided on the drawings. Any geotechnical investigations provided by the OWNER apply only to those locations that the data was collected, and may not be indicative of conditions elsewhere on the site. The CONTRACTOR is responsible for collecting any additional geotechnical or survey data he deems necessary to complete an accurate estimate of earthwork quantities.

CONTRACTOR shall be solely responsible for balancing site materials. If onsite excavation and borrow operations do not provide enough suitable material for fill areas, CONTRACTOR shall coordinate and pay for excavation, transport and placement of imported material meeting the specifications of the contract documents. If excavation results in excess materials, CONTRACTOR shall coordinate and pay for loading, transport and offsite disposal of excess materials.

If CONTRACTOR finds the geotechnical information or existing or proposed elevations shown on the plans to be erroneous, he shall notify LA/E immediately.

SURVEYING AND STAKING

CONTRACTOR to provide all necessary construction layout.

RECORD DRAWINGS

Maintain as-built drawings showing actual locations of utilities and other features encountered, modifications to proposed grades and site features, and other deviations from the original design.

PART TWO - PRODUCTS

EARTH FILL

Satisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups GW, GP, GM, SM, SW, and SP. In addition, on-site clay soils (CL, CH and SC) are deemed suitable for support of athletic fields, walks and pavements within limits defined in Sections 31 22 16.15 - Roadway Subgrade Preparation and 31 23 16.13 - Trenching. However, these soils are moisture and disturbance sensitive and must be placed within a narrow range of moisture contents to achieve proper compaction. Scarification and drying of wet, moisture sensitive soils or removal and replacement with suitable fill may be required at Contractor's option as part of the base bid.

Unsatisfactory fill soil materials are defined as those complying with ASTM D 2487 soil classification groups OL, OH and PT.

GRANULAR FILL

Granular fill clean material meeting the requirements of "Grade 2 Granular Backfill" as defined in Section 209 of the State Specifications.

PREPARED SUBGRADE

Native soils beneath subbase, base course, pavement, or synthetic turf shall not contain ML(silt, low plasticity) soil type. Subgrade soils shall meet proof-roll testing requirements.

BREAKER RUN AGGREGATE

Crushed stone, rock or gravel meeting the requirements of either Breaker Run or Select Crushed material as defined in Section 311.2 or Section 312.2 of State Specifications. Recycled aggregate materials and products containing recycled aggregate materials meeting the above stated requirements may be used as breaker run

PART THREE - EXECUTI0N

GENERAL

Complete earthwork for structures, trenching, and pavement in accordance with this section and the following applicable sections:

Section 31 22 16.15 Roadway Subgrade Preparation
Section 31 23 16.13 Trenching

TOPSOIL REMOVAL

Comply with erosion control requirements of Section 31 25 00 – Erosion Control relative to topsoil removal and storage.

Complete clearing and grubbing work in accordance with Section 30 10 00 – Site Clearing.

Disc existing turf 8" deep two ways prior to stripping and stockpiling.

Excavate topsoil from areas to be further excavated.

Do not permit topsoil to be mixed with subsoil.

Do not stockpile to depth exceeding 8 feet.

Do not drive heavy equipment over stockpile topsoil.

Do not strip topsoil when wet.

Remove all topsoil from proposed locations of structures, pavement, walks, synthetic turf and other paved areas.

Stockpile excess topsoil on site for use by OWNER if requested. Otherwise, remove surplus soil from site.

Do not excavate, grade or work topsoil in frozen or muddy condition.

Minimize compaction of topsoil to the extent possible.

EXCAVATION

Excavate to the elevations shown on drawings; allow for placement of fill, base course, pavements, and topsoil as required by the plans and other Contract Documents.

Transfer lines and grades provided by the OWNER or LA/E as necessary.

Excavate areas to provide positive drainage whenever possible.

Remove excess and spoil material from the site in a timely fashion.

Stockpile all boulders suitable for landscaping at a location designated by LA/E.

Do not excavate below design grades without prior authorization by LA/E.

PLACING AND COMPACTING MATERIAL

Place material in fill areas only after all topsoil has been removed.

Place fill to the elevations shown on drawings; allow for placement of base course, pavements and topsoil as required by drawings and Contract Documents.

Do not place fill on areas consisting of organic soil, debris or other soft and yielding material.

Do not place fill on frozen or muddy areas or place frozen fill.

Moisture condition subgrade as necessary to provide a firm surface prior to placing fill.

Place fill in horizontal lifts having thickness as shown on Table 31 20 00 -2.
Compact fill material as required by Table 31 20 00 -2 for given use.

Moisture condition fill material as necessary to achieve density required for given use.

Place and compact backfill so as to minimize settlement and avoid damage to walls, utility lines and other work in place. Place backfill simultaneously on both sides of free-standing structures.

Proof-roll subgrade soils to detect unstable, yielding soils, which must be removed or improved by appropriate preparation and compaction. If unsuitable soils are approved for excavation below subgrade (EBS) elevations, use soils outlined in PART 2 - PRODUCTS. Soils that are moisture and disturbance sensitive must be densified within a narrow range of moisture contents to achieve proper compaction. Scarification using 30" minimum diameter disks and drying of wet soils or removal and replacement with suitable fill may be required at LA/E's approval as part of the base bid.

Provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified compaction. Compaction of controlled backfill by travel of grading equipment will not be considered adequate for uniform compaction. Hand guided vibratory or tamping compactors will be required whenever controlled backfill may be placed adjacent to walls, footings, and columns or in confined areas.

Accommodate and assist geotechnical consulting ENGINEER in collecting and testing soil samples.

Location	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density [(a)]
Areas Beneath Footings, Floor Slabs, or Structures	8”	95% Modified	70%
Footing, Foundation and Structure Backfill	8”	95% Modified	70%
Areas Beneath Existing or Proposed Pavement (Roads, Drives, Walks) and synthetic turf	8”	95% Modified	70%
Natural Turf Areas	8”	90 % Modified	60%

(a) Minimum relative density as determined by ASTM D-4253-00 for coarse-grained soils with less than 15% by mass passing the No. 200 sieve. Applicable only when minimum proctor compaction cannot be achieved.

Table 31 20 00 -2

WASTE RELOCATION

Waste material may be encountered during excavation. Remove waste that may be encountered during construction activities as follows.

If insufficient clay layer thickness, improperly place waste, or undocumented waste containing areas are identified, remove and haul off site to a licensed solid waste disposal facility. If necessary, import soil meeting the requirements of NR 50.06(3)(a), place and compact in insufficient clay thickness areas (less than 2 feet clay cap cover over top of waste).

Removal and relocation of mass solid waste will expose hazards that area a concern of health and safety. Contractor to prepare a Health and Site Safety Plan addressing job hazard analysis of chemical, biological, physical and environmental hazards. Plan is required by the Occupational Safety and Health Administration (OSHA) as a Hazardous Waste Operations and Emergency

Response (HAZWOPER) to propose appropriate safety procedures to address site control for special waste handling and disposal, daily work activities, contingency plans, and proper structure of emergency response.

If waste is encountered outside of documented waste areas, employ the following contingency action plan:

1. Notify WDNR of this new information.
2. Segregate and stockpile the waste material.
3. Dispose waste as previously noted.

CLEAN UP

Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.

Thoroughly clean all drainage ways, roads, parking lots, sidewalks, and paved surfaces and remove and dispose of all debris and mud.

TOLERANCES

Tolerances for finished subgrade elevations as compared to plan grades shall be as follows:

Parking Lots/Roadways/Walkways:	1/8" in 10-feet
Competition Sport Fields:	1/8" in 10-feet
Open turf areas	1/4" in 10-feet

End of Section

SECTION 31 22 16.15 - ROADWAY SUBGRADE PREPARATION

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete subgrade preparation under paved areas as required in these specifications and as shown on the drawings. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Quality Assurance
- Permits/Fees
- Construction Layout

PART TWO - PRODUCTS
- Earth Fill
- Granular Backfill
- Prepared Subgrade
- Breaker Run Aggregate

PART THREE - EXECUTION
- Preparation
- Excavation
- Subgrade Approval/Proof-Rolling
- Excavation Below Subgrade (EBS)
- Restoration
- Tolerances

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 02 05 00	Common Work Results for Existing Conditions
Section 02 41 13	Demolition
Section 03 00 00	Site Concrete
Section 31 05 00	Common Work Results for Earthmoving
Section 31 20 00	Earthmoving
Section 31 23 16.13	Trenching
Section 31 25 00	Erosion Control

QUALITY ASSURANCE

The CONTRACTOR shall complete quality assurance testing as outlined in Table 31 22 16.15 -1:

Material	Test Required	Test/Sample Frequency
Sand Subbase, if required	D1140-00 / C136-06	1 test/500 cy placed

Table 31 22 16.15 - 1

PERMITS/FEES

CONTRACTOR shall be solely responsible for obtaining all permits necessary to complete work. CONTRACTOR shall pay all fees associated with obtaining permits. These include, but are not limited to permits for work within public right-of-way, land disturbance permits and building permits.

CONSTRUCTION LAYOUT
CONTRACTOR to provide all necessary construction layout.

PART TWO - PRODUCTS

EARTH FILL
In accordance with Section 31 20 00 Earthmoving.

GRANULAR FILL
In accordance with Section 31 20 00 Earthmoving.

PREPARED SUBGRADE
In accordance with Section 31 20 00 Earthmoving.

BREAKER RUN AGGREGATE
In accordance with Section 31 20 00 Earthmoving.

PART THREE - EXECUTI0N

PREPARATION
Review plans and prepare workplan and schedule. Coordinate any necessary interruptions in site access with LA/E, in accordance with other specification sections.

Contact Diggers Hotline. Locate and protect utilities, structures, pavement, trees, landscaping, benchmarks and other features in the work area.

Layout work. Establish and transfer line and grade as necessary to complete the work.
Remove topsoil from work area. Sawcut and remove pavement from work area.

Grade to drain water away as shown on drawings.

EXCAVATION, PLACING AND COMPACTING MATERIAL
Excavate, place, compact and prepare subgrade in accordance with Section 31 20 00 Earthmoving.

SUBGRADE APPROVAL/PROOF -ROLLING
Prior to undercutting or excavating below subgrade (EBS) or placing any basecourse, contact LA/E to schedule inspection of subgrade and proof rolling. Provide minimum of 24 hrs confirmed notice. All proof rolling shall be completed in the presence of the LA/E and/or geotechnical consultant.

To complete proof rolling, entire subgrade shall be provided with a relatively smooth surface, suitable for observing soil reaction during proof rolling.

CONTRACTOR shall schedule and provide a fully loaded tri-axle dump truck for proof – rolling. Loaded truck shall have a minimum gross operating weight of 30 tons. Test shall be conducted with “tag” or “pusher” axles retracted from the ground.

Test rolling shall be accomplished in a series of traverses parallel to the centerline of the street or parking area. The truck shall traverse the length of the concrete and turf area once for each 12 feet of width. Additional passes along the traverse shall be completed as directed by the LA/E, to further define unsatisfactory subgrade.

Soft areas, yielding areas, cracked areas or areas where rolling or wave action is observed shall be considered indicative of an unsatisfactory subgrade. Such areas shall be undercut as outlined in subsequent subsections of this specification.

Once the subgrade has been proof-rolled and approved, protect the soils from becoming saturated, frozen, or adversely altered.

EXCAVATION BELOW SUBGRADE (EBS)

EBS shall be completed only when directed by the LA/E. The CONTRACTOR shall not be compensated for any unauthorized EBS. Measure and document EBS areas and depths in consultation with LA/E.

Excavate EBS areas to a twelve (12) inch depth using equipment with smooth cutting edge. Excavated EBS material that does not meet the specifications for fill needed elsewhere on site shall be removed from the site and legally disposed.

EBS areas shall be backfilled with Breaker Run or granular fill, in maximum of 6” thick lifts (compacted). Separate pay items are provided for EBS – granular fill and EBS-breaker run. Breaker Run and granular fill shall be compacted to 90% Modified Proctor dry density.

Backfill placed in EBS areas shall be able to drain freely. EBS in clayey or silty soils shall be graded so they may drain.

RESTORATION

Roll all subgrade surfaces using a smooth drum roller to promote an impervious surface and minimize percolation of water into the subgrade.

TOLERANCES

Tolerances for finished subgrade elevations as compared to plan grades shall be as follows:

Sidewalks/Concrete Pads:	1/8" in 10-feet
Competition Sport Fields:	1/8" in 10-feet
Open turf areas;	1/4" in 10-feet

End of Section

Intentionally left blank

SECTION 31 23 16.13 - TRENCHING

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete trenching for utilities and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Submittals
- Record Drawings
- Quality Assurance
- Permits/Fees
- Construction Layout

PART TWO- PRODUCTS
- Washed Crushed Stone
- Crushed Stone Bedding
- Crushed Stone Screenings
- Bedding Sand
- Cement Slurry Grout

PART THREE - EXECUTION
- Preparation
- Connections to Existing Utilities
- Dewatering
- Excavation
- Bedding/Initial Cover
- Backfill and Compaction
- Restoration

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 02 05 00	Common Work Results for Existing Conditions
Section 02 41 13	Demolition
Section 31 05 00	Common Work Results for Earthmoving
Section 31 20 00	Earthmoving
Section 31 25 00	Erosion Control
Section 33 40 00	Storm Sewer Systems

SUBMITALS

Provide copies of record drawings.

Provide samples of each type of soil or aggregate proposed for use on the project. Samples shall consist of a minimum of 50 pounds of soil. The CONTRACTOR shall be responsible for delivering soil samples to the testing agency as designated by the LA/E. Provide samples a minimum of 2 weeks prior to starting construction.

Provide copies of material testing reports.

RECORD DRAWINGS

Maintain record drawings showing actual locations of utilities and other features encountered, modifications to proposed grades and site features, and other deviations from the original design.

QUALITY ASSURANCE

The CONTRACTOR shall complete quality assurance testing as outlined in Table 31 23 16.13-1:

Material	Test Required	Test/Sample Frequency
Granular Fill	D2922-01 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test/300 lf trench for each 1/3 & 2/3 depth
Earth Fill	D2922-01 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test/300 lf trench for each 1/3 & 2/3 depth

Table 31 23 16.13-1

PERMITS/FEES

CONTRACTOR responsible for obtaining all permits necessary to complete trenching work. Pay all fees associated with obtaining permits. These include, but are not limited to permits to work within right-of-way, utility connection permits, plumbing permits, electrical permits and other building permits.

CONSTRUCTION LAYOUT

CONTRACTOR to provide all necessary construction layout.

PART TWO - PRODUCTS

WASHED CRUSHED STONE

Well graded coarse aggregate conforming to Size No.1, Section 501.2.5.4.4. State Specifications.

CRUSHED STONE BEDDING

Clean material meeting the requirements of "¾" Crushed Stone Chips" as defined in Section 8.43.2(a)2 of Standard Specifications regardless of pipe size.

CRUSHED STONE SCREENINGS

Crushed stone free of organic material, concrete, asphalt and other debris. Material shall meet the requirements of "Crushed Stone Screenings" as defined in Section 8.43.2(b) of Standard Specifications.

BEDDING SAND

Sand meeting the requirements of "Bedding Sand" as defined in Section 8.43.2(c) of Standard Specifications.

CEMENT SLURRY GROUT

Portland cement based grout having a slump of 10"-12" and the following mix proportion (per CY):

Type 1 Portland Cement	100#
Class C Fly Ash	300#
Fine Aggregate	2700#
Water	400#
Air Entraining Admixture	35 oz

Similar mix designs that are suitable for the intended use will be considered.

PART THREE - EXECUTI0N

PREPARATION

Review plans and prepare work plan and schedule. Coordinate any necessary interruptions in utility service with LA/E, in accordance with other specification sections.

Layout work. Establish and transfer line and grade as necessary to complete the work.

Remove topsoil from work area. Saw cut and remove pavement from the work area.

CONNECTIONS TO EXISTING UTILITIES

Connect to existing utilities in accordance with requirements of other pertinent specification sections.

DEWATERING

Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains.

Dewater in accordance with Section 31 23 19.

EXCAVATION

Excavate to elevations and dimensions necessary to complete construction. Excavations shall be sufficiently deep to provide for bedding beneath pipes and structures.

For pipes less than 12 inches in diameter, maximum trench width at the top of the pipe shall be 3 feet. For pipes greater than 12 inches in diameter, the maximum trench width at the top of the pipe shall be no greater than the outside diameter of the pipe plus 2 feet.

The trench width at the ground surface shall be minimized to the extent possible through the use of trench boxes, shields, or shoring. Implentation of OSHA regulations shall be the responsibility of the CONTRACTOR or his LA/E.

The trench width at the ground surface shall not exceed the width of the trench at the top of the pipe by more than 2 feet without prior approval by LA/E.

Provide a minimum clearance of 6 inches from outside of pipe to the closest of either the sidewall of trench or inside wall of trench box, shield or shoring.

Notify LA/E if trench subgrade consists of unstable soil, organic material, debris or other undesirable material.

Segregate various materials excavated. Reserve material meeting the requirements of backfill for the location. Remove and dispose excavated material that does not meet the requirements of backfill, and excess excavated material from the site, unless directed otherwise by other specification sections or LA/E.

Locate bedding, backfill and spoil piles in accordance with OSHA requirements, and so that it does not interfere with public travel, adjacent landowners or other construction activities.

Trench excavation shall be limited to that which can be excavated and backfilled within the same workday.
The same trench may obstruct no more than one street crossing at one time.

BEDDING/INITIAL COVER

Bed pipes and place initial cover material in accordance with detail drawings and the requirements of specifications for the utility and pipe type being installed. Follow procedures and materials required by the Standard Specifications.

Establish excavation subgrade in accordance with proposed utility lines and grades, allowing for required amount of bedding material.

Excavation shall be free of water prior to placement of bedding material.

Place bedding material to required depth, and compact to 95% Modified Proctor dry density.

Shape bedding material to conform to bell of pipe, fittings and structures.

After placing pipe, support during placement and compaction of initial cover material. Place cover material in lifts having a maximum thickness of 6 inches. Compact initial cover material to 95% Modified Proctor dry density.

Compaction of initial cover material for pipe and fittings shall be accomplished using hand tools and vibratory plate or tamping type walk behind compactors.

BACKFILL AND COMPACTION

Once initial cover material is placed and compacted, backfill trenches using material specified as shown on drawings.

Backfill trenches to elevations shown on drawings; allow for placement of base course, pavements, and topsoil as required by the drawings and other Contract Documents. Where final restoration will be delayed, backfill trench to existing grade to provide a safe, free-draining surface.

Moisture condition backfill material as necessary to achieve density required for given use.

Do not place material on frozen surfaces or use frozen material.

Compact fill material as required by Table 31 23 16.13-2 for the given use. Compact material to minimize settlement and avoid damage to structures, pipes, utility lines and other features. Place backfill simultaneously on both sides of structures.

Scarification and drying of wet soils or removal and replacement with suitable fill may be required at CONTRACTOR'S option as part of the base bid.

It is the responsibility of the CONTRACTOR to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified density. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

Flooding or jetting of backfill material for compaction purposes is not allowed.

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density (a)
Areas Beneath Footings, Floor Slabs, or Structures	Structural Fill	8”	95% Standard	70%
Footing, Foundation and Structure Backfill	Structural Fill	8”	95% Standard	70%
Areas within 10’ of an Existing or Proposed Building or Structure Footing or Slab	Granular Fill	8”	90% Standard	60%
Areas Beneath Existing or Proposed Pavement (Roads, Drives, Walks) or Synthetic Turf	Granular Fill	8”	95% Standard	70%
Grass Areas	Earth Fill	8”	90 % Standard	60%

(a) Minimum relative density as determined by ASTM D-4253-00 for coarse-grained soils with less than 15% by mass passing the No. 200 sieve. Applicable only when minimum proctor compaction cannot be achieved.

Table 31 23 16.13-2

RESTORATION

Restore trenches to proposed grades and surfaces as soon as practicable after backfilling.

Remove excess bedding, backfill and spoil material from the site as soon as possible after backfilling is complete, but no later than 1 calendar day after backfilling is complete.

Thoroughly clean all drainage ways, roads, parking lots sidewalks and paved surfaces and remove and dispose all debris and mud.

End of Section

Intentionally left blank

SECTION 31 23 19 - DEWATERING

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for dewatering as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- References
- Submittals
- Quality Assurance
- Permits/Fees
- Safety
- Erosion and Sediment Control
- Environmental Contaminants
- Noise Pollution

PART TWO - PRODUCTS
- General

PART THREE - EXECUTION
- General
- Sump Dewatering
- Well Installation
- Operation
- Removal/Abandonment

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 02 05 00	Common work results for Existing Conditions
Section 31 23 16.13	Trenching
Section 31 25 00	Erosion Control
Section 33 40 00	Storm Sewer Systems

REFERENCES

Applicable provisions of the General Conditions shall govern work under this section.

Wisconsin Administrative Code (WAC):
- Chapter NR 141 – Monitoring Well Construction
- Chapter NR 812 – Well Construction and Pump Installation

Wisconsin Department of Natural Resources (WDNR) Technical Standard for Erosion Control
WDNR Sediment Control Technical Standard
WDNR Dewatering Technical Standard

SUBMITTALS

When deep wells or well point systems are utilized, provide copies of the site assessment, system design computations for removal of groundwater, and design information for sediment removal practices.

For sump dewatering in trenches or excavations, provide copies of sediment removal practice selection and discharge design calculations or information.

Provide copies of all permits required for dewatering.

Provide copies of daily monitoring and testing logs for dewatering practices as described in the WDNR Dewatering Technical Standard.

Provide copies of all borehole abandonment forms.

QUALITY ASSURANCE

Provide and submit a quality assurance program for maintaining erosion control and sediment control practices. As work progresses through phases of the contract, submit copies of the updated quality assurance program for erosion control and sediment removal practices.

PERMITS/FEES

Pay for and obtain all permits/approval required by state and federal regulations.

Necessary permits/approval may include, but are not limited to high capacity well approval under NR 812.09 and erosion control permits.

When installing by jetting methods, provide own water source. Do not use hydrants as water source without permission from LA/E and/or local utility, as applicable. Obtain and pay for any required hydrant use and permits.

SAFETY

Prevent public access to dewatering system components.

Abandon boreholes in accordance with applicable state and federal codes immediately following use.

EROSION AND SEDIMENT CONTROL

Comply with the requirements of:

Section 31 25 00 – Erosion Control

Complete selection, installation, operation, and maintenance of erosion control and sediment removal measures related to a dewatering system in accordance with the WDNR Dewatering Technical Standard or equivalent approved by WDNR.

Upon installation of the dewatering system, immediately remove from the site any mud, sediment or drilling fluid generated by jetting or rotary drilling operations.

When overland discharge of water is necessary, dissipate energy of water stream using nozzles, deflectors, riprap or other methods. Avoid discharge into areas prone to flooding, sensitive areas or exposed soil.

Inspect dewatering system daily for signs of erosion and eliminate cause of erosion.

ENVIRONMENTAL CONTAMINANTS

Monitor dewatering system discharge regularly for signs of chemicals or other environmental contaminants.

If chemicals or environmental contaminants are observed, terminate dewatering system operation immediately and contact the LA/E.

Prevent introduction of contaminants into the soil or groundwater through the dewatering system.

NOISE POLLUTION
Provide mufflers, housing, berms and fencing as necessary to minimize noise pollution resulting from dewatering system operation.

PART TWO - PRODUCTS

GENERAL
All deepwell and wellpoint dewatering equipment and well construction/abandonment materials shall meet the requirements of NR 141 and NR 812.

PART THREE - EXECUTION

GENERAL
Comply with all local, state and federal regulations.

When deep wells or well point systems are utilized, prepare a system design and obtain permits in accordance with NR 812.09 for high capacity wells as defined by NR 812.07(53). Design system to dewater site as necessary to complete construction, but minimize impact on local water table. Monitor water levels in wells adjacent to construction site. Adjust dewatering system configuration and operation as necessary if neighboring wells are adversely impacted. Do not adversely impact neighboring private wells.

Coordinate installation of dewatering system with other contractors. Locate dewatering system components in locations that do not interfere with site operations or other construction activities.

Pump groundwater at lowest rate necessary to dewater site as required to accommodate other sitework.

SUMP DEWATERING
Install collection sump in the low point of the excavation(s).

Provide filter material, trash screens and other devices around pump or intake to avoid pumping of sediment. Provide sediment tanks, filters, and flocculants as required for sediment control. Inspect discharge daily and install and maintain erosion control and sediment removal practices in accordance with the Technical Standards.

WELL INSTALLATION
Install wells by rotary, driven or hydraulic jetting methods.

OPERATION
Provide personnel, equipment and power necessary to maintain and operate the dewatering and sediment control systems as required to complete construction at the site.

Do not discharge water containing sediment, debris or contaminants into the sanitary sewer system or waters of the State. Ensure water discharge does not contain silt held in suspension. Filter discharge water in accordance with WDNR conservation practice 1061.

Direct surface drainage away from excavated areas.

Control grading in and adjacent to excavations to prevent water running into excavated areas or unto adjacent properties or public thoroughfares.

Furnish and operate suitable pumps on a 24 hour basis to keep excavations free of water until services have been placed and backfill is completed. If pump discharge exceeds 70 gallons per minute, obtain required WDNR high capacity well permit.

REMOVAL/ABANDONMENT

Remove all dewatering system components immediately following use.

Clean receiving storm sewer system of any sediment or debris deposits resulting from dewatering system operation.

End of Section

SECTION 31 25 00 - EROSION CONTROL

PART ONE - GENERAL

SCOPE

The work under this section consists of providing all work, materials, labor, equipment, and supervision necessary to provide and construct erosion control measures necessary to protect property and the environment. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Submittals
- Erosion Control Plan

PART TWO - PRODUCTS
- General
- Silt Fence
- Silt Fence Outlet
- Erosion Mat
- Staples
- Riprap
- Inlet Protection
- Concrete Truck Washout
- Rock Sediment Bags
- Temporary Tracking Pad
- Soil Stabilizers
- Soil Tackifiers
- Silt Sock

PART THREE - EXECUTION
- General
- Grading and Earthwork
- Drainage
- Tracking Control
- Maintenance
- Concrete Washout

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 02 05 00	Common Work Results for Existing Conditions
Section 02 41 13	Demolition
Section 31 20 00	Earthmoving
Section 31 22 16.15	Roadway Subgrade Preparation
Section 31 23 16.13	Trenching
Section 31 23 19	Dewatering

Provide erosion control in accordance with the following references:

- Wisconsin Construction Site Best Management Practice Handbook, current version as published by the WDNR (“Best Management Practice Handbook”)
- Erosion Control Product Acceptability List (“PAL”), current version as published by the WisDOT.

Method of measurement and basis of payment sections in any referenced erosion control documents shall not apply to this contract.

These documents are available from: State of Wisconsin Document Sales and Distribution 202 South Thornton Avenue; P.O. Box 7840; Madison, WI 53707; 608-266-3358 or found on WisDOT "Doing Business" website.

SUBMITTALS

Submit shop drawings and material certifications for all erosion control features.

EROSION CONTROL PLAN

LA/E, on behalf of Owner, has obtained Wisconsin Department of Natural Resources Water Resources Application for Project Permits (WRAPP) which includes Stormwater Management and Erosion Control Plans (SMECP). The WRAPP Coverage Letter with Certificate of Permit Coverage is available from the Owner.

Contractor shall familiarize himself with requirements of the permit documents and be responsible for executing the work in accordance with all permit requirements.

LA/E has prepared an erosion control plan included in these documents for the project.

The erosion control plan is in accordance with Chapters NR 151, NR 216, and COMM 60, Wis. Adm. Code. The Contractor will provide additional or alternate erosion control measures to the LA/E as needed due to the contractors' means and methods throughout all phases of construction.

Contractor shall comply with requirements of erosion control plan, and requirements of General Permit to Discharge under the Wisconsin Pollutant Discharge Elimination System: **http://www.dnr.state.wi.us/org/water/wm/nps/pdf/stormwater/permits/construction/construction_permit_S067831-3.pdf)**. If applicable, project specific WPDES Construction Site Stormwater Discharge Permit for Erosion Control shall supersede General Permit.

Erosion control and storm water management practices shall be installed and maintained in accordance with the WDNR approved Technical Standards (or equivalent).

PART TWO - PRODUCTS

GENERAL

Erosion mats, soil stabilizers, and tackifiers shall be listed on the Product Acceptability List for Multi-Modal Applications ("PAL") as published by the WisDOT.

When drawings include permanent erosion control or storm water control features, CONTRACTOR may utilize these items to temporarily control erosion and storm water during construction activities. Fully clean and restore erosion control or storm water features to function for intended permanent use prior to acceptance of work.

SILT FENCE

Fence fabric shall comply with the requirements of State Specification Section 628.2.6, in 3 foot tall rolls, with 4' tall 2" x 2" nominal cross section hardwood posts spaced a maximum of 10' on center. Silt fence shall be Mirafi, Trevira, Amoco, CFM, or approved equal.

SILT FENCE OUTLET

Outlets for relieving high flows constructed of silt fence and rock sediment bags per detail in the Drawings.

EROSION MAT

Erosion mat shall comply with the requirements of Class I and Class II, erosion mat as defined by the State Specifications and shall be listed on the WisDOT PAL and the following;

A short term duration (6 months or greater), light duty, organic, “Erosion Control Revegetative Mat” (ECRM) meant for use in urban areas, or lawns, where mowing may be accomplished within two weeks with little or no snagging of the netting or mat.

All Type Urban mats shall conform to the requirements for Erosion Mats, with the following modifications:

> Urban mats netting must be 100% organic biodegradable. This shall include parent material, stitching, and netting.

Class I Type A erosion mats shall be single netted, photodegradable, polypropylene products. All products in this category will be allowed on slopes up to 4H:1V. This product is not to be used in channels. North American Green EroNet S75 (permanent netting) and DS75 (biodegradable netting) or approved equivalent shall be used.

Class I Type B erosion mats shall be double netted products. The minimum mat thickness shall be 3/8 inch (9 mm) as measured in place. All products approved in Urban Type A category will be allowed on slopes up to 3H:1V. Slopes that are between 4H:1V and 2.5H:1V are required to use mats in the Urban Type B category. North American Green EroNet S150 (permanent netting) and DS150 (biodegradable netting) or approved equivalent shall be used.

The netting shall be stitched to prevent separation of the net from the parent material. The netting shall be capable of withstanding moderate foot traffic without tearing or puncturing, and shall be in accordance with section 628 of the WisDOT Standard Specifications. Neither the netting, nor the installation, shall pose a safety risk to pedestrians walking on, or crossing it.

Class II Type B mats shall be permanent triple layer reinforcement matting. The minimum thickness shall be ½ inch (12.5 mm) as measured in place with an average thickness of 0.67 inch. The nettings shall be stitched together on 1.50 inch openings with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All ditches and channels up to slopes of 2:1 shall be lined with Class II, Type B mats. North American Green VMax C350 or approved equivalent shall be used.

Class III Type A mats shall be permanent triple layer reinforcement matting. The minimum thickness shall be ½ inch (12.5 mm) as measured in place with an average thickness of 0.67 inch. The nettings shall be stitched together on 1.50 inch openings with UV stabilized polypropylene thread to form permanent three-dimensional turf reinforcement matting. All high-flow channels and ditches up to slopes of 1:1 and greater shall be lined with Class III, Type A mats. North American Green VMax P550 or approved equivalent shall be used.

Erosion mat shall be American Excelsior, SI Geosolutions, Erosion Control Systems, North American Green, or approved equal

STAPLES

Furnish U-shaped staples, made of No. 11 or larger diameter steel wire, or other engineer-approved material, are one to 2 inches wide, and not less than 6 inches long for firm soils and not less than 12 inches for loose soils. The contractor may use anchors the staple gun manufacturer recommends, either lighter gage staples or equivalent, for engineer-approved staple gun systems.

RIPRAP

Riprap shall be the class specified and shall conform to State Specifications Section 606.2. Provide medium riprap over Type R fabric unless otherwise indicated on Drawings. Fabric placed

under slopes steeper than 2:1 shall be anchored by a 6” wide by 12” deep trench at the top of the slope.

INLET PROTECTION
In accordance with detail on drawings.

CONCRETE TRUCK WASHOUT
In accordance with detail on drawings.

ROCK SEDIMENT BAGS
Furnish rock bags made of a porous, ultraviolet resistant, high-density polyethylene or geotextile fabric that will retain 70% of its original strength after 500 hours of exposure according to ASTM D 4355 and a minimum empty size of 30-inches long by 15-inches wide. Rock Sediment Bags shall conform to Standard Specifications for Highway Construction 628.2.13 for coarse aggregate. Rock Sediment bags. Ero-tex Sediment Control Filter Bags or approved equal shall be provided.

Rock Sediment Bags shall be filled with aggregate conforming to one of the following Graduations:

Rock Aggregate (Size No.1)	
Sieve Size	% Passing
2"	-
1 1 /2"	-
1"	100
3/4"	90-100
3/8"	20-55
#4	0-10
#8	0-5

Rock Aggregate (Size No.2)	
Sieve Size	% Passing
2"	100
1 1 /2"	90-100
1"	20-55
3/4"	0-15
3/8"	0-5
#4	-
#8	-

TEMPORARY TRACKING PAD
In accordance with detail on drawings.

Aggregate for tracking pads shall be 3 to 6 inch clear or washed stone. All material shall be retained on a 3-inch sieve. Type R fabric shall be placed under the tracking pad unless otherwise indicated on Drawings.

SOIL STABILIZERS
Soil stabilizers shall be non-asphalt-based products of the type specified, and meeting the requirements of the PAL.

SOIL TACKIFIERS
Soil tackifiers shall be non-asphalt-based products of the type specified, and meeting the requirements of the PAL.

SILT SOCK
8” Silt Sock SD or approved equal with wood filler material per manufacturer recommendation.

PART THREE - EXECUTION

GENERAL
Install erosion control measures as required by erosion control plan and contract documents. Provide additional erosion control measures as dictated by CONTRACTOR’S means and

methods, or by differing site conditions. Notify LA/E of additional erosion control features that are provided, but not shown on drawings.
Provide erosion control measures necessary to protect property and the environment. Include erosion control measures as required by most stringent of applicable sections of The WDNR Best Management Practice Handbook or State Specifications.

Perform all work in accordance with manufacturer's instruction where these specifications do not specify a higher requirement.

GRADING AND EARTHWORK

Install temporary or permanent erosion control measures, in accordance with “Construction Sequence” found on Erosion Control Plan for this project, prior to any onsite grading or land disturbances.

Clear only those areas designated for the placement of improvements or earthwork before placement of final cover. Perform stripping of vegetation, grading, excavation, or other land disturbing activities in a logical sequence and manner which will minimize erosion. If possible, schedule construction for times of year when erosion hazards are minimal.

Do not clear site of topsoil, trees, and other natural ground covers before commencement of construction. Retain natural vegetation and protect until final ground cover is placed.

Do not stockpile soil within 25 feet of any roadway, parking lot, paved area, or drainage structure or channel. Provide temporary stabilization and control measures (seeding, mulching, covering, erosion matting, barrier fencing, etc.) for the protection of disturbed areas and soil piles which will be in existence for a period of more than 14 consecutive calendar days.

Remove surplus excavation materials from the site immediately after rough grading. The disposal site for the surplus excavation materials shall also be subject to these erosion control requirements.

DRAINAGE

Minimize water runoff and retain or detain on-site whenever possible so as to promote settling of solids and groundwater recharge.

Convey drainage to the nearest adequate public facility. Do not discharge water in a manner that will cause erosion or sedimentation of the site or receiving facility.

Protect storm sewer inlets and catch basins in accordance with the erosion control plan, if provided. If not specified, protect inlets with straw bale barriers, silt fencing, filter basket, gabion stone weepers, or other equivalent methods approved by the LA/E which provide the necessary erosion protection.

Divert roof drainage and runoff from all areas upslope of the site around areas to be disturbed or channel them through the site in a manner that will not cause erosion.

Minimize pumping of sediments when dewatering. Discharge to a sedimentation basin or sedimentation vessel to reduce the discharge of sediments. Do not discharge water in a manner that will cause erosion or sedimentation of site or receiving facility. Follow WDNR Conservation Practice 1061 for dewatering.

TRACKING CONTROL

Provide each entrance to site with a stone tracking pad. Construct tracking pad of Gabion Stone or Breaker Run. If necessary, provide a crushed aggregate paved parking area.

If applicable, wash water shall be discharged to sedimentation basins, sedimentation vessels, or other such control areas.

MAINTENANCE

Inspect all erosion control measures within 24 hours of the end of each rainfall event that exceeds 0.25 inches, or daily during period of prolonged rainfall, or weekly during periods without rainfall. Immediately repair and/or replace any and all damaged, failed, or inadequate erosion control measures. Maintain daily log of erosion control measure inspection and repair per WPDES Stormwater Discharge Permit.

Maintain stockpile stabilization measures as necessary after rainfall events and heavy winds. Replace tarps, re-seed, and reapply mulch, tackfiers and stabilizers as necessary.

Remove sediment from stormwater and erosion control structures, basins and vessels as necessary.

Repair or replace damaged inlet protection.

Replace or supplement stone tracking pads with additional stone when tracking pad becomes ineffective. Remove by any sediment reaching a public or private roadway, parking lot, sidewalk, or other paved. Do not remove tracked sediments by flushing. Completely remove any accumulations not requiring immediate attention at least once daily at the end of the workday.

Frequently dispose of all waste and unused construction materials in licensed solid waste or wastewater facilities. Do not bury, dump, or discharge, any garbage, debris, cleaning wastes, toxic materials, or hazardous materials on the site, on the land surface or in detention basins, or otherwise allow materials to be carried off the site by runoff onto adjacent lands or into receiving waters or storm sewer systems.

Remove all temporary erosion control measures at the end of the project.

CONCRETE TRUCK WASHOUT AREA

Construct temporary settling basin on any project requiring delivery of concrete in trucks. Wash water from the cleaning of concrete truck chutes, concrete pumps, and contractors equipment is highly alkaline and shall not be discharged from washout area.

Basin can be a prefabricated container, or self-installed below-grade or above-grade washout pits or basins. The basin shall be constructed large enough to allow wash water sufficient time to evaporate providing room for additional wash water while maintaining a minimum of 12 inch freeboard. The basin shall have walls constructed of staked bales of hay and/or a pit excavated for the purpose. The basin shall be lined with 6 mil polyethylene sheeting or an impermeable geotextile fabric that will not allow the contents to escape into the underlying soils.
When solids occupy 75% of the volume of the basin or when 12 inch freeboard cannot be maintained, remove and disposed of solids properly. Inspect the liner for damage and replace if necessary.

A sign stating "Concrete Truck Washout Area" shall be constructed at the basin.

End of Section

SECTION 32 05 00 - COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

PART ONE - GENERAL

SCOPE

This section provides information common to two or more technical site work specification sections or items that are of a general nature, and not included in other sections. This section applies to ALL site work, as applicable. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Referenced Organizations
- Referenced Documents
- Quality Assurance
- Safety
- Permits
- Construction Limits
- Work by Others
- Submittals
- Off Site Storage
- Codes
- Certificates and Inspections

PART TWO - PRODUCTS
- Barricades, Signs, and Warning Devices

PART THREE - EXECUTION
- Maintenance of Site and Building Access/Egress
- Continuity of Existing Traffic and Traffic Control
- Protection and Continuity of Existing Utilities
- Protection of Existing Work and Facilities
- Stormwater/Excavation Water Management

RELATED WORK

Applicable provisions of the General Conditions govern work under this Section along with following sections:

Section 32 10 00	Hard Surface Base and Paving
Section 32 31 13	Chain Link Fencing and Gates
Section 32 91 13	Soil Preparation
Section 32 92 23	Seeding

REFERENCED ORGANIZATIONS

Applicable provisions of the General Conditions shall govern all work under this section.

Abbreviations of organizations referenced in these specifications are as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers'
ASME	American Society of Mechanical Engineers'
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
FHA	Federal Highway Administration

EPA	Environmental Protection Agency
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
STI	Steel Tank Institute
UL	Underwriters Laboratories Inc.
WDNR	State of Wisconsin Department of Natural Resources
WisDOT	State of Wisconsin Department of Transportation

REFERENCED DOCUMENTS

Where reference is made to “State Specifications” it shall mean: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2024 edition.

Where reference is made to “Standard Specifications” it shall mean: “Standard Specifications for Sewer and Water Construction in Wisconsin,” Sixth Edition, December 22, 2003 and Addendum 1, December 22, 2004 and Addendum No. 2, April 22, 2008.

Incorporate following listing of correction of referenced chapters or sections contained within “Standard Specifications.”

Page	General Section	Noted Reference Section or Chapter	Correct Reference Section or Chapter
3-21	3.2.6(n)1	4.17.0	4.16.0

Where reference is made to “PAL” it shall mean Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website.

Where reference is made to “BMPH”, it shall mean the Wisconsin Construction Site Best Management Practice Handbook, current edition as published by the WDNR.

Method of measurement and basis of payment sections in referenced documents shall not apply.

QUALITY ASSURANCE

Provide materials and products as required by individual specification sections. Refer to Section GC - General Conditions of the Contract regarding substitutions.

CONTRACTOR shall provide quality assurance testing and reporting as required by individual specification sections.

SAFETY

CONTRACTOR is solely responsible for worksite safety.

Perform all work in accordance with applicable OSHA, state and local safety standards.

Contact Diggers Hotline at 1-800-242-8511 in accordance with statutory requirements. Request that non-member utilities and private utilities be located by appropriate parties.

PERMITS

Unless otherwise noted in the Contract Documents, CONTRACTOR shall be responsible for obtaining and paying for all permits necessary to complete the work.

CONSTRUCTION LIMITS
Construction Limits are indicated on drawings. In the absence of such a designation on drawings, confine work to minimum area reasonably necessary to undertake work as determined by LA/E. In no case shall construction activities extend beyond state property lines or construction easements.

The CONTRACTOR shall restore all disturbed areas in accordance with drawings and specifications. If plans and specifications do not address restoration of specific areas, these areas will be restored to pre-construction conditions as approved by LA/E.

WORK BY OTHERS
Coordinate work under this project with work by OWNER and other CONTRACTORS on site.

SUBMITTALS
Refer also to Section GC - General Conditions of the Contract.

Submit manufacturer's shop drawings, product data, samples, substitutions and operation and maintenance (O&M) data for approval as required by individual specification sections.

Unless otherwise noted, submit electronically to Rettler Corporation unless otherwise directed by LA/E at the Pre-Construction Meeting.

OFF SITE STORAGE
Refer to the General Conditions.

In general, payments for materials stored off site will only be considered in instances where there is limited space available for storage on the site. Prior approval by LA/E, together with execution of a Storage Agreement will be required.

CODES
Comply with the requirements of all applicable, local, state and federal codes.

CERTIFICATIONS AND INSPECTIONS
Refer to Section GC - General Conditions.

Obtain and pay for all required sampling, testing, inspections, and certifications except those expressly listed as provided by LA/E or other third party in Contract Documents. Deliver originals of certificates and documents to LA/E within 3 days; provide copies to LA/E. Include copies of certifications and documents in the O&M Manual.

PART TWO - PRODUCTS

BARRICADES, SIGNS, AND WARNING DEVICES
Traffic barricades, traffic signs, and warning devices shall meet the requirements of applicable OSHA standards and the FHA Manual of Uniform Traffic Control Devices (MUTCD).

PART THREE - EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS
All construction access shall ingress and egress from location shown on drawings.

Unless otherwise shown or directed, maintain existing access and egress to the existing facilities throughout construction. Maintain ANSI A117 compliant access for disabled persons, delivery

access, emergency vehicle access, and emergency egress. Do not interrupt access and egress without prior written approval from LA/E.

CONTINUITY OF EXISTING TRAFFIC AND TRAFFIC CONTROL

Do not interrupt or change existing traffic circulation without prior written approval from LA/E.

When interruption is required, coordinate schedule with OWNER agency to minimize disruptions. When working in public right-of-way, obtain all necessary approvals and applicable permits from City of Appleton.

When CONTRACTOR'S activities impede or obstruct traffic flow, CONTRACTOR shall provide traffic control devices, signs and flaggers in accordance with other Contract Documents and current version of the MUTCD, or as shown on the drawings.

PROTECTION AND CONTINUITY OF EXISTING UTILITIES

Verify the locations of any water main, sanitary sewer, storm sewer, drainage, gas, electric, telephone/communication, fuel, steam lines, or other utilities and site features which may be encountered in any excavations or other sitework. Properly underpin and support all lines to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from LA/E, affected utilities and users. Notify all users impacted by outages minimum of 48 hours in advance of outage. Provide notification in writing and describe nature and duration of outages and provide name and number of CONTRACTOR'S foreman or other contact.

Cut off and cap any service connections encountered which are to be removed at the limits of the excavation in accordance with the requirements of applicable codes and any specifications governing such removals.

PROTECTION OF EXISTING WORK AND FACILITIES

Verify the locations of, and protect, any signs, paved surfaces, buildings, structures, landscaping, streetlights, utilities, and all other such facilities that may be encountered or interfered with during the progress of work. Take measures necessary to safeguard all existing work and facilities that are outside the limits of the work or items that are within construction limits but are intended to remain. Report any damage to existing facilities to LA/E immediately. Correct and pay for all damages.

STORMWATER/EXCAVATION WATER MANAGEMENT

Control grading around structures, pitch ground to prevent water running into excavated areas.

Pits, trenches within building lines and other excavations shall be maintained free of water.

Provide trenching, pumping, other facilities required.

Notify LA/E if springs or running water is encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to LA/E of points and areas that water will be discharged. At the LA/E'S option, CONTRACTOR shall drain spring to the storm sewer system by the use of field tile.

Be responsible for control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas.

End of Section

SECTION 32 10 00 – HARD SURFACE BASE AND PAVING

PART ONE – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide and construct the paving and surfacing as provided for in these specifications and on the drawings. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Submittals
- Record Drawings
- Quality Assurance
- Construction Layout

PART TWO – PRODUCTS
- Recycled Aggregate Products and Materials
- Dense Graded Base
- Hot Mixed Asphaltic Pavement (HMA)
- Geotextile Fabric, Nonwoven

PART THREE – EXECUTION
- Subgrade Approval/Proof-Rolling
- Undercutting/Excavation Below Subgrade (EBS)
- Placing and Compacting Basecourse
- Stockpiling
- Base and Finish Drainage Stone (for use on synthetic turf subgrade)
- HMA
- Geotextile Fabric, Nonwoven

RELATED WORK

Applicable provisions of Division 01 and the following sections:

Section 02 41 13	Demolition
Section 03 00 00	Site Concrete
Section 31 22 16.15	Roadway Subgrade Preparation

SUBMITTALS

Provide copies of record drawings and material testing reports.

Materials meeting State Specifications and supplied from a WisDOT approved source need not be tested. CONTRACTOR shall furnish evidence of such WisDOT approval to LA/E.

RECORD DRAWINGS

Maintain record drawings showing actual locations of utilities and other features encountered, modifications to proposed grades and site features, and other deviations from the original design.

QUALITY ASSURANCE

The CONTRACTOR shall retain the services of a geotechnical consulting ENGINEER to conduct sampling testing and analysis as required by this section and elsewhere in the Contract Documents. The geotechnical consulting ENGINEER shall meet the requirements of ASTM E329-00b.

The CONTRACTOR's geotechnical consulting ENGINEER shall complete material testing as outlined in Table 32 10 00 -1:

Material	Test Required	Test/Sample Frequency
Dense Graded Base	D1140-00 / C136-06	1 test/500 cy placed
Dense Graded Base	D2922-01 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test per 1000 square feet

Table 32 10 00 -1

CONSTRUCTION LAYOUT
CONTRACTOR to provide all necessary construction layout.

PART TWO – PRODUCTS

RECYCLED AND SALVAGED ASPHALT PAVEMENT, AGGREGATE PRODUCTS AND MATERIALS
Salvaged asphalt and base removed and stockpiled from existing driveways, parking lots and walkways meeting requirements of Section 305 of State Specifications.

Contractor may utilize salvaged asphalt for base course below HMA surfaces as follows:

- Walkways, drives and aprons outside limits of running track – top 4" depth salvaged asphaltic base allowed, virgin dense graded base allowed below top 4" depth.
- All HMA surfaces to receive tennis court surfacing – virgin dense graded base only.

DENSE GRADED BASE
Comply with Section 305 of "State Specification."

Tests:

- Provide one sieve analysis of aggregate for each source.

HOT MIX ASPHALTIC (HMA) PAVEMENT
Provide HMA pavement conforming to the requirements Section 450, 455 and 460 of State Specifications. Utilize the same material type throughout the paving operation unless noted elsewhere on drawings.

3.0-inch HMA
Compacted Thickness: Lower layer: 1.5-inch, 5 LT 58-28 S
Upper layer: 1.5-inch, 5 LT 58-28 S

3.5-inch HMA
Compacted Thickness: Lower layer: 1.75-inch, 4 LT 58-28 S
Upper layer: 1.75-inch, 4 LT 58-28 S – **Virgin Material Only for Upper Layer of Tennis Court Receiving Tennis Court Surfacing**

GEOTEXTILE FABRIC, NONWOVEN
Manufacturer: Mirafi
Product: 140N
Or approved equal**.**

PART THREE – EXECUTION

SUBGRADE APPROVAL/PROOF-ROLLING

Conform to requirements of Section 31 22 16.15 Roadway Subgrade Preparation.

UNDERCUTTING/EXCAVATION BELOW SUBGRADE (EBS)

Conform to requirements of Section 31 22 16.15 Roadway Subgrade Preparation.

PLACING AND COMPACTING BASECOURSE

Comply with Section 305 of "State Specifications" except as modified below:

Compact to minimum 95% maximum dry density as determined by ASTM D 1557 (Modified Proctor).

Place dense graded base minimum 1-foot beyond limits of all hard surfaces.

Excavation shall be free of water prior to beginning filling. Do not place material on frozen surfaces or use frozen material.

Fill areas using the specified in Table 32 10 00-2 or as shown on drawings.

Place and compact material to minimize settlement and avoid damage to structures, pipes, utility lines and other features. Hand-place and compact material as necessary.

Moisture condition backfill material as necessary to achieve density required for given use.
Compact fill material as required by Table 32 10 00-2 for the given use.

Responsibility of CONTRACTOR to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified density. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction
Areas Beneath Existing or Proposed Pavement (Roads, Drives, Walks)	Basecourse or Granular Fill	6"	95% Modified

Table 32 10 00 -2

Where additional filling or excavation is necessary, or placement of base course will be delayed, roll surface of proposed roadway or parking lot with a smooth drum roller to provide relatively impervious surface and promote drainage.

STOCKPILING

If continuous compliance with material specifications is questionable, LA/E may require CONTRACTOR to supply material from a stockpile of previously tested material. Maintain a sufficiently large stockpile to preclude the use of material not previously approved.

Build and maintain stockpiles using methods that minimize segregation and prevent contamination. If contract specifies location, place stockpiles where specified. Clear and prepare stockpile areas to facilitate the recovery of maximum amount of stockpiled material.

HOT MIX ASPHALT (HMA) PAVEMENT

Place HMA pavement in accordance with the requirements of Section 450, 455 and 460 of State Specifications.

GEOTEXTILE FABRIC, NONWOVEN

Before placing the fabric, smooth and shape subgrade to the required grade and section, and compact to the specified density. After placing fabric on subgrade, contractor shall not allow traffic or construction equipment to travel on the fabric.

Roll out the fabric on the subgrade and pull taut manually to remove wrinkles. Join parallel strips of fabric by overlapping or sewing. Sew seams as specified in State Specification 645.3.1, except ensure a tensile strength equal to or greater than 60 percent of the specified directional tensile strength of the fabric develops. Overlap the fabric in joints at least 24 inches. Overlap butt splices between fabric rolls at least 36 inches. Utilize weights or pins to prevent the wind from lifting the fabric.

Cover all tears, holes, or rips in the fabric with a patch of fabric overlapping the defect 36 inches in all directions.

Cover all fabric within 72 hours of placement.

If ruts greater than 1 inch develop during construction operations, LA/E may require the contractor to use lighter equipment, equipment with lower contact pressure, or smaller loads on existing equipment.

Fill all ruts in the surface of each lift of backfill with additional material. Do not smooth ruts without adding additional backfill.

End of Section

SECTION 32 13 20 – POST TENSIONED CONCRETE

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete slab prep, sheeting underlayment, formwork, coordination of reinforcement installation, accessories, cast-in-place concrete, finishing and curing as required in these specifications and on Drawings for all post tensioned concrete slabs. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Preinstallation Meeting
- Quality Assurance
- Construction Layout
- Coordination
- Warranty

PART TWO – PRODUCTS
- Concrete, Genera
- Form-Facing Materials
- Steel Reinforcement
- Reinforcement Accessories
- Concrete Materials
- Plastic Sheeting
- Curing Materials
- Related Materials
- Concrete Mixtures, General
- Concrete Mixtures for Post Tensioned Systems
- Fabricating Reinforcement
- Concrete Mixing

PART THREE – EXECUTION
- Formwork Installation
- Embedded Item Installation
- Removing and Reusing Forms
- Plastic Sheeting Underlayment
- Steel Reinforcement Installation
- Joints
- Concrete Placement
- Finishing Formed Surfaces
- Finishing
- Miscellaneous Concrete Item Installation
- Concrete Protecting and Curing
- Concrete Surface Repairs
- Field Quality Control

RELATED WORK

Applicable provisions of Division 01 and the following Sections:

Section 02 41 00	Demolition
Section 31 20 00	Earthmoving
Section 31 22 16.15	Roadway Subgrade Preparation
Section 32 10 00	Hard Surface Base and Paving

Section 32 13 21 Post Tensioned Tennis Court System
Section 32 31 13 Chain Link Fence and Gates

REFERENCE STANDARDS

State Specifications: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2025 edition. Comply with reference sections including but not limited to:

Section 301 Base, Subbase and Subgrade Aggregate
Section 415 Concrete Pavement
Section 501 Concrete
Section 505 Steel Reinforcement

PAL = Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website. American Concrete Institute (ACI):

301 Specifications for Structural Concrete
305 Specification for Hot Weather Concreting
306 Standard Specification for Cold Weather Concreting
315 Details and Detailing of Concrete Reinforcement
318 Building Code Requirements for Reinforced Concrete

Concrete Reinforcing Steel Institute (CRSI):

63 Recommended Practice for Placing Reinforcing Bars

American Society for Testing and Materials (ASTM):

C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
C33 Standard Specification for Concrete Aggregates
C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C94 Standard Specification for Ready-Mixed Concrete
C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
C150 Standard Specification for Portland Cement
C172 Standard Practice for Sampling Freshly Mixed Concrete
C231 Standard Test Method for Air Content of freshly Mixed Concrete by the Pressure Method
C260 Standard Specification for Air-Entraining Admixtures for Concrete
C494/494M Standard Specification for Chemical Admixtures for Concrete
C1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

SUBMITTALS

Product Data: For each type of product.

Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments. Indicate amounts of mixing water to be withheld for later addition at Project site.

Certificate of Dosage Rate Conformance for ready mix supplier.

Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. See also section 32 13 13.

Material Certificates: For each of the following:

- Admixtures.
- Curing compounds
- Slab treatments
- Plastic Sheeting below slab
- Repair materials when required on project prior to installation.

Field quality-control reports.

Minutes of preinstallation conference.

PREINSTALLATION MEETING

Post Tension Slab Preinstallation Conference: Conduct conference at onsite location to be determined by General Contractor or Architect.

Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- Contractor's superintendent.
- Independent testing agency responsible for concrete design mixtures.
- Ready-mix concrete manufacturer.
- Concrete Subcontractor.
- Special concrete finish Subcontractor.

Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, plastic sheeting installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

QUALITY ASSURANCE

Contractor Qualifications: Concrete installer specializing in large concrete pours and post tensioned concrete installation similar to work specified in this section with minimum five (5) years' experience (documented).

Construct and erect concrete formwork in accordance with ACI 301.

Manufacturer Qualifications: A concrete supplier experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

Perform cast-in-place concrete work in accordance with ACI 301, ACI 305, and ACI 306.

CONTRACTOR is responsible for materials testing which shall be conducted as outlined in Section 03 00 00 Site Concrete.

CONSTRUCTION LAYOUT

CONTRACTOR to provide all necessary construction layout.

COORDINATION
Contractor shall coordinate with all trades to ensure proper access, construction sequence, and quality work to be completed.

WARRANTY
Provide minimum two (2) year warranty against defects for materials and installation, unless otherwise indicated.

PART TWO – PRODUCTS

CONCRETE, GENERAL
ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

ACI 301
ACI 117

FORM-FACING MATERIALS
Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

Dimensional lumber or plywood.

Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

STEEL REINFORCEMENT
Any miscellaneous reinforcement not supplied by 32 13 21 shall be supplied under this specification. All bar used for constructing the post tensioned slab shall be epoxy coated bar.

Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 775 epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

REINFORCEMENT ACCESSORIES
Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

CONCRETE MATERIALS

Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain each type of admixture from single source from single manufacturer.

Cementitious Materials:

Portland Cement: ASTM C 150/C 150M, Type I or Type II.

Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.

No fly ash, slag or other fillers will be allowed in Post Tensioned Concrete mix design.

Normal-Weight Aggregates: ASTM C 33/C 33M coarse aggregate or better, graded. Provide aggregates from a single source.

Maximum Coarse-Aggregate Size: Slabs on grade 5” thick or less 1 inch

Lightweight Aggregate: ASTM C 330/C 330M, nominal maximum aggregate size per list under normal-weight aggregate section above.

Air-Entraining Admixture: ASTM C 260/C 260M.

Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

Retarding Admixture: ASTM C 494/C 494M, Type B.

Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

Water: ASTM C 94/C 94M and potable.

PLASTIC SHEETING

Polyethylene Sheeting.

2 layers

Minimum Thickness: 5 to 10 mils.

Lap joints 12 inches and seal with vapor barrier tape.

CURING MATERIALS

Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

Water: Potable.

RELATED MATERIALS

Foam Expansion Strips (for use at athletic equipment post penetrations): Meadows “Deck-O-Foam” or equal, 1/4 inch thick; see plans for slab thickness.

REPAIR MATERIALS

Repair of any damage to concrete from blowouts, unauthorized traffic on slab or any activity resulting in damage to the slab shall be approved by the Architect prior to any repairs being made.

CONCRETE MIXTURES, GENERAL

Prepare design mixtures for each type and strength of concrete, proportioned based on laboratory trial mixture or field test data, or both, according to ACI 301.

Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or blended hydraulic cement in concrete as follows:

Admixtures: Use admixtures according to manufacturer's written instructions.

Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

CONCRETE MIXTURES FOR POST TENSIONED SYSTEMS

Post Tensioned Concrete Slab: Normal-weight concrete.

Minimum Compressive Strength
- 3000 psi at 3 days
- 5000 psi at 28 days
- 600 lbs Cement

Maximum W/C Ratio: 0.43

Slump Limit: 6 inches, plus or minus 1/2 inch

Air Content: 3-5 percent, plus or minus 1.5 percent at point of delivery.

Aggregate: Limestone
- Fine Aggregate: 1350 lbs
- Coarse Aggregate: 1740 lbs

Exterior: see section 03 00 00 "Site Concrete" for concrete pavement and walks

FABRICATING REINFORCEMENT

Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

CONCRETE MIXING

Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

FORMWORK INSTALLATION

Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and as follows:
Variation from plumb in lines and surfaces; 1/4 inch per 10 ft., but not more than 1 inch.

Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
Class A, 1/8 inch for smooth-formed finished surfaces (concrete surfaces exposed to view).

Construct forms tight enough to prevent loss of concrete mortar.

Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

Install pocket formers and any recessed elements, for easy removal.

Set edge forms to achieve required elevations and slopes in finished concrete surfaces.

Chamfer exterior corners and edges of permanently exposed concrete.

Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

EMBEDDED ITEM INSTALLATION

Place and secure net posts and anchors prior to placing post tension slab. Coordinate with athletic equipment supplier to install equipment and foundations located below slab prior to placement of post tension slab. Coordinate any other embedded items required for adjoining work that is attached to or supported by post tensioned concrete.

Coordinate any additional items by other trades as required.

REMOVING AND REUSING FORMS

General: Formwork for post tension slabs may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete must be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

PLASTIC SHEETING UNDERLAYMENT

Install two layers of sheeting. Sprinkle water between layers.
Lap joints 12 inches and seal joints with vapor barrier tape.

STEEL REINFORCEMENT INSTALLATION

General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

Avoid puncturing or removing plastic sheeting.

Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Post tensioned tendons and reinforcement bars: 1.5 inches

Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

JOINTS

General: No joints in post tensioned slab. Refer to Concrete Paving for jointing adjacent to post tensioned slab.

CONCRETE PLACEMENT

Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

Deposit and consolidate concrete for post tensioned slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners. Use extra caution to thoroughly vibrate all concrete around anchorages to avoid rock pockets or other unconsolidated concrete.

Maintain reinforcement in position on chairs during concrete placement.

Slope surfaces uniformly to drains where required.

Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

Cold-Weather Placement:

Comply with ACI 306.1 and as follows:

Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

Hot-Weather Placement:
Comply with ACI 301 and as follows:

Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

FINISHING FORMED SURFACES
Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove pocket formers, any remaining fins and other projections that exceed specified limits on formed-surface irregularities.

FINISHING
General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
Shot Blasting Finish: All post tensioned slabs shall be shot blasted after curing to provide a Concrete Surface Profile (CSP) 2 or 3. Remove all dust and debris from shot blasting operation and provide a slab ready to receive athletic surface coatings. Concrete contractor is responsible for providing shot blasting and coordinating with the surfacing contractor for final finishing requirements.

MISCELLANEOUS CONCRETE ITEM INSTALLATION
Athletic Equipment Foundations (Net posts and anchors):

Coordinate sizes and locations of concrete bases with actual equipment provided.

Minimum Compressive Strength: 4000 psi at 28 days.

CONCRETE PROTECTING AND CURING
General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

Formed Surfaces: Cure formed concrete surfaces, including post tensioned slab, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, and other surfaces.

Cure concrete according to ACI 308.1, by one or a combination of the following methods:
Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

- Water.
- Continuous water-fog spray.
- Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

CONCRETE SURFACE REPAIRS

Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

Structural repairs related to blow outs or other failures of the post tensioned system will be recommended by the post tension supplier and concrete installer and approved by Architect.

Repair materials and installation not specified above may be used, subject to Architect's approval.

FIELD QUALITY CONTROL

Take three concrete test cylinders for every 75 cu yd (60 cu m) or less of concrete placed.

Take one additional test cylinder during cold weather concreting, cured on site under same conditions as concrete it represents.

Take one slump test for each set of test cylinders taken.

Take minimum of three (3) extra cylinders for final stressing at 3,000 psi minimum.

End of Section

SECTION 32 13 21 – POST TENSIONED TENNIS COURT SYSTEM

PART ONE – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete the post tension slab reinforcement system including tendons, anchors, rebar, ties, supports and accessories. Also included is tensioning of reinforcement system and finishing (filling pocket formers) as required in these specifications and on Drawings for all Post Tensioned concrete tennis court slabs. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Preinstallation Conference
- Quality Assurance
- Construction Layout
- Delivery, Storage and Handling
- Coordination

PART TWO – PRODUCTS
- Formwork
- Reinforcement
- Accessories
- Concrete Materials and Mix Design
- Grout

PART THREE – EXECUTION
- Examination
- Installation
- Field Quality Control
- Removal of Forms

RELATED WORK

Applicable provisions of Division 01 and the following Sections:

Section 02 41 00	Demolition
Section 31 20 00	Earthmoving
Section 31 22 16.15	Roadway Subgrade Preparation
Section 32 10 00	Hard Surface Base and Paving
Section 32 13 20	Post Tensioned Concrete
Section 32 31 13	Chain Link Fence and Gates

REFERENCE STANDARDS

State Specifications: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2023 edition. Comply with reference sections including but not limited to:

Section 301	Base, Subbase and Subgrade Aggregate
Section 415	Concrete Pavement
Section 501	Concrete
Section 505	Steel Reinforcement

PAL = Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website. American Concrete Institute (ACI):

301 Specifications for Structural Concrete
305 Specification for Hot Weather Concreting
306 Standard Specification for Cold Weather Concreting
315 Details and Detailing of Concrete Reinforcement
318 Building Code Requirements for Reinforced Concrete

Concrete Reinforcing Steel Institute (CRSI):

63 Recommended Practice for Placing Reinforcing Bars

American Concrete Institute (ACI):

ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2006.
ACI 301 Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.
ACI 318 Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.

American Society for Testing and Materials (ASTM):

ASTM A 416/A 416M Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete; 2006.
ASTM A 722/A 722M Standard Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete; 2007.

Post Tensioning Institute (PTI):

PTI (MAN) Post-Tensioning Manual; Post-Tensioning Institute; 2006, Sixth Edition.
PTI (TENDON) Specification for Unbonded Single Strand Tendons; Post-Tensioning Institute; 2000.

SUBMITTALS

Product Data: Provide data on concrete design mix, admixtures, and corrosion inhibitors etc.

Shop Drawings: Indicate layout and steel sections, tendon sizes, grouping, spacing, placing sequence, supports and locations, tendon supports and sheathing, accessories, clearances required for jack, and anchor stresses.

Indicate formwork methods, materials, arrangement of joints, ties, shores, location of bracing and temporary supports, and schedule of erection and stripping.

Describe tensioning sequence, type of jack, pressure monitoring device, anchorage set, tendon elongation and tendon cut-off procedures.

Design Data: Indicate calculations for loadings and stresses of designed framing. This data shall include shortening, shrinkage, and friction losses.

Certificate: Certify that tendon strength characteristics meet or exceed specified requirements. Certificate shall include mill test results for each strand.

Project Record Documents: Record actual locations of tendons; stressing sequence and tension loads established, calculations for elongation of tendon, and tendon stressing logs.

Equipment Data: Equipment used for Hydraulic stressing shall be submitted for review, including certifications from an independent lab on equipment used.

Stressing documentation: Submit Stressing Logs for review.

PREINSTALLATION MEETING

Convene one week before starting work of this section. Discuss tendon and rebar locations, along with NO core drilling, cutting or power-driven inserts without prior approval of Architect.

Where possible, coordinate this meeting to occur at same time as Preinstallation Meeting for Post Tensioned Concrete installation.

QUALITY ASSURANCE

Designer Qualifications: Complete all work under the direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located. All cost associated with this supervision shall be included. Submit resume for review and approval.

Installer Qualifications: Post tensioning supplier specializing in performance of the type of work specified in this section with minimum five (5) years' experience (documented). Site superintendent resume shall be reviewed for approval, all iron workers must have current PTI post tensioning certification. PT supplier is directly responsible for complete installation and stressing of all tendons.

Manufacture Qualifications: Manufacture shall be a member of PTI (Post Tensioning Institute), post tensioning hardware and tendons shall be supplied by a single manufacture that is Approved by the PTI. All shipments shall include conformations of information listed above.

CONSTRUCTION LAYOUT

CONTRACTOR to provide all necessary construction layout

DELIVERY, STORAGE AND HANDLING

Packing and Shipping: Deliver materials in original unopened water protective packaging to prevent damage to products.

Tendons: Loading/unloading of tendons shall be done in a manner to protect tendon sheathing from damage and pinching. Contractor shall replace all stands which are damaged or defective at no cost to the owner.

Tendon bundles shall be stored in accordance with PTI best practices.

COORDINATION

Contractor shall coordinate with all trades to ensure proper access, construction sequence, and quality work to be completed.

PART TWO – PRODUCTS

FORMWORK

Formwork: As specified in Section 32 13 20.

REINFORCEMENT

Tendon Strand: ASTM A 416/A 416M, Grade 270 (1860 MPa) seven-wire stranded steel cable; low-relaxation type; full length without splices.

Tendon Strand: Factory assembled, complying with PTI Tendon Specification, ASTM A 416/A 416M, Grade 270 (1860) seven-wire stranded steel cable 1/2" dia.@ .153 sq. in.; low-relaxation type; full length without splices; weldless; greased and covered with polyethylene sheathing providing free movement of tendon within sheathing; complete with end anchorages.

Tendon Coating for corrosion protection:
Coating shall be mineral base oil and a lithium hydroxystearate/ polymer thickener or lithium soap-based grease for post tensioning construction. Product shall meet or exceed the Post Tensioning Institute specifications for use as a corrosion preventative coating for unbonded, single strand tendons in corrosive service.

Acceptable Manufactures:
Shell PT Coating Grease by Shell Oil Products
Mobil Greaserex K-218 by Exxon Mobil Lubricants and Specialties
Vexipak or equal.

Tendon Anchors: Encapsulated Anchor shall be by General Technologies, 13022 Trinity Drive, Stafford TX 77477, Phone 281.240.0550 http://www.gti-usa.net/.

Fixed Anchors: Live and dead ends, zero void by General Technologies, 13022 Trinity Drive, Stafford TX 77477, Phone 281.240.0550 http://www.gti-usa.net/

Anchor Caps: All anchor caps to be filled with grease.

Sheathing: 50 mil minimum.

ACCESSORIES
Chairs, Bolsters, Bar Supports, Spacers: Size and shape for strength and support of reinforcement during tendon location, installation, and placement of concrete.

Tape: Polyken #826 or wonder tape.

CONCRETE MATERIALS AND MIX DESIGN
Concrete Materials: As specified in Section 32 13 20.
Mix Design: As specified in Section 32 13 20.

GROUT
Grout Fill:

Compressive Strength (28 day): 7500 psi.

Masterflow 928 Grout shall be nonmetallic, non-shrink hydraulic cement-based mineral-aggregate with an extended working time. ANSI /NSF 61 approved, meeting requirements of ASTM C 1107.

Manufactured by BASF Construction Chemicals, LLC. Building Systems. 889 Valley Park Drive, Shakopee, MN 55379 http://www.buildingsystems.basf.com/ or approved equal.

PART 3 – EXECUTION

EXAMINATION
Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings. Prior to concrete pour, a site inspection report shall be completed performed as listed below.

On-site Inspection report for the review of post tensioning and steel members shall include the following information:
1. Project Name
2. Date that inspection was completed
3. Inspection company name and the name of onsite inspector.
4. Name of contractor and steel fabricator
5. Number of workers on site performing work and general progress and location

6. Confirmation on back up bar installation, misc. accessories, anchors, protective coatings,
7. Spacing, layout and size of tendons.
8. Grade of slab, coverage of tendons and fabrication methods.
9. Current weather conditions

INSTALLATION

Tendon Placement

Locate and position tendons per drawings. Protect from displacement. Protect from damage; replace if damaged. Maintain 4" clearance with all required interferences and adjust layout accordingly.

Maximum Distance from Indicated Position: 1/8 inch (3 mm).

Secure jack pressure plates in position perpendicular to line of stressing force.

Inspect sheathing around tendons for damage prior to placement of concrete. Repair per PTI standards if sheathing is damaged.

Placing Concrete

Place concrete in accordance with Section 32 13 20.

Verify tendons, anchors, seats, plates, and other items to be cast into concrete are placed and secure.

Tolerances: See Section 32 13 20 for formwork construction tolerances.

Tensioning

Perform final tensioning when concrete has reached 3,000 psi compressive strength and ambient temperature is above specified requirements, in one step.

Confirm concrete strength with test cylinders prior to tensioning.

Measure prestressing force. Maintain jacking and tensioning records as work progresses.

Jack against tendon pressure plate, not against concrete.

Cut off excess tendon inside face of concrete. Apply touch-up primer to cut end.

Repair duct displaced by tensioning process. Conduct repair procedure as directed.

Grouting

Grout fill anchorage pockets.

FIELD QUALITY CONTROL

CONTRACTOR shall obtain an independent testing agency to conduct field inspection of reinforcing system prior to concrete pouring as well as inspection/measuring to ensure tendon system is properly tensioned. All inspection of post tensioning shall be completed by a PTI Certified Level 1 Unbonded PT Inspector.

Inspect all sheathing and tendons for damage, review anchors for proper installation at edge.

REMOVAL OF FORMS

See Section 32 13 20 for requirements for removal of forms.

Do not remove forms, shores, and bracing until concrete has been tensioned to strength sufficient to carry its own weight, construction loads, and design loads.

End of Section

SECTION 32 18 23.53 – TENNIS COURT SURFACING - POST TENSIONED CONCRETE

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all labor, equipment, materials, and related work for Concrete Tennis Court Surfacing required for this project as indicated on the Drawings.

RELATED WORK

Applicable provisions of Division 01 and the following Sections:

Section 32 13 20	Post Tensioned Concrete
Section 32 31 13	Chain Link Fence and Gates

REFERENCE STANDARDS

State Specifications: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2023 edition. Comply with reference sections including but not limited to:

Section 415	Concrete Pavement
Section 501	Concrete

Court Construction – American Sports Builders Association (ASBA):

Tennis Courts: A Construction & Maintenance Manual for court construction details. This publication may be obtained by calling the ASBA at 443-640-1042 or visiting www.sportsbuilders.org.

SUBMITTALS

Product Data, Shop Drawings, Samples:

General: Provide certificates certifying that materials comply with specification requirements, signed by bituminous concrete producer and Contractor.

Manufacturer shall submit complete specifications, six (6) copies of line layout drawing, installation instructions, and maintenance requirements per shop drawing requirements in General Conditions. The Contractor shall submit all shipment documents and proper materials volumes.

Installer shall submit a list of local installations and description of experience in this work.

Submit one set of Advanced Polymer Technology's "Laykold ColorCoat System Specifications."

Submit system components Technical Data Sheets (TDS) and one Laykold Color Chart.

Submit current Safety Data Sheets.

Submit current ISO Quality Management System Certification certificate.

Submit current ITF surface classification.

QUALITY ASSURANCE

Qualifications:

Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the design and application of work described for this section, and who shall be present at all times during progress of the work of this section and shall direct all work performed under this section.

For actual finishing of surfaces, and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

Provide final surfaces of uniform texture, conforming to required grades and cross-section.

All tennis court surfacing materials shall be Laykold as manufactured by Advanced Polymer Technology (APT) of Harmony, PA, an ISO 9001 certified manufacturer. APT may be contacted via telephone 888-266-4221, fax 724-452-1703, or web site www.laykold.com

All work shall be done in accordance with American Sports Builders Association (ASBA) guidelines.

The contractor shall record the batch number of each product used on the site and maintain it through the warranty period.

The contractor shall provide the inspector, upon request, an estimate of the volume of each product to be used on the site.

Asphalt and concrete substrates shall be allowed to cure a minimum of 30 days before application of any coatings. If time sensitive and/or high RH level is present, Laykold Epoxy VTB (172) Primer can be applied to 5-day old (minimum) concrete substrates according to coatings manufacturer guidelines. RH testing is required.

The substrate shall be CLEAN and DRY before coatings are applied. The surface of the substrate shall be inspected and made sure to be free of grease, oil, dust, dirt and other foreign matter before any coatings are applied.

Water used in all mixtures shall be fresh and potable.

No part of the surfacing system shall be applied during a rainfall, or when rainfall is imminent.

Do not apply coatings to a cold surface. Surface and air temperatures must be a minimum of 50ºF (10ºC) and rising.

Do not apply coatings if extremely high humidity prevents drying.

No coatings are to be applied if surface temperature exceeds 130°F (54°C).

All materials shall be delivered to the job site in sealed containers with the manufacturer's label affixed.

Color(s) of acrylic color coating system are to be selected by owner from manufacturer's product color card.

If all the above conditions are met, surfacing materials shall have a one-year limited warranty as supplied by the manufacturer.

DELIVERY, STORAGE AND HANDLING

Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.

Replacements: In the event of damage, immediately make all repairs and re-placements necessary to the approval of the Architect and at no additional cost to the Owner.

FIELD CONDITIONS

Environmental Requirements (Weather Limitations): Do not apply when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

Traffic Control: Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

Field Measurements: Contractor shall familiarize himself with existing conditions on site prior to installation.

COORDINATION

Contractor shall coordinate with all trades to ensure proper access, construction sequence, and quality work to be completed.

WARRANTY

Provide minimum one (1) year warranty against defects for materials and installation, unless otherwise indicated.

Entire court surface to be warranted by installer for a period of two years against color fade or surface deterioration.

PART TWO – PRODUCTS

MANUFACTURERS

Laykold Tennis & Sport Surfacing Systems manufactured by Advanced Polymer Technology, 109 Conica Lane, Harmony, PA 16037. Corporate Office: 724-452-1330; Primary Contact: Jeff Bryant; Office: 732-206-0031; Mobile #: 732-300-0572

LAYKOLD COLORCOAT SYSTEM MATERIALS

All components of Laykold ColorCoat system shall be supplied by Advanced Polymer Technology, an ISO 9001 certified manufacturer. Laykold system components shall not contain ANY lead, mercury, nor any heavy metals, PCB, or formaldehyde.

Laykold Bond-Kote:

Latex emulsion primer or approved equal.
As a concrete adhesion promoter Bond-Kote needs to be diluted 1 part LM Bond-Kote to 5 parts water. Diluted material should be applied with a high-quality roller.
Weight 8.34 lbs./gallon

Laykold Acrylic Deep Patch:

A high strength acrylic cement modifier or approved equal.
Percent Solids by Weight 47% (minimum)
Weight 8.80 lbs./gallon

Laykold Acrylic Resurfacer:

An acrylic-based emulsion used for smoothing rough pavements or approved equal. Laykold NuSurf is an acceptable substitute.
Percent Solids by Weight 52% (minimum)
Weight 10.68 lbs./gallon

Laykold ColorCoat Concentrate:

A pigmented wear-resistant acrylic emulsion or approved equal. Advantage Laykold factory textured color or Laykold ColorFlex are acceptable substitutes.
Percent Solids by Weight 49 % (minimum)
Weight: 12.9 (+/- 3) lbs./gallon

Laykold Line Prime:

Clear drying acrylic emulsion line primer or approved equal.
Percent Solids by Weight 29%
Weight: 8.9 lbs./gallon

Laykold Textured Line Paint:

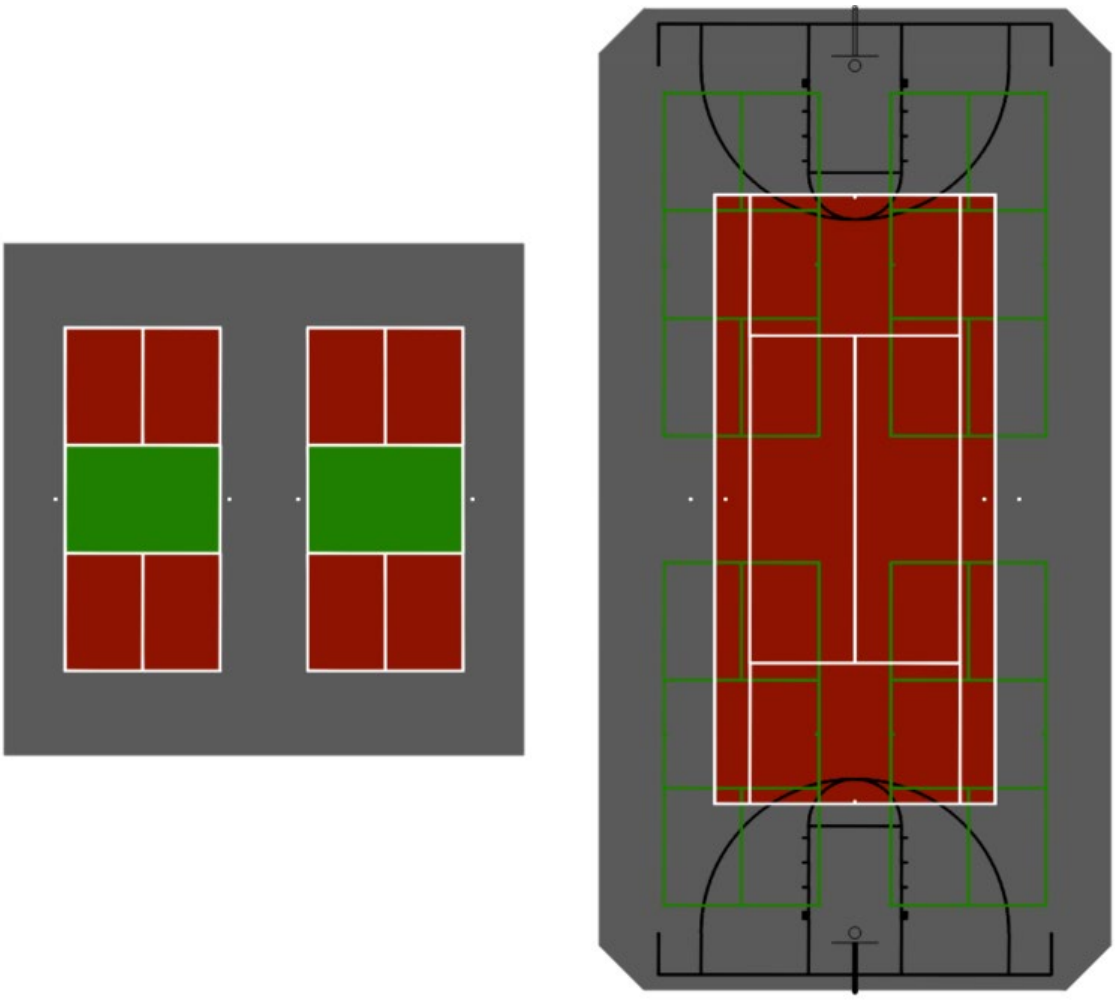
Factory textured, wear-resistant acrylic emulsion line marking paint, or approved equal.
Percent Solids by Weight 67% (minimum)
Weight: 11.4 lbs./gallon

East Court Colors shall be as follows;

Tennis Playing Surface:	BRICK RED
All other Court Surfaces:	DARK GRAY
Primary Tennis Lines:	WHITE
Secondary Pickleball Lines:	GRASS GREEN
Tertiary Basketball Lines:	BLACK

West Court Colors shall be as follows;

Pickleball Playing Surface:	BRICK RED
Kitchen:	GRASS GREEN
All other Court Surfaces:	DARK GRAY
Pickleball Lines:	WHITE



Provide OWNER 4'x4' sample of proposed court colors for approval prior to ordering and installing surfacing.

WATER

The water used in all mixtures shall be fresh potable.

TENNIS COURT SURFACING SYSTEM

Provide an even textured non-resilient color playing surface for new concrete tennis courts as indicated on drawings.

Surface shall have an ITF category 3 Medium Pace rating.

Exact colors to be selected by Architect from manufacturer's standard colors.

System shall be Laykold. Contractors utilizing other manufacturers shall be pre-approved and shall provide materials to match those noted above in bid information.

OTHER MATERIALS
All other materials not specifically described but required for proper and complete installation of the work of this section, shall be as selected by the contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

EXAMINATION
Concrete substrates shall be installed with a vapor barrier according to ASBA guidelines and be finished with a CSP 3 profile.

Inspect concrete substrate for dryness. Report any discrepancies to general contractor.

Surface of substrate shall be cleaned by general contractor as required.

Surfacing contractor to approve site and surface conditions prior to proceeding with application of any coatings.

Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

PREPARATION
Surface preparation:
Review concrete finish with Architect and Court Surface contractor. Concrete shall have a CSP3 surface profile via shot-blasting or other mechanical methods. Consult with Architect if acid etching is required.

Steel Shot Blast:
This contractor shall be responsible for this process. Utilize steel shot technique to get to a concrete surface profile (CSP) #3. Review process with Architect prior to starting work.

Do not allow any curing agents or hardeners to be used. Concrete must cure for a minimum of 28-days.

Patching & Crack Filling:
Once the surface has been thoroughly cleaned and is free of all loose material, dirt, or dust, the court shall be flooded and allowed to drain a minimum of 30 minutes and a maximum of 1 hour. Any area that holds water (birdbaths) in a depth greater than 1/16 inch (1.6 mm or the thickness of a nickel) shall be outlined and patched. Patching shall be done before concrete priming.

Surface Leveling:
Birdbaths shall be leveled using a Laykold Acrylic Deep Patch court patch binder slurry. Prime area to be patched with a 50/50 mixture of Laykold Acrylic Deep Patch and water. Primer shall be brushed into place and allowed to dry prior to patching. Patch mix shall consist of Laykold Acrylic Deep Patch, 50-mesh sand and Type 1 Portland Cement. Mix as per manufacturer directions.

Crack Filling:
Cracks shall be cleaned, primed, and filled using Laykold Acrylic Resurfacer if cracks are 1/16 inch or less. If greater than 1/16 inch, Laykold Acrylic Deep Patch court patch binder slurry should be used to fill cracks. Mix as per manufacturer's directions. Laykold Crack Filler is an acceptable substitute.

All areas that are repaired/leveled/corrected using a court patch binder mixture shall be allowed to fully cure and then ground smooth and level with the substrate by stone or an acceptable mechanical method.

Concrete Primer:
Bond-Kote by Laykold. Primer may be installed one week after shot blasting. Concrete may have a relative humidity of greater than 75%; calcium chloride greater than 5 lbs / 24 hr / 1000 sq.ft. Apply to steel shot or water blast slabs with a surface profile of CSP #3. Install per manufacturer's requirements.

INSTALLATION

Filler Coat(s):
Apply one coat of Laykold Acrylic Resurfacer using a 24", 30" or 36" wide 70 Durometer flexible rubber squeegee. Batch mix shall consist of 55 gallons (260 kg) of Laykold Acrylic Resurfacer, 30 to 40 gallons (115-130 kg) of potable water, and 600 to 900 pounds (270- 400 kg) of clean, bagged silica sand (60 to 80 mesh).

The application rate shall be 0.05-0.07 gal/yd2 (0.29-0.40 kg/m2 - 129-180 ft2/gal) of undiluted Laykold Acrylic Resurfacer per coat. NOTE: If the asphalt is very porous, an optional second application of Laykold Acrylic Resurfacer may be applied. Each coat should be completely dry before applying subsequent coats.

Textured Color Coats:
Apply two coats of Laykold ColorCoat Concentrate textured batch mixture using a 24", 30" or 36" 50 Durometer flexible rubber squeegee. Batch mix shall consist of 55 gallons (260 kg) of Laykold ColorCoat Concentrate, 25 to 35 gallons (95-115 kg) of potable water and 300 to 450 pounds (135-203 kg) of clean, bagged silica sand (70 to 100 mesh).

The application rate shall be 0.04-0.05 gal/yd2 (0.23-0.29 kg/m2 - 180-225 ft2/gal) of undiluted ColorCoat Concentrate per coat. Each coat should be completely dry before applying subsequent coats.

Game Lines:
Wait a minimum of 24 hours after final color coat before applying line paint.
All lines are to be applied by painting between masking tape with a paintbrush or roller according to U.S.T.A. and A.S.B.A. specifications.

Prime masked lines with Laykold Line Prime and allow a minimum drying time of 1-hour.

Apply 1 to 2 coats as needed of Laykold Textured Line Paint with a brush or roller.
Remove masking tape immediately after lines are dry.

Allow lines to dry a minimum of 24 hours before allowing play on court.

Limitations: No parts of the construction involving Laykold System shall be conducted during rainfall or when rain is imminent. The air temperature must be at least 50 degrees F and rising within a 24-hours period. Do not apply when surface temperature is in excess of 130 degrees F. The Laykold system will not prevent surface or structural cracks from reoccurring.

CLEANING

After completion of installation, clean surfaces of excess or spilled asphalt materials to the satisfaction of Architect/Engineer.

Protection:
Protect from traffic during all operations, and until sealer is thoroughly set and cured and does not pick up under foot or wheeled traffic.

Protect adjacent surfaces. Mask abutting drainage system and clean after installation of product. Repair damage at no expense to Owner. Dispose of properly all drums, extra product at no expense to Owner.

Barricades:
After installation, do not permit traffic on surface until it has dried and hardened. Provide barricades and warning devices as required to protect installation and the general public.

End of Section

SECTION 32 18 23.59 – TENNIS COURT SURFACING - ASPHALT

PART ONE – GENERAL

SCOPE

This work under this section shall consist of providing all work, materials, labor, equipment and supervision necessary for proper completion of all tennis court surfacing, marking and related work indicated on the drawings and specified herein. CONTRACTOR shall refer to the drawings for the required locations of tennis court surfacing to be installed. CONTRACTOR shall field verify all quantities and dimensions. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- References
- Owner Furnished Materials
- Provisions for Future Work
- Submittals
- Quality Assurance
- Material Handling and Storage
- Guarantee
- Installer Qualifications

PART TWO – PRODUCTS
- Acrylic Resurfacer
- Acrylic Color Playing Surface System
- Line Painting

PART THREE – EXECUTION
- Application Preparation
- Surface Curing
- Layout
- Contraction Joints
- Acrylic Resurfacer
- Acrylic Color Playing Surface System
- Line Painting
- Submittal
- Clean Up

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

Section 32 10 00 Hard Surface Base and Paving

REFERENCES

National Asphalt Paving Association (NAPA)
United States Tennis Association (USTA)
International Tennis Federation (ITF)
American Sport Builders Association (ASBA)

OWNER FURNISHED MATERIALS

None

PROVISIONS FOR FUTURE WORK

None

SUBMITTALS

Prior to Construction, The Contractor shall submit the following items for the Engineer's review and approval. Any additional information or testing required, by the Engineer, necessary for the approval shall be at the Contractor's expense.

Manufacturer specifications & cut sheets for all products to be used including installation instructions. At a minimum, the following items shall be included:
Acrylic resurfacer
Acrylic color playing surface system
Line paint

Authorized Applicator certificate from the surface system manufacturer.

Reference list from the installer of at least 5 projects of similar scope done in each of the past 15 years.

Current Material Safety Data Sheets (MSDS) for products used.

Playing surface color samples for approval prior to installation.

Submit two (2) copies of the surveyor's layout for the acrylic surfacing indicating its location in relation to the substrate and the elevations of the substrate.

QUALITY ASSURANCE

The Contractor is required to maintain an in-house Quality Control Program. Only certified or qualified personnel shall operate this program. As a minimum, the Quality Control program shall provide data that shows that all materials meet all specification requirements. All Quality Control data shall be available to the Engineer upon request. The Contractor shall pay for all Quality Control or any retesting required.

The Contractor is responsible for the adequate drainage of the finished system. Birdbaths and/or ponding will not be allowed.

The presence or absence of inspection or field observations shall not relieve the Contractor from their inherent responsibility to conform to the intent of the project specifications.
Surfacing shall conform to the guidelines of the ASBA for planarity.

All surface coatings products shall be supplied by a single manufacturer.

The contractor shall record the batch number of each product used on the site and maintain it through the warranty period.

The contractor shall provide the Construction Representative, upon request, an estimate of the volume of each product to be used on the site.

The installer shall be an authorized applicator of the specified system by the manufacturer.

The manufacturer's representative shall be available to help resolve material questions.

Manufacturer of all surfacing products is to be an established firm experienced in the manufacturing of outdoor tennis court surfacing systems with installations of a minimum of five (5) years in age.

The OWNER and Engineer shall be notified by the Contractor to inspect and approve the surfaces prior to the Contractor installing subsequent surfacing material steps. The following is a list of minimum points/steps where inspection/approval shall be completed:

Flood test.
Prior to installation of each coat of acrylic resurfacer.
Prior to installation of each coat of acrylic color playing surface material.

MATERIAL HANDLING AND STORAGE
Store materials in accordance with manufacturer specifications and MSDS.

Deliver product to the site in original unopened containers with proper labels attached.

All surfacing materials shall be non-flammable.

GUARANTEE
Provide a guarantee against defects in the materials and workmanship for a period of three (3) years from the date of substantial completion. The guarantee shall cover the tennis court surface against any fault or defect in material or workmanship for installation defects and guarantee adhesion of the surface to the underlying asphalt. Excluded from the guarantee is normal wear from general intended use or vandalism.

INSTALLER QUALIFICATIONS
Installer shall be regularly engaged in construction and surfacing of acrylic tennis courts, play courts, or similar surfaces.

Installer shall be an Authorized Applicator of the specified surface system.

PART TWO – PRODUCTS

RESURFACER – LAYKOLD NUSURF OR APPROVED EQUAL
Material shall consist of an asbestos free 100% acrylic latex binder specifically designed for job mixing with silica sand to obtain a fast-drying filler coat that reduces surface posterity in asphalt pavements.

Material shall be 100% acrylic resin (no vinyl copolymerization constituent). The product shall contain not less than 3.5% attapulgite.

Percent solids by weight (minimum) 26.7%

Weight 8.7-8.9 lbs/gallon

Acrylic resurfacer materials are subject to approval by the Engineer and or OWNER.

ACRYLIC COLOR PLAYING SURFACE SYSTEM – LAYKOLD COLORFLEX
Material shall consist of an asbestos free 100% acrylic latex textured color surface finish system specifically designed for use as a longwearing playing surface for tennis courts.

Preapproved color playing surface systems include Laykold as manufactured by Advanced Polymer Technology.

Acrylic color playing surface systems and materials are subject to approval by the OWNER.

Court color will be based on standard colors provided by Laykold.

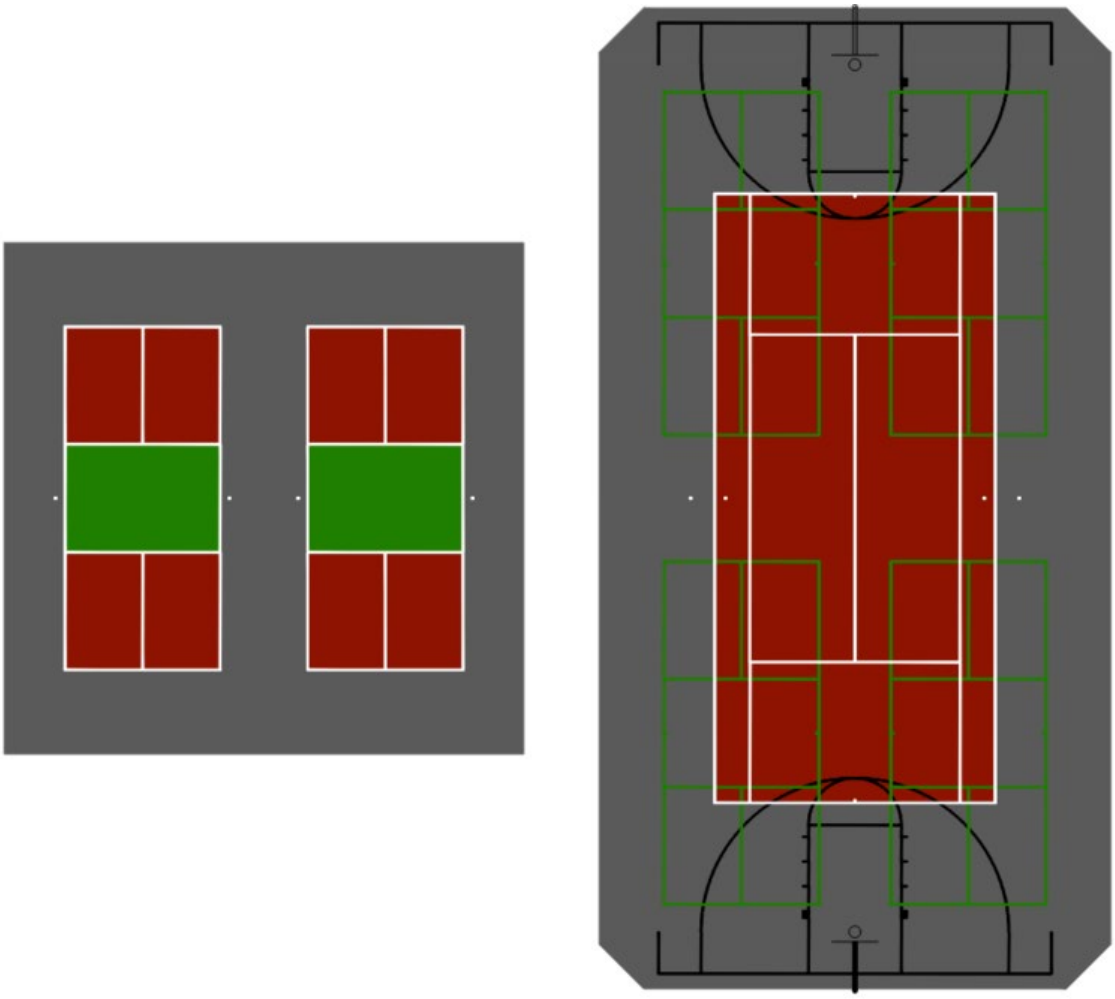
Manufacturers will provide standard colors most closely matching Laykold colors specified.
East Court Colors shall be as follows;

Tennis Playing Surface:	BRICK RED
All other Court Surfaces:	DARK GRAY
Primary Tennis Lines:	WHITE
Secondary Pickleball Lines:	GRASS GREEN
Tertiary Basketball Lines:	BLACK

West Court Colors shall be as follows;

Pickleball Playing Surface:	BRICK RED
Kitchen:	GRASS GREEN
All other Court Surfaces:	DARK GRAY
Pickleball Lines:	WHITE

Provide OWNER 4'x4' sample of proposed court colors for approval prior to ordering and installing surfacing.



LINE PAINTING

Material shall consist of 100% acrylic emulsion type line marking paint specifically designed for use in line marking of outdoor tennis courts on asphalt surface.

Line paint shall be approved by the acrylic color playing surface system manufacturer for use on the playing surface.

Manufacturers and products shall be approved by the USTA.

Line paint materials are subject to approval by the Engineer and or OWNER.

PART THREE – EXECUTION

APPLICATION PREPARATION

Check the condition of the substrate and notify the general CONTRACTOR and LA/E if conditions exist which might affect the performance or appearance of the acrylic surface.

Application of the filler coat indicates the applicator has accepted the condition of the substrate.

Verify that the substrate is level to the tolerances required under the QUALITY ASSURANCE subheading in PART ONE.

Clean and sweep sand and loose debris from substrate as required to assure proper bond.
Provide measures to protect adjacent surfaces from court surfacing over-spray.

SURFACE CURING

Application of filler coats and color coats shall not be performed until the bituminous pavement has been properly cured. Bituminous or Portland cement concrete pavements must be exposed to ambient temperatures above 50°F for a period of not less than 30 days before the application of the filler coat. Selected surface shall be applied no sooner than thirty (30) days after paving is completed.

LAYOUT

Use steel tapes, transits, and other surveying equipment which will allow that precise measurement of distances and angles.

Layout shall be performed by or field verified by a Licensed Land Surveyor.

All boundary lines shall be 2" in width.

CONTRACTION JOINTS

Contractor shall sawcut joints at locations shown on project plans or as a minimum between from chain link fence to chain link fence through both the net post locations and between courts equidistant from sidelines and base lines. Joints shall be sawed to a depth of one third the pavement thickness or at least one inch, whichever is deeper. Debris in sawcut joints shall be removed using compressed air prior to the application of the filler coat.

ACRYLIC RESURFACER

All work shall be performed within the temperature ranges required by the manufacturer.

Thoroughly clean all areas to be free of loose dirt, dust, algae, greases and oils. Cracks shall be blown clean with an air compressor or high-pressure water. Any areas previously showing algae growth shall be treated with bleach or approved product to kill the organism and then properly rinsed.

The LA/E shall approve the surface prior to installing each coat of Acrylic Resurfacer.

Apply two (2) coats Acrylic Resurfacer per the manufacturer's recommendations.

Each coat shall be applied 90 degrees to the previous coat.

After each coat is allowed to dry, inspect entire surface. Any defects shall be repaired.

Filler Coats:
Filler coats shall be sand filled acrylic for filling pavement surface voids and for surface texture.

Initial resurfacer coat shall include sand. Final resurfacer coat shall not include sand.

Silica sand gradation shall be 70-90 mesh (ultra fine sand).

The desired playing surface texture/speed is “medium play”.

Filler coats shall cover entire proposed area as indicated on the plan. Extend surface material a minimum of one foot beyond court perimeter fencing on all sides, if shown on plan.

All materials shall be hand applied.

A uniform texture shall be achieved free of visible ridges, patch edges, or treated areas.

If shrinkage cracks appear, they shall be addressed prior to the commencement of additional coats.

Initial filler coat shall be tested prior to application of the final coat.

ACRYLIC COLOR PLAYING SURFACE SYSTEM
All work shall be performed within the temperature ranges required by the manufacturer.

Thoroughly clean all areas to be free of loose dirt, dust, algae, greases and oils. Cracks shall be blown clean with an air compressor or high-pressure water. Any areas previously showing algae growth shall be treated with bleach or approved product to kill the organism and then properly rinsed.

The LA/E shall approve the surface prior to installing each coat of Acrylic Color Playing Surface material.

Apply two (2) coats Acrylic Color surface per the manufacturer's recommendations.

Each coat shall be applied 90 degrees to the previous coat.

After each coat is allowed to dry, inspect entire surface. Any defects shall be repaired.

Color Surface Coats:
The color finish system material shall be compatible with the filler coat material.

Color coats shall cover all asphalt surfaces within the complex (inside and outside of fence).

No sand may be added to the color material, unless authorized by the Engineer.

All materials shall be hand applied.

Initial playing surface coat shall be play tested by OWNER Representatives prior to application of the final coat.

LINE PAINTING

Primary line paint shall be compatible with the color surface system. Use of traffic, oil, alkyd, or solvent vehicle type paint is prohibited.

Playing lines shall be accurately located, masked, and laid out in accordance with WIAA and USTA guidelines and shall match the plan detail. Razor cutting shall not damage surface system.

Paint shall be applied in two (2) coats in accordance to the manufacturer's recommendations by skilled and experienced installers.

Seal lines per manufacturer’s recommendations.

SUBMITTAL

Provide the OWNER or LA/E a copy of the bill of lading or supplier’s invoice identifying the volume of filler material and acrylic paint delivered to the project site.

CLEANUP

All adjacent paved and grass areas shall be kept clean at all times during construction.

Contractor shall be responsible for any pavement or grass areas damaged during construction.

All debris and empty containers shall be removed from the site. Dispose of materials in accordance with local, state and Federal regulations.

Leave site in a clean and orderly condition.

End of Section

Intentionally Left Blank

SECTION 32 31 13 – CHAIN LINK FENCING AND GATES

PART ONE – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide a fully functioning chain link fence and gate installation as provided for in these specifications and on the Drawings. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- Reference
- Continuity of Existing Security Fencing
- Record Drawings

PART TWO – PRODUCTS
- General
- Fence Height
- Required Arms, Rails, and Tension Wires
- Required Coatings
- Fabric
- Fabric Fasteners
- Materials to be Furnished
- Gates
- Gate Hardware
- Post Tops
- Tension Wire
- Stretcher Bars

PART THREE – EXECUTION
- Site Work
- Posts and Braces
- Post Bracing Assembly
- Stretcher Bars
- Fabric
- Grade Clearance
- Gates
- Cleanup

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

Section 03 00 00	Concrete
Section 31 05 00	Earthwork

REFERENCE

State Specifications: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2025 edition.

Unless otherwise specified in these specifications or otherwise shown on the Drawings, conform work under this section to Section 616 of the State Specifications.

CONTINUITY OF EXISTING SECURITY FENCING

Do not interrupt or change existing security fencing without prior written approval from the LA/E. When interruption is required, coordinate schedule with the OWNER agency to minimize disruptions. Unless specifically stated, all work involved in interrupting or changing existing security fencing is to be done during normal working hours.

Verify the locations of any water main, sanitary sewer, storm sewer, drainage, irrigation, electric, gas, fiber optic, telephone, steam lines or other utilities which may be encountered in the excavation of fence bases.

RECORD DRAWINGS

Maintain record drawings of all fencing installations and points of connection made as part of this project and for future connection on original drawings prepared by the installing CONTRACTOR/subcontractor. Include copies of record drawings with the Operating and Maintenance instructions.

PART TWO – PRODUCTS

GENERAL

All materials furnished shall be new materials unless otherwise specified. Salvaged materials may be used only when specified.

FENCE HEIGHT

The height of the fence shall be as shown on the Drawings or specified. The designated height of the fence shall be the fabric height.

REQUIRED ARMS, RAILS, AND TENSION WIRES

Provide rampart arm, top rail/tension wire, intermediate rail, and bottom rail/tension wire in accordance with the Drawings.

REQUIRED COATINGS

In accordance with Section 616.2.3.1 of State Specifications.

PVC Coated: Vinyl coating thickness, galvanized coating weight, and wire tensile strength conform to ASTM F668, Class 2b.

Color: black

FABRIC

Provide 9 gauge aluminum coated, two (1 3/4) inch mesh fabric, with knuckled selvedge on top and bottom conforming to ASTM A-491.

FABRIC FASTENERS

Provide fabric fasteners of steel wire clips and tie wires galvanized in accordance with ASTM A-641, Class III, or aluminum coated in conformance with fence fabric specifications.

Provide fasteners for posts, top and intermediate rails, bottom rails, top tension wires and braces of 9 gauge steel or 0.179 inch diameter aluminum tie wires.

Provide fasteners for bottom tension wire of not smaller than 12 gauge or 0.149 inch diameter aluminum tie wires.

MATERIALS TO BE FURNISHED

All Post Types shall be SCH 40 Pipe Steel or SS 40 Pipe Steel. Furnish materials in accordance with the following schedules for the fence height specified:

TYPE AND HEIGHT	POST TYPE	SIZE O.D. (IN)	MIN. WALL THICK (IN)	MIN. SECT MODULUS (IN3)	MIN. YIELD STRENGTH (PSI)	MIN. WGT (LBS/FT)	MAX. POST SPACE (FT)
LINE POSTS (7 feet or less w/windscreen)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	6
	SS 40 Pipe Steel	2.875	0.160	0.878	45,000	4.64	6
LINE POSTS (8-10 feet w/windscreen)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	6
	SS 40 Pipe Steel	2.875	0.160	0.878	45,000	4.64	6
LINE POSTS (14 feet w/windscreen)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	6
	SS 40 Pipe Steel	3.5	0.160	1.34	45,000	5.71	6
END, CORNER AND BRACE POSTS (7 feet or less)	SCH 40 Pipe-Steel	2.375	0.154	0.560	25,800	3.65	--
	SS 40 Pipe Steel	2.375	0.130	0.488	45,000	3.12	--
END, CORNER AND BRACE POSTS (8 or 10 feet)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	--
	SS 40 Pipe Steel	2.875	0.160	0.878	45,000	4.64	--
END, CORNER AND BRACE POSTS (14 feet)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	--
	SS 40 Pipe Steel	3.5	0.160	1.34	45,000	5.71	--
RAILS AND BRACES	SCH 40 Pipe-Steel	1.66	0.140	0.235	25,800	2.27	--
	SS 40 Pipe Steel	1.66	0.111	0.196	45,000	1.84	--

GATES

TYPE AND HEIGHT	POST TYPE	SIZE O.D. (IN)	MIN. WALL THICK (IN)	MIN. SECT MODULUS (IN3)	MIN. YIELD STRENGTH (PSI)	MIN. WGT (LBS/FT)	MAX POST SPACE (FT)
GATE POSTS (leaf width 6 feet or less)	SCH 40 Pipe-Steel	2.875	0.203	1.064	25,800	5.79	--
	SS 40 Pipe Steel	2.875	0.160	0.877	45,000	4.64	--
GATE POSTS (leaf width 7 to 13 feet)	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10	--
	SS 40 Pipe Steel	2.875	0.160	0.878	45,000	4.64	--
GATE FRAMES	SCH 40 Pipe-Steel	1.90	0.145	0.326	25,800	2.72	--
	SCH 40 Pipe-Steel	1.90	0.090	0.221	45,000	1.74	--

Provide additional horizontal and vertical members as necessary to assure proper gate operation and attachment to fabric and hardware.

Provide diagonal braces made of crossed adjustable length three-eighth inch diameter truss rods on nonwelded gate frames and on welded frames where corner rigidity is not sufficient to prevent sag.

Gate frames shall be covered with the same fabric as the fence.

Weld or assemble gate frames with malleable or pressed steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges. Attach to frame at fifteen (15) inches o.c. all sides. Provide caps for all gate frame work ends.

GATE HARDWARE

Provide heavy duty hinges of malleable iron, pressed or forged steel, nonlift-off type, adjusted to permit 180-degree gate opening. Provide two (2) hinges for each leaf.

Provide heavy duty forked type or plunger bar type latches for all single leaf gates. Provide center stop and keeper for all double leaf gates. Provide spring latch for all sliding gates. Provide padlock eye as an integral part of all latches.

Provide heavy duty track, ball bearing hanger sheaves framing and supports, guides, stays stops and bracing necessary for sliding gates.

POST TOPS

Provide cast or malleable iron tops on all posts. Tops shall have an opening for the top rail to pass through.

TENSION WIRE

Provide 7-gauge tension wire conforming to the fence fabric used, complete with end clamps.

STRETCHER BARS

Provide stretcher bars of one-piece lengths equal to the full fabric height with a minimum cross section of 3/16" x 3/4". Provide one (1) stretcher bar for each gate and end post and two (2) for each corner and pull post, except roll form posts with integral loops.

PART THREE – EXECUTION

SITE WORK

Prior to fence construction remove and dispose of all trees, brush, logs, stumps and other debris for a width of at least twelve (12) inches each side of the proposed fence alignment.

POSTS AND BRACES

Set posts in a vertical position at the required location and alignment. Set tops at the required elevation to provide a smooth profile at the top rail or tension wire without abrupt changes and in conformity with the general contour and which meets the approval of the LA/E.

Place an end post at each end of each run of fence. Place a corner post whenever a break of 30 degrees or more occurs in the horizontal alignment. Set an intersection post in line with an intersecting chain link fence and brace it to the adjacent posts of the intersecting fence.

Place an intermediate braced post where the vertical alignment changes by more than 5 degrees or a change in fence grade of more than 9% percent occurs

Place an intermediate braced post at 660 foot intervals for fence with a top rail and at 1,000 foot intervals for fence with a top tension wire on all long runs of fence. Set an intermediate brace post at the approximate midpoint when runs of fence are less than 1,320 feet but more than 660 feet for fence with top rail, or less than 2,000 feet but more than 1,000 feet for fence with top tension wire.

Line, corner, gate, and brace posts will be driven posts according to construction details.

POST BRACING ASSEMBLY

Post bracing assemblies consist of one or more brace rails and a 3/8 inch truss rod as hereafter specified. Provide brace rails the same size as the top rail. Provide truss rods with an adjustable take-up adapter.

Install a single bracing assembly at each gate and end post location.

Install a double bracing assembly at each corner post and all intermediate braced posts. Provide the bracing assembly with one horizontal brace rail and one diagonal truss rod on all fences which have a top rail. Locate the horizontal brace rail in accordance with the manufacturer's specifications.

Provide the bracing assembly with one horizontal brace rail and one diagonal brace rail and one diagonal truss rod on all fences which do not have a top rail. Locate the horizontal rail in accordance with the manufacturer's specifications.

STRETCHER BARS

Provide one stretcher bar for each gate and end post and two for each corner and pull post, except roll form posts with integral loops. Attach to posts with heavy duty pressed steel or malleable iron bands spaced at 15 inches o.c.

FABRIC

Install, stretch, and anchor tension wires to each end, corner, gate and brace post and properly attach to each line post before the fabric is placed. Pass top tension wire thru the post top rail opening. Install top, intermediate and bottom rails at proper locations.

Hang fabric on the inside (playing side) of all installations at tennis court.

Attach the end of the fabric to the end, corner, gate or brace posts (except roll form posts with integral loops) by means of a stretcher bar threaded through the end loops of the fabric and stretched to remove all slack with proper stretching equipment. Secure the stretched fabric to posts, rails and tension wires with specified fabric fasteners. Install fabric fasteners on all posts at not greater than 14 inches o.c. and on rails and bottom tension wires at not more than 24 inches o.c. Where a top tension wire is installed, fasten to the fabric at not more than 18 inches o.c.

Repeat stretching operations at approximately every 100 feet for each run of fence.

Make splices in fabric by interweaving a wire picket through each end loop of each piece of fabric. Each splice shall be subject to the LA/E approval.

GRADE CLEARANCE

For tennis court edges, provide a clearance from the bottom of the fabric to the new finished grade of 1 inch.

GATES

Install gates plumb and level and adjust for smooth operation as intended, without binding or hanging up.

CLEANUP

After chain link fence construction is completed clean up all storage and work areas. Replace or repair as required all landscape features damaged or disturbed under this contract.

End of Section

SECTION 32 80 00 – IRRIGATION

PART 1 - GENERAL

SCOPE

The CONTRACTOR shall provide all labor, materials, equipment, registrations and services necessary, or incidental to the completion of an in-ground irrigation system for the planting areas indicated on the plans.

PART ONE – GENERAL
- Scope
- Description of the System
- Shop Drawings
- Permits
- Codes and Standards
- Drawings
- Materials

PART TWO – PRODUCTS
- Piping Systems
- Irrigation Equipment

PART THREE – EXECUTION
- General
- Workmanship
- Excavation and Backfill
- Access
- Identification
- Tests and Adjustments
- Installation of Wire
- Installation of Piping
- Thrust Blocking
- Winterization
- Cleaning Equipment and Premises
- Operating and Maintenance Manuals
- As-Builts
- Certification of Tests and Adjustments Form

RELATED WORK

Applicable provisions the following sections:

Section 32 25 25	Water Supply Well
Section 32 25 30	Well Pumping Equipment
Section 32 82 00	Irrigation Pumping Station

DESCRIPTION OF THE SYSTEM

The existing irrigation system is a two-wire controlled system served by a low cap irrigation well and watertronics VFD, a hunter controller with expansion capabilities and remote-controlled valves. For phase-2 design purposes, the irrigation system addition has been designed with HUNTER rotary sprinkler heads and valves. Furnish and install equipment as common in the industry, associated piping and incidentals as shown and specified. Connection the existing irrigation main will be provided by CONTRACTOR. Verification of the existing irrigation well and VFD capacity to service the proposed irrigation system expansion will be the responsibility of the CONTRACTOR.

SHOP DRAWINGS

Provide construction drawings for review in accordance with requirements of General Conditions. Drawings shall contain complete dimensional, operational, and material quality information on all equipment items. CONTRACTOR shall provide sufficient copies of drawings for his own needs, supplier's needs, requirements of other CONTRACTORS affected by equipment and two (2) copies to be retained by LA/E.

CONTRACTOR shall be responsible for transmitting copies of approved drawings to other affected CONTRACTORS such as electrical CONTRACTOR for wiring connections, plumbing CONTRACTOR for piping limited to the following information: catalog sheets or drawings showing general arrangements, dimensions, weights, electrical characteristics, power consumption, model numbers, finishes, material, service accessibility requirements, capacity (gpm, etc.), efficiency and other data pertinent to application of item to project. All parameters given in equipment schedule shall be stated in the drawings.
Drawings or submittals are required on following items:

- Control Valves
- Valve Boxes
- Sprinkler Heads
- Swing Joints
- Wiring Schematics
- Automatic Controller
- Quick Coupling Valves
- Master Valve

PERMITS

All permits and registrations required by any and all regulatory agencies or utilities shall be secured and paid for by the CONTRACTOR.

CODES AND STANDARDS

All work specified in this section and applicable provision of Division 01 shall conform to all applicable state and local codes, and to standards for materials and workmanship of nationally recognized approved agencies and trade associations, i.e. State Administrative Code, General Requirements; State Department of Health; American Society of Mechanical ENGINEERS; American Society for Testing and Materials; The American Water Works Associations; Plastic Pipe Institute; Valve Manufacture Institute.

DRAWINGS

Plans of piping shown on scale drawings are intended to indicate size and/or capacity where stipulated, approximate location and/or direction and approximate general arrangement of one phase of work to another, but not exact detail or arrangement of construction. Plans are based on equipment scheduled. CONTRACTOR shall be responsible for changes resulting from equipment other than scheduled.

If it is found before installation, that a more convenient, suitable or workable arrangement for any or all phases of project would result by varying or altering the arrangement indicated on the drawings, the CONTRACTOR may change the location or arrangement of his work without additional cost to OWNER, but only after obtaining a written approval by LA/E.

Drawings are shown schematically, however, minor variations may occur. CONTRACTOR shall verify dimensions, locations and any other information critical to placement of devices, with the drawings to assure proper installation. Field measurements shall take precedence over drawing dimensions and shall be verified.

MATERIALS

Each major component of equipment shall have manufacturer's name, address, catalog and serial number permanently attached in a conspicuous place.

The same brand or manufacturer shall be used for each specific application of valves, fittings, controls, and other equipment.

All materials shall be new and of the quality specified.

All equipment shall be listed, approved or rated by a nationally recognized testing and rating bureau of recognized manufacturers association responsible for setting industry standards. All electrical equipment and apparatus shall be U.L. listed.

Acceptable irrigation manufacturers - Hunter, Toro or RainBird, but must be approved as equal to that product shown on the plans and in the specifications.
It is the intent of this specification to establish a uniform equipment pallet for this and the remaining phases of the project. Substitutions will only be allowed if in the opinion of the LA/E it is deemed to be equal or an upgrade and offers the same features that were originally specified.

Equipment Substitutions
Whenever a piece of equipment or material is identified by a manufacturer's trade name, catalog number, etc., it is intended merely to establish a standard; and any equipment of another manufacturer which will perform adequately the requirements of design and is of equal or greater quality than the specifications in the opinion of the LA/E will be considered equally acceptable.

It is the intent of this specification to permit use of materials of any nationally recognized manufacturer so long as they are fully equal to quality and performance of named item in opinion of LA/E. Materials or equipment of other manufacturers may be used upon following conditions.

Proposed substitute is equal in design, materials, construction and performance in opinion of LA/E. No compromise in quality level will be allowed.

Service capabilities, availability of service parts, and stability of manufacturer are adequate in opinion of LA/E and OWNER.

CONTRACTOR assumes responsibility for any modifications required for installation of substitute equipment and for accommodation of such substitution by work of other CONTRACTORS. Any additional expense on part of other CONTRACTORS or OWNER due to substitution of equipment shall be borne by CONTRACTOR making such substitution.

Substitute equipment shall fit into space provided with adequate provisions for service and maintenance.

PART 2 - PRODUCTS

PIPING SYSTEMS

Polyvinyl Chloride Pipe – PVC Pipe Mainline

PVC pipe to be extruded from virgin materials. Pipe to have pressure ratings and size marked continuous on pipe. ASTM D2241. Mainline piping shall be CL200 PVC.

Sleeving shall be Schedule 40 PVC. Pipe sleeves shall be as indicated on the drawings. Wire sleeves shall be a minimum of 1” in size. Mark all sleeve locations. Sleeves shall be placed under all walks and drives or as indicated. Separate sleeves shall be provided for pipes and wires.

Road bores shall be HDPE piping with flange connections. Extend piping five feet beyond the surface.

PVC fittings: ASTM D2241 schedule 40 PVC molded fittings suitable for solvent weld, slip joint ring tite seal or screwed connections.

S-80 PVC fittings may be used and may be threaded or solvent weld.
S-80 TOE Nipples with S-80 couplings for plastic to metal connections.
(S-80 nipples cut in half will not be allowed)

All mainline piping to be trenched only. Vibratory plowing will not be allowed.

All mainlines, lateral lines and sleeves are to have a metallic tracer wire, with connections back to the controller. Sleeves shall have tracer tape brought just below the surface at the ends for ease of locating.

Polyethylene Pipe – PE Lateral Lines

All polyethylene pipe shall be virgin, high impact, polyethylene pipe, having minimum 100 PSI working pressure rating. All polyethylene pipe shall be continuously and permanently marked with manufacturer's name, material, size, and schedule of type.

Polyethylene insert pipe fittings shall be constructed of Schedule 80 and shall conform to ASTM D2466. Polyethylene pipe shall be secured to fitting by means of two (2) stainless steel hose clamps for fittings of 1.5" and 2". Fittings 1" and smaller shall use one (1) stainless steel clamp or approved methods.

Lateral lines are to be trenched. If conditions are appropriate and rock free for vibratory plowing, the CONTRACTOR may plow lateral piping, but must get OWNER'S approval prior to installation.

IRRIGATION EQUIPMENT

Electric Control Valves

All valves shall be of globe or globe/angle configuration with a female pipe thread inlet and outlet connections. Diaphragm assembly shall be sonically welded to form a solid-piece component. The diaphragm shall be of rubber construction to retain flexibility and provide maximum sealing throughout its area.

Electric valves shall have a manual flow control with a hand-operated, rising-type flow control stem with control wheel/handle and an internal manual bleed assembly. Size per plan.
All parts shall be serviceable without removing valve from line. Valve may be installed at any angle without affecting valve operation.

22" solenoid lead wires shall be attached to a 24 VAC solenoid with waterproof molded coil capable of being removed by turning coil. Valve shall be held normally closed by internal water pressure with manual bleed screw.

The valve shall be equipped with an adjustable pressure regulator device with a dial for setting the outlet pressure.

Quick Coupler Valves

The quick coupling valve shall have a yellow vinyl cover and Acme threads.

The quick coupler is to have stabilizer wings. If the valve does not have stabilizers originally installed, use attachable stabilizers.

Quick coupler valves are to be mounted on a swing joint with brass female threads and placed in a 10" round valve box. The valve box is to be filled with ¾" clear rock. Ensure proper height when backfilling.

Ductile Iron Fittings

All mainline valve-tapping fittings shall be deep bell ductile iron fittings or saddle taps. DI fittings shall have lugs to accept lateral connection valve.

Lateral Connection Valve

The lateral connection shall be made of ductile iron body, resilient seated angle valve. The valve connection shall be made without the use of any threaded or glued joints. The valve body shall swivel about its base to allow positioning the valve outlet to various angles. The lateral connection is to also use a DI male adapter to transition from the lateral connection to the electric valve.

Isolation Valves

Isolation valves 3" and smaller shall be bronze gate valves. The gate valve shall be 200lb rated, non-shock, solid disc, non-rising stem with threaded ends. Valves shall have a bronze cross handle. Valve sizes shall be as shown on plan. Connections to the piping shall be made with a S-80 TOE nipple and a S-80 Coupling.

Isolation valves 4" and larger, shall meet all AWWA C509-80 standards. Valves shall be resilient seat body and bonnet are to be cast iron alloy ASTM A126 Class B or ductile Iron ASTM A536. Valve to be epoxy

coated inside and outside. Stems to be stainless steel with a cast iron 2” square operating nut. The valve shall provide full diameter waterway, low torque operation and absolute shut-off. Valves shall be push-on type valves. Valves to be 200 psi CWP Nibco P619-RW or approved equal.

Valve Boxes

Valve boxes shall be rectangular, 12" /w 6” extension or 10” Round and have “T” lid tops.

Valve box shall be of a size that provides adequate space for valve repairs. More than one valve requires a 12” rectangular box, a maximum of 1 electric valve and lateral connection per 12” rectangular valve box. A 10” round valve box may be used for isolation valves and wire drops only.

Sprinkler Heads

Sprinkler Heads: Per plan notes.

Solvent Weld Fittings

Solvent weld PVC fittings shall be Schedule 40, ASTM D-2466 and ASTM D1784. PVC Schedule-40 fittings shall be produced from PVC Type 1, Cell Classification 1245B. Fittings shall be manufactured by Spears or approved equal. All solvents and cements shall be that recommended by the manufacturer.

Gasketed Fittings

Gasketed PVC pipe fittings shall carry a minimum pressure rating of 200 psi. All fittings shall conform to ASTM 3139 and ASTM 1784.

Swing Joints

Swing Joints riser assemblies shall have a working pressure rating of 315 psi @73F. The swing joint shall have two O-rings at each swivel joint. The inlet and outlet sockets and threads conforming to ASTM standards D 2467 and D 2464, respectively. The body wall thickness of all components conforming to ASTM D 2464.

The swing joint riser assemblies will be molded of Rigid Poly (vinyl) Chloride (PVC) Type 1, Cell Classification 12454-B per ASTM Standard D 1784. It shall be manufactured in such a way, that both the male and female O-ring sealing areas be free from mold parting lines. The burst pressure tested per ASTM D2467 and the long term pressure tested at 1,000psi for 1,000 hours.

The swing joint shall have a three year warranty for the swing joint riser. The sprinkler swing joint shall have a minimum length 10” nipple and quick coupler swing joints shall have a minimum length 12” nipple and be by Spears or approved equal. The threads shall correlate to sprinklers, quick couplers and related components. Quick couplers are to have a brass female threaded 90 ell outlet and use a 4” brass nipple to enter the bottom of the quick coupler.

Two Wire Irrigation System Requirements

Provide station decoders with surge suppression and ground wire as needed to group irrigation remote control valves.

Locate and install grounding plates as per manufacturer’s recommendations. Locate grounding plates a minimum distance of six (6) feet perpendicular to the mainline. Locate grounding plate at irrigation controller as per manufacturer’s recommendations. Minimum ground hardware shall be a four (4) inch x thirty-six (36) inch copper plate with at least 10AWG dia. copper wire.

Provide 14 AWG/1.6 mm diameter twisted decoder wire in sheathed casing as provided by Hunter Industries. Hunter Industries wire must be used to maintain warranty provided by Hunter. Provide DBR6 or DBY6 wire connectors as manufactured by 3M for connection of decoders to valve connections and decoders to two wire system. Wire runs shall not be looped.

Install two wire irrigation systems as per manufacturer’s recommendations to provide a complete and operational system.

Tools and Extra Equipment

The CONTRACTOR is to provide to the OWNER, two (2) sets of tools to repair and work on all equipment specified.

The CONTRACTOR is to provide one (1) electric valve of each size specified and four (4) sprinkler heads of each type specified.

Provide (3) three quick coupling keys with (3) three 1" hose swivels to the OWNER.

Controller

Controller: Existing per plan notes.

Timing shall be accomplished by solid-state means. Controller expansion shall be by module expansion units.

Controller is to be installed and grounded per manufacture recommendations.

Install pump start relay per manufacturer specifications.

PART 3 - EXECUTION

GENERAL

CONTRACTOR shall verify all necessary information regarding exact location of existing underground structures and utilities and shall mark their location, both at site and on all copies of installation plans.

CONTRACTOR shall be liable for damages to and cost of repairing or replacing any buried conduit, cables or piping encountered during installation of work, unless they were not marked or he has not been previously informed of such underground utilities. If CONTRACTOR is aware of such buried lines, he shall immediately have the incurred damages repaired at his own expense. Conversely, OWNER shall be liable for cost of replacing or repairing damages to any of those existing utilities of which CONTRACTOR has not been previously informed.

WORKMANSHIP

All work shall be done by qualified irrigation installers that are knowledgeable and experienced in operations they are performing. Installation methods, procedures and materials shall be in accordance with accepted industry practice and with standards of manufacturing and contracting associations applicable to the work. All work shall be neatly done with special emphasis on appearance of work exposed to view.

EXCAVATION AND BACKFILL

Trenches for the PVC piping system, wiring and allied material will be excavated to a sufficient depth and width to permit handling and installation of the materials. Mainline trenches are to be a minimum of 18" cover to top of pipe. Lateral piping shall have a minimum of 16" top of pipe cover. Mainlines without the lateral connection shall be at a depth of 16" to the top of pipe.
Excavation for pipes shall be cut to required grade. Provide an accurate grade and uniform bearing throughout the length of pipe. Backfill shall be sand or rock free on-site materials, not exceeding 6" in thickness lifts and mechanically compacted in 6" layers as it is brought up to the top 6" of finish grade. Compaction shall be 95% Modified Proctor.

Installation by trenchless methods may be allowed on 2" lateral piping and smaller, only if in the opinion of the LA/E that the site conditions are acceptable and the CONTRACTOR has equipment of sufficient size to install the piping by trenchless methods. CONTRACTOR is to get written permission from LA/E to install by trenchless methods.

When additional backfill material is needed to replace the unsuitable materials, it will be the CONTRACTOR'S responsibility and expense to supply such material. It will also be the CONTRACTOR'S responsibility to dispose of the unsuitable material.

Concrete, asphalt or gravel paved areas, sidewalks, curb, gutters, and lawn areas, which are disturbed, shall be replaced and restored to original condition by this CONTRACTOR unless specifically stated to the contrary.

The CONTRACTOR will be responsible for all finish and fine grading of trenches, disturbed areas around sprinklers heads, electric valves and any other excavated or disturbed areas by the CONTRACTOR. CONTRACTOR will also be responsible for all trench settling throughout the project during the one-year warranty period. If settling occurs, the CONTRACTOR will repair and bring back to originally set grade.

The CONTRACTOR shall grade out trenches and disturbed areas to blend with the existing grades, re-seed trenches and all disturbed areas with seed and fertilizer mix specified.

ACCESS

All items of mechanical equipment shall be located so that parts requiring service and adjustment are accessible. Filter replacements, valve servicing, pump service, adjustment, replacement, control service, and pressure reducing valve service shall be readily accessible. If additional access doors or panels are required to make service convenient, they shall be provided by CONTRACTOR supplying item requiring services.

CONTRACTOR to examine final grade and installation conditions. Do not start irrigation system until satisfactory conditions are corrected. If the irrigation CONTRACTOR begins work, he is accepting the conditions and is responsible to bring the site to final grading conditions. This includes compacting, leveling and regarding all trenches.

Irrigation system shall be roughed in after finished grade is complete and before turf and landscaping is established.

IDENTIFICATION

The legend and flow arrow shall be applied at all valve locations. Valve numbering shall be located so as to be conspicuous and legible. The controller and valve numbering can be engraved in black on a yellow plastic tag, by Christy's Enterprise or equal. The tag size shall be a standard size of 2.25" x 2.66".

TESTS AND ADJUSTMENTS

CONTRACTOR shall be responsible for testing of the well for verification of yield and a drawn down test prior to the start of any irrigation system installation. The CONTRACTOR shall furnish all labor, material and equipment for the pumping test for a period of 8 hours. Furnish a meter or measuring equipment and airline and gauge to measure capacity and water levels. The ENGINEER may require that the test pumping period be conducted at maximum rate or may select several step rates during the test. The ENGINEER may require the CONTRACTOR to extend or reduce the test period. During the course of the test pumping, the CONTRACTOR shall record discharge and drawdown per the following schedule (preferably through the use of a down hole pressure transducer and digital data logger). Drawdown measurements shall be accurately made and shall be within +1/8 inch of actual drawdown.

Upon completion of pumping, recovery measurements shall be taken for a period of time no less than 1/3 the length of the pumping period.

CONTRACTOR shall conduct tests of systems as required by codes, regulatory agencies and this specification. Tests shall be made under system operating pressure. Notify LA/E and regulatory agencies prior to conducting tests. CONTRACTOR shall complete the Certification of Tests and Adjustments Form (at the end of this section) and submit to LA/E when tests have been completed.

A hydrostatic test equal to scheduled operating pressure of the system is to be applied to main line and lateral lines.
Test complete system under full line pressure. Pressure must be maintained with less than 2lbs loss in the system for 4 hours. If the system does not hold pressure, repair leaks and retest system until the system maintains pressure.

All necessary testing equipment shall be furnished by CONTRACTOR.

The CONTRACTOR will be responsible for the balancing and adjustments of the various components of the system so the overall operation of the system is the most efficient. Including but not limited to the synchronization of the controllers, adjustments to the pressure regulator valves and sprinkler adjustments. Coordinate controller setup with LA/E.

INSTALLATION OF WIRE
Wiring shall be installed a minimum of 24-inches below finished grade to the side of or below piping where possible.

Looped slack at valves shall be provided for electrical wiring. Wires shall be snaked in trenches with and expansion loop at 100-foot intervals.

Provide a two-wire system to each solenoid valve from the controller.

INSTALLATION OF PIPING
All mainline pipes shall be installed with a minimum depth of 24” of cover on top of pipe.

All lateral piping shall be installed with a minimum depth of 16”.

All pipes shall be installed in accordance with manufacturer's recommendation and applicable codes.

All gravel or other foreign material shall be removed from trenches. Backfill shall be with clean materials only.

All gasketed pipe, tees, elbows and fittings will be thrust blocked as detailed with concrete to prevent the breaking or blowing off of the joint. **Gasketed Pipe Not Allowed on lateral lines.**

THRUST BLOCKING
Thrust blocks will be installed in accordance with J-M installation guide #TR-533A 11-77 at all changes in direction, reducers and as shown on plans. The use of joint restraints on the main line must be approved by the LA/E.

WINTERIZATION
Winter drainage shall be accomplished by replacing water with compressed air. Compressed air connector is located at point of connection shown on the plans. Subcontractor shall drain system at end of first season at no cost to OWNER. A blowout tap and threaded plug shall be placed at the point of connection and after the backflow unit as directed by LA/E for blow-out purposes.

CLEANING EQUIPMENT AND PREMISES
Thoroughly clean all parts of the piping, valves, and equipment.

Remove all construction debris, excess materials, and equipment.

OPERATING AND MAINTENANCE MANUALS
CONTRACTOR shall furnish to Landscape ARCHITECT two operating manuals for furnished equipment. Information sheets shall be bound in standard three-ring binders labeled to show CONTRACTOR'S name,

address, regular business phone number, emergency phone number, and date. Operating manuals shall be submitted prior to completion of work to allow time for review. Manual shall contain following information:

List (keyed with identification numbers used) each item of equipment, which requires service, giving the name of the item, model number, manufacturer's name and address, and providing the name, address, and phone number of the nearest representative of authorized service organization.

Cut sheets to be included for the following, but not limited to: electric valves, isolation valves, swing joints, valve boxes, controllers and sprinkler heads.
A copy of the shop drawing for each item.

A complete operating and maintenance manual, parts list, wiring diagrams, lubrication requirements, and service instructions for each major item.

Complete control diagrams with description of all operation sequences and control devices.

Properly executed registrations and registered manufacturer's warranties.

After completion of work and when OWNER has had sufficient time to examine operating manuals and become somewhat familiar with operation of equipment, a meeting will be arranged for purpose of instructing OWNER in proper maintenance of system and to answer questions he/she may have regarding its operation.

AS BUILTS
The CONTRACTOR is to provide the OWNER a scaled drawing completed field “As-Built” of the system.

All components of the system are to be drawn and referenced to a fixed location on the site.

Components of the system but not limited to, sprinkler heads, electric valves, isolation valves, all PVC piping, quick couplers, PVC pipe sizing, power wire routes and size and 24v wire routes from the controller to the electric valves including common runs.

All PVC piping shall be referenced in the trench for lengths of run, change in direction and distance and locations of all components referenced in feet from a known point.

Two final hard copies of the overall drawings with dimension and notes are to be provided to the LA/E and OWNER and one copy of the As-Built in AutoCAD 2002 digital format at the same scale drawing as provided to the CONTRACTOR. The CONTRACTOR is to provide individual controller sequencing sheets in a 24” x 36” size and 81/2” x 11” format. Both submittals shall be laminated and placed as directed by OWNER. CONTRACTOR may contact the LA/E for this service if needed.

The CONTRACTOR is to submit field As-builts with pay submittal for each area the pay submittal is being submitted for. Payment will not be approved if progress drawings are not submitted.

CERTIFICATION OF TESTS AND ADJUSTMENTS FORM

CONTRACTOR: _____

PROJECT NAME: _____

PROJECT NUMBER: _____

The CONTRACTOR named above certifies that the tests and adjustments indicated below have been completed in accordance with the specifications on the date indicated.

System pressure at the point of connection to meet required psi.

TESTS	DATE
1. Hydrostatic test of main line	
Pressure tested at _____ psi	
2. Water line tested under full pressure and made watertight	
3. Water pressure at the farthest & highest sprinkler	
4. Pattern of water coverage and adjustment	
5. Complete cycle of program control	

COMPANY: _____

SIGNED BY: _____

END OF SECTION

SECTION 32 91 13 - SOIL PREPARATION

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment and supervision necessary to provide and prepare soil for seeding. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Submittals
- Quality Assurance

PART TWO - PRODUCTS
- Salvaged Topsoil
- Lime

PART THREE - EXECUTION
- Topsoil stripping
- Subgrade Soil Preparation
- Placing Topsoil
- Organic Soil Amendments

RELATED WORK

Applicable provisions of the General Conditions and the following sections:

Section 32 92 19 Seeding

SUBMITTALS

Submit recommendations for soil organic amendments and pH adjustment based on soil organics and pH test of existing topsoil to be salvaged.

Provide copies of all quality assurance testing reports.

QUALITY ASSURANCE

CONTRACTOR shall retain the services of an independent testing firm to conduct sampling, testing and analysis of salvaged and imported soil and amendments as required by this section and elsewhere in the Contract Documents prior to delivery and placement of materials to verify general conformance with Specification requirements. Materials testing firm shall be subject to approval by LA/E. Pre-placement testing shall be at rate established in Table 32 91 13-1.

Collection of soil specimens shall be completed in accordance with accepted practices, and shall be subject to approval by LA/E.

Material	Test Required	Test/Sample Frequency
Salvaged Topsoil	pH	1 test/1000 cy
Salvaged Topsoil	D422-63(1998) Standard Test Method for Particle Size Analysis of Soils	1 test/1000 cy

Table 32 91 13-1

PART TWO - PRODUCTS

SALVAGED TOPSOIL

Clean salvaged material meeting the requirements of Section 625.2(1) of the State Specifications. Material shall be free of rocks, gravel, wood, debris, noxious weeds and associated seeds.

Location: all seeded and sodded general turf areas outside ballfield limits.

LIME

Lime material shall meet the requirements of Section 629.2.2 of the State Specifications.

PART THREE - EXECUTION

TOPSOIL STRIPPING

Remove existing topsoil in accordance with the requirements of Section 31 20 00 – Earthmoving.

SUBGRADE SOIL PREPARATION

Remove or mow all vegetation to a height 3 inches. Remove all rocks, debris, and litter that will prevent compliance with topsoil and seeding specifications. Final grade area to within 2 inches of subgrade elevations. Till or disc the subsoil in general landscape areas to a depth of 2 to 4 inches to allow aeration.

PLACING TOPSOIL

Place topsoil in relatively dry conditions.

Fine grade topsoil eliminating rough and low areas to insure positive drainage. Maintain levels, profiles and contours of subgrade. Finished topsoil grade shall not vary more than ¼ inch from required grade in 10 feet measured in any direction.

Remove stone, roots, grass, weeds, debris and other foreign material larger than ½ inch.

Manually spread topsoil around trees, plants, fences and buildings to prevent damage, which may be caused by grading equipment.

Slightly compact placed topsoil.

Stockpile excess topsoil on site at locations designated on drawings.

Leave stockpile area and site clean and raked, ready to receive landscaping.

Place topsoil to achieve final grades indicated on the Drawings, allowing for settlement. Place topsoil to the depth shown on the Drawings. If no depth is shown provide a minimum of 6 inches of topsoil.

Do not apply topsoil to saturated or frozen subgrades.

ORGANIC SOIL AMENDMENTS AND pH ADJUSTMENT

Provide organic soil amendments and lime as recommended soil analysis. If topsoil has been determined acceptable by a soil test, no amendments are needed.

Uniformly apply organic soil amendments and lime and incorporate into the top 4 to 6 inches of soil by tilling or discing.

End of Section

SECTION 32 92 19 - SEEDING

PART ONE - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment and supervision necessary to complete seeding, mulching and turf maintenance as indicated on the drawings. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Submittals
- Delivery, Storage and Handling
- Planting Season
- Guarantee

PART TWO - PRODUCTS
- Seed
- Water
- Mulch
- Starter Fertilizer
- Maintenance Fertilizer

PART THREE - EXECUTION
- Preparation
- Starter Fertilizing
- Sowing
- Mulching
- Cleaning and Repair
- Maintenance Period
- Maintenance Watering
- Maintenance Fertilizer
- Mowing

RELATED WORK

Applicable provisions of the General Conditions govern work under this Section and the following Sections:

Section 31 20 00	Earthmoving
Section 32 91 13	Soil Preparation

SUBMITTALS

Provide seed data showing seed mix composition and a guarantee of germination.

Provide selected seed supplier(s) for project.

Provide fertilizer formulation.

DELIVERY, STORAGE AND HANDLING

Deliver seed to in original, unopened container, labeled as to weight, analysis, and manufacturer. Store any seed delivered prior to use in manner safe from damage from heat, moisture, rodents, or other causes. Replace any seed damaged after acceptance.

Deliver fertilizer shall be delivered to the site in original, sealed containers, and stored in waterproof space. Containers shall bear the manufacturer's name, analysis, trademark and guarantee as per standards of the Wisconsin Department of Agriculture.

PLANTING SEASON
The regular seeding season is considered April 1-June 15 and September 1-October 15.

GUARANTEE
The CONTRACTOR shall guarantee the germination of seed installed during the regular seeding season.

PART TWO - PRODUCTS

SEED
General Turf
50-50 Seed Mix – All General Green Areas:
- 25% Abbey Kentucky Bluegrass
- 25% Envicta Kentucky Bluegrass
- 25% Pentium P Ryegrass
- 25% Inspire P Ryegrass
- Apply at 6lbs of seed per 1000 ft^2.

Or approved equal by LA/E.

WATER
Water free of wastewater effluent or other hazardous chemicals.

MULCH
Clean straw or hay that is well-seasoned, and free of rot, mildew and the seeds of noxious weeds.

STARTER FERTILIZER
Fertilizer proportioned as follows: Nitrogen 10 percent, phosphoric acid 18 percent, soluble potash 22 percent.

Apply at rate of 0.5 Nitrogen pounds per 1000 square feet.

MAINTENANCE FERTILIZER
See MAINTENANCE FERTILIZER AND SEED section in PART THREE.

PART THREE - EXECUTION

PREPARATION
Prepare area in accordance with Section 32 91 19 – Soil Preparation.

Apply “Round-up” or other non-selective herbicide approved by LA/E in accordance with manufacturer’s instructions prior to tilling and fine grading. Do not fertilize and seed any sooner than delay period recommended by manufacturer.

No seeding shall occur on frozen ground or at temperatures lower than 32° F (0° C).

STARTER FERTILIZING
Apply fertilizer in accordance with manufacturer's instructions.
Apply after smooth raking of topsoil and prior to roller compaction. Do not apply fertilizer at same time or with same machine as will be used to apply seed. Apply fertilizer after seed has been dragged and soil leveled. Mix thoroughly into upper 2” of topsoil. Lightly water to aid dissipation of fertilizer.

SOWING
Apply seed at a rate of 6 lbs. per 1,000 sq. ft. evenly in two (2) intersecting directions. Rake in lightly. Do not seed area in excess of that which can be mulched on same day.

Do not sow immediately following rain, when ground is too dry, or during windy periods. Drag seeded area with lightweight drag to cover seed and level soil.

Immediately following seeding, fertilizing and compacting, apply mulch to a thickness of 1" to 1/2". Maintain clear of shrubs and trees. Crimping of mulch shall be performed in two (2) directions after placement of mulch.

Apply water with a fine spray immediately after each area has been mulched. Saturate to 4" of soil.

MULCHING

Place and anchor mulch using the methods outlined in Section 627.3 of State Specifications.

CLEANING AND REPAIR

Waste and excess material from seeding operation shall be promptly removed. Adjacent paved areas are to be cleaned, and any damage to existing adjacent turf areas shall be repaired.

MAINTENANCE PERIOD

Maintenance of turf (watering, mowing, fertilizing, supplemental seeding) shall extend for minimum of 105 growing days from date of seeding to establish a healthy, uniform, close stand of established grass. Bare areas greater than 6" will not be accepted. The maintenance period shall be extended at no additional cost to establish grass until accepted by LA/E if not accomplished within the minimum 105 growing day period.

MAINTENANCE WATERING

Seeded areas are to be watered daily to maintain adequate surface soil moisture for proper seed germination. Watering shall continue for not less than 30 days following seeding. Thereafter, apply ½ inch of water twice weekly until final acceptance.

MAINTENANCE FERTILIZER

Apply maintenance fertilizer and seed on following schedule:

Date	Material	Rate
All Turf		
Sowing Date + 28 Days	24-0-14	1.0 lb N. /1000 sq.ft.
Sowing Date + 49 Days	34-2-8	1.0 lb N. /1000 sq.ft.
Sowing Date + 77 Days	Overseed thin areas with 50/50 Seed Mix	500 lb. (total)
Sowing Date +105 Days	24-0-14	1.0 lb. N /1000 sq.ft.

MOWING

Cool season grasses, such as bluegrass, tall fescue, perennial ryegrass, etc. shall be mown to a height of 2-1/2" (6.4 cm) in spring and fall, and no less than 3" (7.6 cm) from June through September. These heights are to be maintained through repeat mowings as needed until final acceptance.

No more than 33% of grass leaf shall be removed during any single mowing operation.

The mowing operation is to include trimming around obstacles and the raking of excess grass clippings. Weed trimmers shall not be used around trees.

End of Section

Intentionally left blank

SECTION 32 92 23 - SODDING

PART ONE - GENERAL

SCOPE

Work includes sodding and maintenance. Furnish all labor, material and equipment necessary to perform the sodding and related work as indicated on the drawings.

RELATED WORK

Applicable provisions of the General Conditions govern work under this section.

Section 32 91 13 - Soil Preparation.

REFERENCES

State of Wisconsin Department of Transportation, "Standard Specifications for Road and Bridge Construction", 2024 Edition.

DELIVERY, STORAGE AND HANDLING

Sod shall be protected from sun, wind and dehydration during transport to site.

Fertilizer shall be delivered to the site in original, sealed containers, and stored in a waterproof space. Containers shall bear the manufacturer’s name, analysis, trademark and guarantee as per State Specifications.

PLANTING CONDITIONS

Sodding shall not occur when the air temperature is above 95^{O}F.

GUARANTEE

The CONTRACTOR shall guarantee in writing that the sod be properly approved and/or certified, uniform in appearance and quality, and free of visible imperfections prior to and after installation.

PART TWO - PRODUCTS

SOD

Highland type, nursery-grown sod shall be of dense growth, with a strong, fibrous root system, and shall be composed of at least seventy-five (75) percent Kentucky Bluegrass, mixed with fescue and perennial rye grasses, and free of pernicious weeds. At the time of cutting, the sod should have a length of approximately 2", and be raked free of debris.

Standard sections of sod to be installed shall be of enough strength to support their own weight and to retain their size and shape when held within its upper ten (10) percent and suspended vertically.

FERTILIZER

Granular, non-burning product composed of not less than fifty (50) percent organic slow-acting, guaranteed analysis professional fertilizer. Fertilizer shall conform to State Specification.

Commercially available type 'B' top-dressing fertilizer shall be composed of 20% nitrogen, 5% phosphoric acid, and 20% potash, unless directed otherwise by prior soil test.

WATER

Adequate supplies suitable for irrigation and free of harmful materials.

PART THREE - EXECUTION

PREPARATION

The surface to be sod shall be loosened by equipment or hand methods to a reasonably fine granular texture, and to a depth of not less than 1" (2.5 cm). The surface shall be lightly and uniformly watered to the loosened depth prior to installation.

Commercial fertilizer shall be applied at a rate of 1 lb. per 1,000 sq. ft. (0.48 kg/100 sq. m.), and lightly raked into the soil.

SODDING

Sod shall be installed at the finish grade(s) specified on a surface prepared and finished to an even, loose and uniform surface.

Sod shall be harvested, delivered, and cut and laid within a 24-hour period. Harvested sod not installed within this time period may still be used if examined and approved by LA/E's Project Representative prior to installation.

Sod shall be machine-cut at a uniform soil thickness (excluding top growth and thatch) of 3/4", plus or minus 1/4" (19 mm, +/- 6.4 mm). The sod shall be cut in roll format uniform commercial-sized rolls. Broken pads and torn or uneven ends are unacceptable. Sod harvested by the supplier under drought conditions is not acceptable.

Sod shall be laid with the first row in a straight line, and with subsequent rows placed parallel to the first and tight against one another. Stagger lateral joints. The overlapping of sections and spaces between joints are both unacceptable. Sod sections are not to be stretched.

On slopes greater than 1:4, install sod perpendicular to the slope, with staggered joints, and secure with wooden stakes of 6" minimum length, driven plumb to the soil portion of the sod, and spaced along the longitudinal length of the sod strip, between 18" and 36" apart. Once sod is rooted, remove or drive stakes into ground.

Newly-sodded sections shall be immediately rolled to remove minor depressions and irregularities, and to eliminate air pockets. The roller is to weigh no more than 150 lbs. per linear foot of roller width.

Newly-sodded sections shall be lightly watered during installation. Following rolling, sections shall be thoroughly watered enough to dampen the subsoil to a depth of 4". Moderately water sodded areas daily, without allowing the subsoil to be waterlogged, until LA/E acceptance.

FERTILIZING

All chemical applications are to be performed in accordance with current federal, state and local laws, through EPA-registered materials and application techniques, and performed under the supervision of a licensed certified applicator.

Fertilizer is to be applied with a mechanical rotary or drop-type distributor approximately thirty (30) days after sodding, at a rate equal to 1 lb. per 1,000 sq. ft., and thoroughly watered into the soil.

CLEANING

Waste and excess material from the seeding operation shall be promptly removed. Adjacent paved areas are to be cleaned, and any damage to existing adjacent turf areas shall be repaired.

COMPLETION AND REPAIR

The CONTRACTOR will perform all necessary weeding, mowing and trimming, and shall replace any section larger than 1 sq. ft. that is bare or otherwise damaged. Grass is to be mown to a height of 2-1/2" at least once prior to acceptance.

INSPECTION

Areas of installed sod shall be inspected by the CONTRACTOR and LA/E's Project Representative at the conclusion of the contracted maintenance period, upon written request for such an inspection submitted by the CONTRACTOR at least five (5) working days prior to the desired inspection date. The condition of the sodded areas, including any instances of settlement, washouts, tire damage, etc., will be noted by LA/E's Project Representative and a determination made whether the maintenance period shall be extended. The CONTRACTOR will be notified in writing of acceptance by LA/E.

MAINTENANCE

Watering: Apply ½" of water twice weekly until final acceptance.

Mowing: Cool season grasses, such as bluegrass, tall fescue, perennial ryegrass, etc. shall be mown to a height of 2-1/2" in spring and fall, and no less than 3" from June through September. These heights are to be maintained through repeat mowings as needed during the length of the contract.

No more than forty (40) percent of grass leaf shall be removed during any single mowing operation.

The mowing operation is to include trimming around obstacles and the raking of excess grass clippings. Weed eaters shall not be used around trees.

MAINTENANCE PERIOD

Maintenance of sod (watering, mowing, fertilizing, supplemental seeding) shall extend for minimum of 30 growing days from date of sodding.

End of Section

Intentionally left blank

SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES

PART ONE – GENERAL

SCOPE

This section provides information common to two or more technical site work specification sections or items that are of a general nature, and not included in other sections. This section applies to ALL site work, as applicable. Included are the following topics:

PART ONE - GENERAL
- Scope
- Related Work
- Referenced Organizations
- Referenced Documents
- Quality Assurance
- Safety
- Permits
- Construction Limits
- Work by Others
- Submittals
- Off Site Storage
- Codes
- Certificates and Inspections
- Laser
- Tracer Wire

PART TWO – PRODUCTS
- Barricades, Signs, and Warning Devices
- Tracer Wire

PART THREE – EXECUTION
- Maintenance of Site and Building Access/Egress
- Continuity of Existing Traffic and Traffic Control
- Protection and Continuity of Existing Utilities
- Protection of Existing Work and Facilities
- Storm Water/Excavation Water Management
- Laser and Laying Pipe
- Tracer Wire

RELATED WORK

Applicable provisions of Division 01 govern work under this Section along with the following Sections:

Section 33 11 00	Water Utility Distribution Piping
Section 33 30 00	Sanitary Sewer Systems
Section 33 40 00	Storm Sewer Systems

REFERENCED ORGANIZATIONS

Applicable references of Division 01 shall govern all work under this section.

Abbreviations of organizations referenced in these specifications are as follows:

AASHTO	American Association of State Highway and Transportation Officials
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers

ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
FHA	Federal Highway Administration
EPA	Environmental Protection Agency
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
STI	Steel Tank Institute
UL	Underwriters Laboratories Inc.
WDNR	State of Wisconsin Department of Natural Resources
WisDOT	State of Wisconsin Department of Transportation

REFERENCED DOCUMENTS

Where reference is made to “State Specifications” it shall mean: Wisconsin Department of Transportation, "Standard Specifications for Highway and Structure Construction", 2025 edition.

Where reference is made to “Standard Specifications” it shall mean: “Standard Specifications for Sewer and Water Construction in Wisconsin,” Sixth Edition, December 22, 2003 and Addendum 1, December 22, 2004 and Addendum No. 2, April 22, 2008.

Incorporate following listing of correction of referenced chapters or sections contained within “Standard Specifications.”

Page	General Section	Noted Reference Section or Chapter	Correct Reference Section or Chapter
3-21	3.2.6(n)1	4.17.0	4.16.0

Where reference is made to “PAL” it shall mean Wisconsin Department of Transportation, current edition of "Product Acceptability List" or “Approved Product Lists” found on the WisDOT “Doing Business” website.

Where reference is made to “BMPH”, it shall mean the Wisconsin Construction Site Best Management Practice Handbook, current edition as published by the WDNR.

Method of measurement and basis of payment sections in referenced documents shall not apply.

QUALITY ASSURANCE

Provide materials and products as required by individual specification sections. Refer to Section GC - General Conditions of the Contract regarding substitutions.

CONTRACTOR shall provide quality assurance testing and reporting as required by individual specification sections.

SAFETY

CONTRACTOR is solely responsible for worksite safety.

Perform all work in accordance with applicable OSHA, state and local safety standards.

Contact Diggers Hotline at 1-800-242-8511 in accordance with statutory requirements. Request that non-member utilities and private utilities be located by the appropriate parties.

PERMITS
Unless otherwise noted in the Contract Documents, CONTRACTOR shall be responsible for obtaining and paying for all permits necessary to complete the work.

CONSTRUCTION LIMITS
Construction Limits are indicated on Drawings. In absence of such a designation on Drawings, confine work to minimum area reasonably necessary to undertake the work as determined by LA/E. In no case shall construction activities extend beyond state property lines or construction easements.

The CONTRACTOR shall restore all disturbed areas in accordance with Drawings and specifications. If Drawings and specifications do not address restoration of specific areas, these areas will be restored to pre-construction conditions as approved by LA/E.

WORK BY OTHERS
Coordinate work under this project with work by OWNER and other CONTRACTORS on the site in accordance with Section 01 11 00, Summary of Work.

SUBMITTALS
Refer also to Section GC - General Conditions of the Contract and Division 01.

Submit manufacturer's shop drawings, product data, samples, substitutions and operation and maintenance (O&M) data for approval as required by individual specification sections.

Unless otherwise noted, submit electronically to Chase Rettler at crettler@rettler.com unless otherwise directed by LA/E at the Pre-Construction Meeting.

OFF SITE STORAGE
Refer to Division 01.

In general, payments for materials stored off site will only be considered in instances where there is limited space available for storage on the site. Prior approval by LA/E, together with execution of a Storage Agreement will be required.

CODES
Comply with requirements of all applicable, local, state and federal codes.

CERTIFICATIONS AND INSPECTIONS
Refer to Section GC - General Conditions.

Obtain and pay for all required sampling, testing, inspections, and certifications except those expressly listed as provided by LA/E, OWNER or other third party in the Contract Documents. Deliver originals of certificates and documents to LA/E within 3 days; provide copies to the OWNER. Include copies of the certifications and documents in the O&M Manual.

LASER
Lasers specifically designed for providing line and grade for pipe laying may be used. The laser shall be capable of maintaining line and grade within 0.01% (0.01-foot allowable error per 100 feet).

The laser shall be securely mounted in pipe or manhole as per manufacturer’s recommendations and shall be checked periodically to ensure accurate alignment is maintained.

TRACER WIRE
For items not addressed by project specifications, the work shall be performed in accordance with Chapter 2.11.0 and Details File No. 24A and 24B of Standard Specifications.

PART TWO – PRODUCTS

BARRICADES, SIGNS, AND WARNING DEVICES
Traffic barricades, traffic signs, and warning devices shall meet the requirements of applicable OSHA standards and FHA Manual of Uniform Traffic Control Devices (MUTCD).

TRACER WIRE
Install tracer wire over all exterior water, sanitary, and storm pipes. The wire shall be a minimum of 10-gauge single-conductor solid copper, copper clad steel, or stainless wire with solid HDPE insulation coating suitable for underground installation. Wire shall be rated for wet conditions. Copperhead 1430 Super Flex Copper Clad Tracer Wire (copper clad steel) is preapproved.

INSULATION COLOR - Tracer wire insulation color shall conform to the uniform color code adopted by the American National Standard Institute. Tracer wire for: Sanitary sewer and laterals, force mains, storm sewers and laterals shall be green. Water mains and services shall be blue.

Access Boxes shall include an in−ground frost sleeve extending to 24 inches in depth made of a material approved for building sewers in accordance with Wisconsin State Statute SPS 384, Table 384.30-3 which shall be polyvinyl chloride (PVC) pipe. The frost sleeve shall have a removable watertight top of sufficient thickness and strength to sustain the weight of anticipated traffic.

Access Box shall have a cast iron lid that can be locked and opened with a standard pentagon head key wrench. The underside of the lid shall have two stainless steel screws mounted to it. Valvco TWAB Access Box that extends 24 inches below the finish grade is preapproved. The name of the utility piping shall be marked on the lid.

A one-pound magnesium anode shall be used on all tracer wire dead end locations such as at wyes on municipal mains or stubs for future extensions. Copperhead Grounding Anode with corrosion resistant SnakeBite Connector is preapproved.

Conductive warning tape may not be utilized in lieu of tracer wire.

PART THREE – EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS
All construction access shall ingress and egress from location shown on Drawings.

Unless otherwise shown or directed, maintain existing access and egress to school facilities throughout construction. Maintain ANSI A117 compliant access for disabled persons, delivery access, emergency vehicle access, and emergency egress. Do not interrupt access and egress without prior written approval from LA/E.

CONTINUITY OF EXISTING TRAFFIC AND TRAFFIC CONTROL
Do not interrupt or change existing traffic circulation patterns without prior written approval from the LA/E.
When interruption is required, coordinate schedule with the OWNER agency to minimize disruptions. When working in public right-of-way, obtain all necessary approvals and permits from local municipality.

When CONTRACTOR'S activities impede or obstruct traffic flow, provide traffic control devices, signs and flaggers in accordance with other Contract Documents and the current version of the MUTCD, or as shown on Drawings.

PROTECTION AND CONTINUITY OF EXISTING UTILITIES

Verify the locations of any water main, sanitary sewer, storm sewer, drainage, gas, electric, telephone/communication, fuel, steam lines or other utilities and site features which may be encountered in any excavations or other sitework. Properly underpin and support all lines to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from LA/E, affected utilities and users. Notify all users impacted by outages a minimum of 48 hours in advance of outage. Provide notification in writing and describe nature and duration of outages and provide name and number of CONTRACTOR'S foreman or other contact.

Cut off and cap any service connections encountered which are to be removed at the limits of the excavation in accordance with the requirements of applicable codes and any specifications governing such removals.

PROTECTION OF EXISTING WORK AND FACILITIES

Verify the locations of, and protect, any signs, paved surfaces, buildings, structures, landscaping, streetlights, utilities, and all other such facilities that may be encountered or interfered with during the progress of the work. Take measures necessary to safeguard all existing work and facilities that are outside the limits of the work or items that are within the construction limits but are intended to remain. Report any damage to existing facilities to LA/E immediately. Correct and pay for all damages.

STORM WATER/EXCAVATION WATER MANAGEMENT

Control grading around structures, pitch ground to prevent water running into excavated areas.

Pits, trenches within building lines and other excavations shall be maintained free of water.

Provide trenching, pumping, other facilities required.

Notify LA/E if springs or running water is encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to LA/E of points and areas that water will be discharged. At LA/E's option, CONTRACTOR shall drain the spring to the storm sewer system by the use of field tile.

Be responsible for control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas.

LASER AND LAYING PIPE

Provide method of checking laser alignment after 25 feet of pipe has been laid and at 100-foot intervals thereafter. Check may be made by using a batter board, a transit mounted over the laser, or other method approved by LA/E that checks both line and grade, and is independent of laser beam.

Laying of pipes in finished trenches shall commenced from lowest point, so that the spigot ends point in the direction of flow. Lay all pipes with ends abutting and true to line and grade. Fit and match pipe so that when laid in the work pipe will form a sewer with a smooth and uniform invert.

TRACER WIRE

Place tracer wire within 6 inches above entire length of pipe and taped on top of the pipe at 10 foot intervals. Tracer wire shall be accessible and locatable within the owner's property at no more than 400−foot intervals.

Exterior access locations shall include a means of protecting tracer wire. At all termination points, provide sufficient wire that extends to 18 inches above or beyond the finish grade or vertical surface.

- Road or Street Right-of-way (ROW) – An Access Box shall be placed at the ROW over the utility pipe that do not discharge into a manhole at the utility main. An Access Box at ROW is not necessary if the wire terminates in a manhole at the main pipeline.
- Manhole – Tracer wire in manholes shall enter the manhole between adjusting rings within 15 inches of finish grade where it shall be coiled and mounted on a noncorrosive fastener.
- Exterior Building Wall – An Access Box shall be placed within one-foot of exterior building wall where water, sanitary, and roof drain laterals penetrate or lie beneath exterior building wall. If access to the wire can be accommodated within the building, which is common with water services, an Access Box near building exterior is not necessary.
- Valve Box – Water main or service valve boxes may also be used as an Access Location. Place wire in valve boxes shall through a ½ inch diameter PVC conduit to within 6 inches of the lid and taped to the PVC so it cannot fall to the bottom of the valve box.
- Fire Hydrant – Place a 2 inch PVC conduit at each fire hydrant buried at least 24 inches that extends at least 3 inches above the break flange. Install with a Slip Cap to provide access to the wire. An access box can be installed at hydrants instead of 2 inch PVC.

Wire splices shall be held to a minimum. Where a splice is necessary, the connections shall be soldered with 62SN or equivalent rosin core solder. When cooled, cover splice with two protective layers of polyethylene adhesive tape 1-1/2 inches wide and 8 mm thick. CopperHead Snake Bite connectors may be use instead of soldering the splice. The connector should be taped.

Tracer Wire shall be installed along entire length of non-metallic pipe and terminate at each end in a flush mount access box or in a concrete manhole at locations indicated on Drawings.

In Access Boxes, tracer wire shall be stripped and attached to the stainless steel screws mounted to the underside of the lid. Sufficient slack shall be left in wire length so cover can be lifted 18 inches above the finished grade with the wire intact.

A cleanout with a flush-mounted cast iron cover assembly can be used as an Access Box. Cleanouts shall have a PVC screw-on type cap under the metal cover assembly. The wire length shall be long enough for the wire to be lifted 18 inches above finished grade while keeping wire intact.

In manholes, extend the tracer wire vertically up outside of structure at a location over the pipe it locates. Prior to installing joint sealant material, drill a hole through the concrete in highest joint between adjusting rings. Place wire through joint and extend it to 18 inches above rim of manhole. Do not install wire directly under cast iron frame. Mount a non-corrosive fastener to inside the manhole within 6 inches of lid and attach coiled excess tracer wire to fastener.

TESTING – Conductivity of each tracer wire circuit shall be tested prior to acceptance of pipe installation.

End of Section

SECTION 33 40 00 - STORM SEWER SYSTEMS

PART ONE – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the storm sewer work required in these specifications and on the drawings. This specification shall apply to all storm sewer work beginning at a point 5 feet outside of the building wall, unless otherwise specified. Included are the following topics:

PART ONE – GENERAL
- Scope
- Related Work
- References
- Submittals
- Provisions for Future Work
- Surveying and Staking
- Record Drawings

PART TWO – PRODUCTS
- General
- Pipe
- PVC Pipe
- HDPE Corrugated Single Wall – Round
- HDPE Corrugated Wall Pipe – Dual Wall Round
- Connections for Dissimilar Pipe Materials
- Manholes
- Castings
- Plastic Inlets (Drain Basins)
- Apron Endwalls
- Geotextile Fabric, Nonwoven
- Tracer Wire

PART THREE – EXECUTION
- Notification
- Laying Pipe
- Bedding/Initial Cover
- Structures (Manholes / Inlets / Plastic Drains)
- Casting Installation
- Connections to Existing Structures
- Leakage Testing
- Tracer Wire

RELATED WORK

Applicable provisions of Division 01 and the following sections:

Section 31 20 00	Earthmoving
Section 31 23 16.13	Trenching
Section 31 23 19	Dewatering
Section 31 25 00	Erosion Control

REFERENCES

Where these specifications do not cover portions of the work to be undertaken, the Standard Specifications in accordance with Section 33 05 00, shall govern the work.

American Society for Testing and Materials (ASTM):

C76-05b	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

C443-05a	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
C507-05a	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
C877-02e1	Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
D412	Definition of Terms Relating to Plastic Piping Systems
D618	Methods of Conditioning Plastics and Electrical Insulating Materials for testing
D751	Method of Testing Coated Fabrics
D1693	Environmental Stress Cracking of Ethylene Plastics
D1784-03	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
D2122	Determining Dimensions of Thermo Plastic Pipe and Fittings
D2412	External Loading Properties of Plastic Pipe by Parallel Plate Loading
D2444	Test for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
D2564-04	Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
D3034-04a	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3212-96a (2003) e1	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
D3350-05	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
D4533	Test Method for Trapezoid Tearing Strength of Textiles
D4632	Test Method for Grab Breaking Load and Elongation of Geotextiles
D4716	Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
D4751	Test Method for Determining Apparent Opening Size of Geotextile
D 6068	Practice of Installation of Geocomposite Pavement Drains
F477-02e1	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M252	Corrugated Polyethylene Drainage Pipe
AASHTO M294	Corrugated Polyethylene Pipe, 12- to 48-in Diameter

SUBMITTALS

Provide manufacturers product information (cut sheets), shop drawings and O&M information for storm sewer materials including:

- Pipe
- Fittings
- Structures
- Outfalls
- Castings

Provide reports documenting any required testing.

Provide copies of record drawings.

PROVISIONS FOR FUTURE WORK

Construct sewer system in a manner that will facilitate future extension or connection. Review plans prior to installation, and notify LA/E if proposed design does not appear to accommodate future extension or connection.

When Drawings indicate future connection at manhole or other structure, install full length of pipe beyond the structure, providing plugged bell at terminal end of pipe. Provide marker board at terminal end of stubbed pipe.

SURVEYING AND STAKING

Proposed Work will be staked once, by OWNER, at no expense to CONTRACTOR. Should CONTRACTOR request restaking, this Work will be done as schedule permits and at expense of CONTRACTOR. CONTRACTOR shall notify LA/E at least 3 days prior to start of work and making periodic requests for line and grade stakes.

CONTRACTOR responsible for transferring line and grade stakes as necessary to complete his work.

RECORD DRAWINGS

Refer to Section GR - General Requirements.

Maintain record drawings that show the actual locations, sizes and types of utilities and other features encountered.

Note any modifications to proposed sewer system size, location or elevation. Record any other deviations from drawings.

PART TWO – PRODUCTS

GENERAL

Conform all materials to size and type shown on drawings or as called for in specifications and to applicable Laws, Codes, and Ordinances.

All products and materials are to be new, undamaged, clean, and in good condition. Existing products and materials are not to be reused unless specifically indicated.

Responsible for safe storage and handling of all materials utilized in work. Store all materials in areas designated by LA/E in cooperation with OWNER.

Perform all work in accordance with any applicable manufacturer's instructions.

PIPE

Provide size, type and class/schedule of pipe as indicated on drawings.

Use only pipe supplied from same manufacturer, and of same type, unless otherwise specified or approved in advance by LA/E.

When applicable, only pipe, joints, material and installation approved by Wisconsin Department of Natural Resources and/or the Department of Commerce for intended use in the State of Wisconsin shall be used.

PVC PIPE

Conform to ASTM D-1785, Schedule 40 solid wall pipe with solvent weld joints. Do not mix different manufacturer's products, or fittings.

HDPE CORRUGATED SINGLE WALL – ROUND

All perforated/underdrain pipe of 4 inches and 6 inches shall be corrugated single wall - round with filter sock meeting the requirements of AASHTO M252 unless otherwise noted.

Joints for fittings and pipe shall be made with split or snap couplings. Standard connection meeting soil-tightness requirements of AASHTO M252.

Manufacturer: ADS Inc., Single Wall Corrugated or approved equal.

HDPE CORRUGATED WALL PIPE – DUAL WALL ROUND

Corrugated pipe with an integrally formed smooth liner. Pipes which are between 4 inch diameter and 36 inch diameter shall meet the requirements of AASHTO M252 and M294, Type S.

Pipe and fittings shall be manufactured from virgin PE compounds conforming to the requirements of ASTM D3350, cell class 324420C.

Joints for fittings and pipe shall be soil-tight bell and spigot, provided with rubber gasket. Rubber gasket shall be installed by the pipe manufacturer.

All 8 inch diameter or larger perforated/underdrain pipe shall be DUAL wall with filter sock conforming to ASTM F-2648.

Manufacturer: ADS, Dual Wall/N-12 or approved equal.

CONNECTIONS FOR DISSIMILAR PIPE MATERIALS

Where new sewer connects to existing dissimilar pipe, connection shall be made with a no hub type couplings meeting requirement of CISPI 310. Couplings shall have neoprene gaskets with stainless steel shield, and multiple stainless-steel clamps with worm gear tightening device. Couplings shall be made specifically for type and size of pipe materials being connected. Couplings shall be Fernco Husky or approved equal.

MANHOLES

General

Provide precast concrete manholes unless otherwise shown or required. Concrete block or cast-in-place manholes may only be used after receiving written approval from LA/E for customized manhole sizes and shapes.

Submit manufacturer's preproduction (shop) drawings for approval prior to start of manufacturing.

CONTRACTOR shall carefully locate all pipe locations, sizes, orientation and elevation prior to ordering new manholes. For sewer re-lays, verify if each pipe encountered is active. In- active pipe shall not be connected to the new sewer.

Precast Manhole Sections

Precast concrete manhole sections, including bottom and top shall meet requirements of ASTM C478.

Provide manholes of the diameter indicated on the Drawings. If field conditions require a larger structure contact LA/E.
Provide flat top slab with in bell cover with offset 24 inch opening.

Manhole wall thickness shall be minimum of 5 inches for 4 foot diameter manholes, 6 inches for 5 foot diameter manholes and 7 inches for 6 foot, 7 foot and 8 foot diameter manholes.

Provide pre-cast manhole base. Manhole bottom section may be pre-cast with integral base.

Joints

Provide manhole riser and barrel sections, cones, and flat tops, with standard pipe section tongue and groove joints.

Seal joints watertight with prefabricated rubber or plastic gaskets or formed in place butyl rubber seal.

Joint sealers: Kent Seal, ConSeal, or approved equal.

Connections

Openings for connections in pre-cast structures shall be knock-outs or cut-outs. Cut-outs shall not extend into joint of bottom manhole section. Provide minimum of 12 inches separation between edge of adjacent cut-outs or knock-outs.

Manhole Steps

Provide steps at 16 inches (400 mm) o.c.± and project approximately 6 inches from wall.

Unless otherwise indicated on the drawings, locate manhole steps over the downstream pipe opening.

Manhole steps shall be steel reinforced polypropylene with ½-inch diameter deformed reinforcing bar. Steps shall be permanently secured in manhole wall. Manhole steps shall be American Step Company, M.A. Industries or approved equal.

Bench and Flowline

Provide either pre-cast or cast-in-place bench and flowline.

Unless otherwise indicated on drawings, bench height shall be 1/2 diameter of downstream pipe. Slope bench towards flowlines at a minimum ½ inch per foot. Provide light broom finish on bench.

Flowlines shall be formed with gradual, uniform sweeps directed towards downstream pipe. Provide smooth, troweled finish for flowlines.

Adjusting Rings

Fiber-reinforced pre-cast concrete adjusting rings 2” to 4” in thickness, meeting the requirements of ASTM C-478.

Install per manufacture's recommendations only.

Seal the annular space between the rings and cone basin, the rings, and the rings and cover frame utilizing an approved butyl sealant.

Precompressed butyl gasket, shall be used between the top of the manhole and first adjustment ring, and between all subsequent rings. Butyl material shall be E-Z Stick, or approved equal.

CASTINGS

General

All castings shall be heavy duty iron conforming to ASTM A48, Class 20 and rated for AASHTO H-20 loading. Provide non-rocking or machined castings with concealed pickhole.

PLASTIC INLETS (DRAIN BASINS)

Basin size, pipe connection size alignment and invert as shown on drawings.

Provide cast iron grates, H-20 rated (lockable). Grates shall be furnished by basin manufacturer and shall be considered an integral part of the surface drainage inlet. Manufacturer of cast iron grates shall conform to ASTM A-48-83 Class 308.

Manufacture drain basins of PVC pipe stock. Manufacture drainage pipe connecting stubs from PVC pipe stock, formed to provide a watertight connection with specified piping system.

Manufacturer: Nyloplast (ADS Inc.) or approved equal.

APRON ENDWALLS

Reinforced concrete apron endwalls for reinforced concrete pipe shall be manufactured with reinforcement and concrete conforming to the pertinent requirements of ASTM C 76 for Class II, Wall B, reinforced concrete pipe and shall be in accordance with the design, dimensions, and details shown on the Plans.

Corrugated steel apron endwalls for PVC and HDPE culvert pipe shall be manufactured in accordance with the pertinent requirements specified for corrugated steel pipe under AASHTO M36 and shall conform to the dimensions, thickness, design and details shown on the Plans.

Joint tightness shall conform to ASTM D3212.

Apron endwalls shall be the same diameter as the pipe that they are connected to.

GEOTEXTILE FABRIC, NONWOVEN

Manufacturer: Mirafi

Product: 140N

Or approved equal**.**

TRACER WIRE

Provide tracer wire in accordance with Section 33 05 00, Common Work Results for Utilities.

PART THREE – EXECUTION

NOTIFICATION

Prior to excavation work, notify all utilities, governmental agencies, or entities, known to, or which can reasonably be assumed to, have above or below ground pipe, conduit cables, structures or similar items within limits of project, to locate and mark location of such items. Expose potential pipe conflicts prior to installation of sewers to allow for any field changes to the design to be made.

LAYING PIPE

Install all pipe in accordance with ASTM specifications which pertain to the specified type of pipe material and the installation situation.

Do not use any pipe or fittings cracked in cutting or handling or otherwise not free from defects. Clean all pipe of any dirt and/or debris both inside and out prior to placing in the trench.

Make joints in accordance with manufacturer's directions with due care to avoid damaging pipe and/or disturbing previously laid pipe.

Cut pipe only according to manufacturer's directions.

Lay all sewer pipes to horizontal alignment and grade shown on the plans with bell ends up hill.

Establish and maintain horizontal alignment using total station, transit or theodolite. Use pipe laser or level to establish and maintain grade of pipe. Discrepancies from the required horizontal alignment or grade at any location shall not be greater than 0.10' or 0.05', respectively.

Do not exceed specified trench widths.

BEDDING/INITIAL COVER

Provide bedding and initial cover in accordance with the applicable requirements of Section 31 23 16.13 – Trenching.

Storm sewer and sewer services shall be provided with 4" of bedding material and 12" of initial cover material (both measured at the bell of the pipe). Crushed Stone Bedding shall be used for both bedding and initial cover.

Install perforated storm sewer pipe 12" or larger in bedding of clear washed stone in accordance with details on drawings. Wrap pipe and bedding using a geotextile fabric of non-woven fibers in accordance with detail on drawings.

Install perforated storm sewer pipe 8" or smaller in bed of 3/8 inch crushed pea gravel or crushed stone chips meeting the requirement of Section 8.43.2(a) of Standard Specifications. Wrap pipe and bedding using a geotextile fabric of non-woven fibers in accordance with detail on drawings

STRUCTURES (CATCH BASINS / INLETS / PLASTIC DRAINS)

Determine proper location, size, elevation, and orientation of all pipes entering new structures before ordering. Do not connect abandoned pipes to new structures. Structures having improper location and/or orientation of the pipe connections will be rejected. Field repairs or adjustments of connection points are not permitted.

Limit the excavation for structures so as to provide only the necessary amount of space to sufficiently prepare the subgrade, set the base, set the structure, and lay pipe. Provide a minimum of 1' of clearance between structure and trench wall for adequate backfilling and compaction.

Where excavation occurs below the bottom elevation of the structure's base, bring the excavation to the required elevation by the use of compacted crushed stone bedding. A minimum of 8 inches of compacted Crushed Stone Bedding shall be placed below the bottom of the structure base.

Set structure base in accordance with elevation and location as indicated on the plans. Install base plumb and level. Install subsequent pre-cast sections in accordance with shop drawing layout. Provide watertight gaskets between each section.

CASTING INSTALLATION

Install casting type as indicated on the plans or in the specifications.

Adjust casting elevation and slope to match adjacent proposed grades.

CONNECTIONS TO EXISTING STRUCTURES

Make all necessary openings into existing structures or sewers including reconstruction of existing inverts or benches, as necessary. Patch all openings permanently watertight with concrete brick and mortar, hydraulic cement, or flexible watertight boots.

LEAKAGE TESTING

Storm sewers shall be visually inspected for excessive water infiltration and soil leakage into sewers or structures. CONTRACTOR shall repair/correct any infiltration or soil leakage that is considered excessive by LA/E.

TRACER WIRE

Install in accordance with Section 33 05 00 Common Work Results for Utilities.

End of Section