PARKING LOT PAVEMENT IMPROVEMENTS
MAUSTON READINESS CENTER
DEPARTMENT OF MILITARY AFFAIRS
MAUSTON, WISCONSIN

TECHNICAL SPECIFICATIONS VOLUME 2 of 2
BID DOCUMENT

Division Project No. **24E8C**

November 25, 2025

FOR
THE STATE OF WISCONSIN
DEPARTMENT OF ADMINISTRATION
DIVISION OF FACILITIES DEVELOPMENT
STATE OF WISCONSIN ADMINISTRATION BUILDING - 7TH FLOOR
101 EAST WILSON STREET - P.O. BOX 7866
MADISON, WISCONSIN 53707

SEAL

By

SITE ENGINEER **ELECTRICAL ENGINEER**

MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, WI 53913
(608) 356-2771

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VOLUME 2 of 2

Division Project No. **24E8C**

DIVISION 33 – UTILITIES

DRAWINGS – Bound Separately

***

SECTION 02 05 00
COMMON WORK RESULTS FOR EXISTING CONDITIONS
BASED ON DFD MASTER SPECIFICATION DATED 6/24/2025

PART 1 – GENERAL

SCOPE
This Section provides information common to two or more technical 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 1 - GENERAL
- Scope
- Related Sections
- Referenced Organizations
- Referenced Documents
- Safety
- Permits
- Construction Limits
- Provisions for Future Work
- Off-Site Storage
- Certificates and Inspections

PART 2 - MATERIALS
- Barricades, Signs, and Warning Devices
- Temporary Plastic Barrier Fencing

PART 3 - 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 SECTIONS
Applicable provisions of Division 01, General Conditions of the General Prime Contractor Contract, and the Supplementary General Conditions shall govern work under this Section.

01 41 26 – Permit Requirements

REFERENCED ORGANIZATIONS
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

SSHC - Where reference is made to the SSHSC, it shall mean the pertinent sections of the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, and all supplemental and interim supplemental specifications.

SSSWC - Where reference is made to the SSSWC, it shall mean pertinent sections of the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition.

BMPH - Where reference is made to the 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.

SAFETY

Contractor is 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. Refer to Section 01 41 26.

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 DFD Project Representative. If construction activities extend beyond state property lines or construction easements, obtain all necessary approvals and permits from applicable municipalities.

The Contractor shall restore all disturbed areas in accordance with the drawings and specifications. If plans and specifications do not address restoration of specific areas, these areas will be restored to pre-construction conditions.

OFF SITE STORAGE

In general, the 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 the DFD Project Representative, together with the execution of an “Off-site Storage Agreement” will be required.

CERTIFICATIONS AND INSPECTIONS

Obtain and pay for all required sampling, testing, inspections, and certifications except those expressly listed as provided by the A/E or other third party in the Contract Documents. The Contractor shall upload documents to the State’s Project Management Information Software system (PMIS) within 3 business days of said work. Include copies of the certifications and documents in the O&M Manual.

PART 2 – MATERIALS

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 3 – EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS

Current building work is being completed under project 23A1T and that Contractor is planned to be onsite into late May or the first part of June 2026. Scheduling shall be coordinated such that site work under 24E8C does not impact building access until building access is no longer needed by the 23A1T Contractor.

Unless otherwise shown or directed, maintain existing access and egress to the facility throughout construction. Maintain ANSI A117 compliant access for disabled persons, access and egress as indicated. Do not interrupt access and egress without prior written approval from the DFD Project Representative.

Provide specified barrier fencing, barricades, signage, and warning lights around all construction, staging, swing path of lift(s) and storage areas.

Provide minimum 5-foot-wide temporary covered walkways at single door building access/egress points affected by work activities. Provide minimum 7-foot-wide temporary covered walkways at double door building access/egress points affected by work activities.

CONTINUITY OF EXISTING TRAFFIC/PARKING AND TRAFFIC CONTROL

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

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, 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. All lines shall be properly underpinned and supported to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from the DFD Project Representative, affected utilities and users. Notify all users impacted by outages a minimum of 48 hours in advance of outage. Notification shall be provided in writing and describe the nature and duration of outages and provide the name and number of Contractor's foreman or other contact.

Any service connections encountered which are to be removed shall be cut off at the limits of the excavation and capped 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 the DFD Project Representative immediately.

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 Architect/Engineer if springs or running water are encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to Architect/Engineer of points and areas where water will be discharged. At the Engineer's option, the 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.

END OF SECTION

SECTION 02 32 00
GEOTECHNICAL INVESTIGATION
BASED ON DFD MASTER SPECIFICATION DATED 9/15/2025

PART 1 - GENERAL

SCOPE

This section details any subsurface investigations completed at the site as part of this project. This section may contain information applicable to ALL sitework and other technical specification sections. All Contractors are expected to review this information 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.

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

GEOTECHNICAL INFORMATION

Available geotechnical information is shown on pages 02 32 00.01-1 through 02 32 00.01 - 46.

PART 2 - MATERIALS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

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Soils & Engineering Services, Inc.

May 9, 2025

Project 13608 R25.001

Ms. Krista Sommerfieldt, PE
MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, Wisconsin 53913

Subject: Geotechnical Exploration and Analyses Report
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
909 Division Street
City of Mauston
Juneau County, Wisconsin
DFD Project No 24E8C

Dear Ms. Sommerfieldt:

We have completed the requested exploration consisting of the performance of four borings and associated laboratory testing and geotechnical engineering analyses. The purpose of the borings was to obtain information about the soil and bedrock types and stratification and short-term subsurface water levels at the boring locations. We present our findings and our comments and recommendations in the enclosed *Geotechnical Exploration and Analyses Report* for the subject project.

Respectfully submitted,

SOILS & ENGINEERING SERVICES, INC.

Craig M. Bower

Craig M. Bower, P.E.

CMB:DER:cmb

Enclosure
Delivered by email: ksommerfeldt@msa-ps.com

1102 Stewart Street
Madison, WI 53713-4648
Phone: 608-274-7600
soils@soils.ws
Fax: 608-274-7511
www.soils.ws

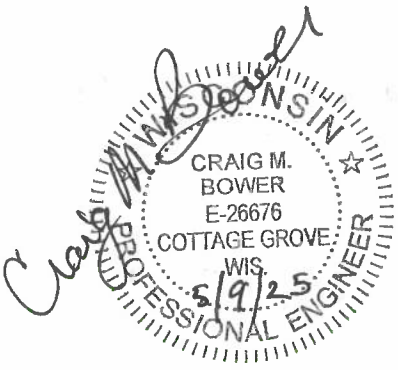
GEOTECHNICAL EXPLORATION AND ANALYSES REPORT

PARKING LOT RECONSTRUCTION
MAUSTON READINESS CENTER
WISCONSIN ARMY NATIONAL GUARD
909 DIVISION STREET
CITY OF MAUSTON
JUNEAU COUNTY, WISCONSIN
DFD PROJECT NO 24E8C
SES Project Number 13608

Prepared By

Soils & Engineering Services, Inc.
1102 Stewart Street
Madison, Wisconsin 53713-4648
phone: (608) 274-7600
e-mail: soils@soils.ws

Craig M. Bower, P.E.



Submitted To

MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, Wisconsin 53913
Phone: (608) 355-8924

Ms. Krista Sommerfieldt, PE

May 9, 2025

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DEFINITIONS OF ACRONYMS

AASHTO = American Association of State Highway and Transportation Officials

ASTM = American Society of Testing and Materials

DI = ductile-iron

EBS = excavation below subgrade

FDM = *Facilities Design Manual*

GPS = global positioning system

HMA = hot-mix asphalt

HSA = hollow-stem augers

LF = lineal feet

OSHA = Occupational Safety and Health Administration

PCC = Portland cement concrete

pcf = pounds per cubic foot

PID = photoionization detector

psf = pounds per square foot

$^{psi}/_{in}$ = pounds per square inch per inch

PVC = polyvinyl chloride

RCP = reinforced-concrete-pipe

SES = Soils & Engineering Services, Inc.

SPT = standard penetration test

SSA = solid-stem augers

SSHSC = *Standard Specifications for Highway and Structure Construction*

USCS = Unified Soil Classification System

VOC = volatile organic compounds

WDNR = Wisconsin Department of Natural Resources

WDSPS = Wisconsin Department of Safety and Professional Services

WGNHS = Wisconsin Geological and Natural History Survey

WisDOT = Wisconsin Department of Transportation

I. INTRODUCTION

This *Geotechnical Exploration and Analyses Report* summarizes the findings of the geotechnical exploration, laboratory tests, and geotechnical engineering analyses performed for the design and reconstruction of the parking lot and driveway for the Wisconsin Air National Guard (WANG) Readiness Center located at 909 Division Street in the City of Mauston in Juneau County, Wisconsin. We completed this work under the general direction of MSA Professional Services, Inc. (MSA) who established the general scope of the work.

The intent of this report is to: (1) convey the geotechnical information obtained from four borings; (2) present the results of laboratory and field tests; (3) provide the results of our geotechnical engineering analyses; and (4) present our comments and recommendations for the design and construction of the proposed improvements. We recommend that MSA Professional Services, Inc. employ Soils & Engineering Services, Inc. (SES) to make observations and perform tests at the time of excavation and construction of the proposed improvements to verify the subsurface conditions encountered by the exploration performed, and to validate our comments, analyses, and recommendations presented in this report for the subject improvements.

II. PROJECT DESCRIPTION

The project consists of the reconstruction of the parking lot and driveway. The project site is located on the southern edge of the City of Mauston, Juneau County, Wisconsin. Please refer to the Project Site Location Sketch, Drawing 25.001-A, enclosed in Appendix A which show the general location of this project.

III. GEOTECHNICAL EXPLORATION

The geotechnical field exploration consisted of the performance of four borings (designated Borings 1 through 4). We present the results of this geotechnical field exploration on the Boring Log Records, and Laboratory Test Result Records enclosed in Appendix A. The Boring Log Records present the subsurface stratigraphy and related information obtained by the borings. We provide information pertinent to the Boring Log Records on the Notes and Legend Records enclosed in Appendix A. The Laboratory Test Result Records present the results of the laboratory tests performed on selected samples recovered by the borings.

A. Boring Locations

MSA staked the locations of the borings prior to our mobilizing to the project site. We located Borings 1 and 4 at or near the marked MSA locations. We completed Borings 2 and 3 within approximately 9 to 21 feet of the marked MSA locations due to overhead or underground utilities. We show the locations of these borings on the Boring Location Sketch, Drawing 25.001-B, enclosed in Appendix A. We include the direction and

distance from the marked locations for each boring on the Boring Log Records enclosed in Appendix A.

B. Boring Elevations

SES personnel determined the ground surface elevation at the locations of Borings 1 through 4 using a surveying level and a leveling rod. We used the first floor of the existing WANG Readiness Center for a benchmark. This benchmark has an assumed elevation of 100.0 feet.

We include the ground surface elevation for each boring on the Boring Log Records enclosed in Appendix A. We plotted the Boring Log Records with depth and elevation scales for reference.

C. Drilling and Sampling Procedures

We drilled and sampled Borings 1 through 4 to the following MSA requested depths below the existing ground surface per a photo attachment with comments in an email of November 6, 2024. We present the requested depths and corresponding elevations for the borings below:

Boring	Ground Surface Elevation (feet)	Bottom of Boring	
		Depth (feet-inch)	Elevation (feet)
1	97.8	5'-0"	92.8
2	98.5	5'-0"	93.5
3	99.7	10'-0"	89.7
4	99.6	5'-0"	94.6

We used a Geoprobe 3100GT drill rig mounted on a truck carrier to complete the borings. We used 2¼-inch-inside-diameter HSA to maintain an open borehole as we advanced the borehole of each boring to the termination depth. At each boring, we obtained soil samples at 2- to 3-foot intervals starting at a depth of 1-foot below the ground surface and continued to a depth of 10 feet. We increased the sampling interval to 5 feet from a depth of 10 feet to the stated termination depth for Boring 3. We performed this sampling using a 2-inch-outside-diameter split-barrel sampler according to ASTM Designation D1586.[1]

[1]See Section III.H below for more information regarding the field test results associated with this sampling.

We visually identified the recovered soils in general compliance with the USCS identification procedures as defined in ASTM Designation D2488.[2]

Please refer to the Boring Log Records enclosed in Appendix A for additional information regarding the drilling and sampling of Borings 1 through 4.

D. Borehole Abandonments

We abandoned the boreholes in compliance with the State of Wisconsin Administrative Code Chapters NR141 and NR812 following the removal of the drilling tools and HSA. Please refer to the WDNR Well/Drillhole/Borehole Abandonment Form 3300-005 enclosed in Appendix A for specifics regarding the abandonment of each of the four borings.

E. Subsurface Stratigraphy

The soil stratigraphy encountered at Borings 1 through 4 consisted of pavement/base course over fill overlying native soil strata. None of the borings encountered bedrock below the native soil within the depth drilled.

The pavement/base course over fill strata encountered by Borings 1 through 4 was variable. We describe the pavement/base course over fill strata encountered at the borings as follows:

- Boring 1 encountered 4 inches of HMA pavement over 6 inches of brown fine SILTY SAND (SM) FILL with little gravel base course over 26 inches of gray and brown LEAN CLAY (CL) FILL with SANDY LEAN CLAY (CL) seams.

- Boring 2 encountered 5½ inches of HMA pavement over 4 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL base course.

- Boring 3 encountered 1½ inches of HMA pavement over 7½ inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL base course.

- Boring 4 encountered 3 inches of HMA pavement over 7 inches of brown fine SILTY SAND WITH GRAVEL (SM) FILL base course over 26 inches of reddish-brown fine SILTY SAND WITH GRAVEL (SM) FILL with trace to some gravel.

Below the pavement/base course over fill, Borings 1 through 4 encountered a native soil strata that was variable. We describe the native soil strata encountered at the borings as follows:

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[2]ASTM Designation D2488 is the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*.

- Borings 1 and 4 encountered reddish-brown LEAN CLAY (CL).
- Boring 2 encountered gray to dark gray with reddish-brown mottling LEAN CLAY (CL) over reddish-brown LEAN CLAY (CL).
- Boring 3 encountered gray to dark gray with reddish-brown mottling LEAN CLAY (CL) over reddish-brown fine CLAYEY SAND (SC) over reddish-brown LEAN CLAY (CL).

Please refer to the Boring Log Records enclosed in Appendix A for a further description of the pavement, base course, fill, and native soil strata encountered at the locations of Borings 1 through 4.

F. Subsurface Water

Our drilling crew found the boreholes of the borings to be caved and dry at the completion of the drilling and sampling of each of the borings.[3] We summarize the caved level depths and respective elevations at completion for each boring as follows:

Boring	Ground Surface Elevation (feet)	Caved Level		
		Depth (feet-inch)	Elevation (feet)	Comments
1	97.8	3'-0"	94.8	Dry at completion
2	98.5	3'-6"	95.0	Dry at completion
3	99.7	8'-1"	91.6	Dry at completion
4	99.6	3'-1"	96.5	Dry at completion

We also include the information regarding the condition of the boreholes at completion of the drilling and sampling for the borings on the Boring Log Records enclosed in Appendix A.

We expect the subsurface (groundwater) levels to fluctuate as influenced by precipitation, snowmelt, surface water runoff, the stage of nearby water bodies, and other hydrological and hydrogeological factors. The groundwater levels at the time of construction of the subject project may be higher or lower than the groundwater levels encountered on the day that we performed the borings.

[3]We define "completion of the drilling and sampling" for a boring as the time when our drilling crew has completed the removal of all drilling tools from the borehole.

G. LABORATORY AND FIELD TESTS

1. Laboratory Tests

We performed laboratory tests on selected split-barrel soil samples to determine the physical properties of the native soil strata encountered at the boring locations. The laboratory tests that we performed on the selected material consisted of determining the moisture content (MC), Atterberg limits (liquid limit [LL], plastic limit [PL], and plasticity index [PI]), the percentage of soil particles passing the No. 200-mesh sieve (P_{200}), and particle size distribution analysis (gradation).

We include the laboratory test results obtained for this report on the Boring Log Records and Laboratory Test Result Record enclosed in Appendix A. We used the results from the Atterberg limits, P_{200}, and gradation tests to confirm or modify the USCS soil identifications in general compliance with USCS classification procedures as defined in ASTM Designation D2487.[4]

2. Field Tests

The field test consisted of the performance of the standard penetration test (SPT).

We performed the SPT during the sampling procedure at each boring. It consists of driving the split-barrel sampler up to 18 inches with a 140-pound hammer weight falling 30 inches. From the SPT, we record the number of blows required to drive the split-barrel sampler every 6 inches as noted in the Field Blow Counts column on the Boring Log Records. If the sampler is driven more or less than the 6 inches, then that distance is also noted in this column. From the Field Blow Counts we obtain the N-value which is the sum of the number of blows required to drive the split-barrel sampler the last 12 inches as noted on the Boring Log Records. If the sampler is not driven the total 18 inches, then there is no reportable N-value for that sample interval. We correct the N-value for hammer efficiency {N_{60}-value}.[5]

We include the N-value and N_{60}-value field test results obtained for this report on the Boring Log Records enclosed in Appendix A.

H. Exploration Results Discussion

The exploration results indicated the following:

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[4]ASTM Designation D2487 is the *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*.

[5]The drill rigs we employ are equipped with automatic hammers with an 80- to 91-percent efficiency. The SPT was developed using cathead and rope (donut) hammers with a 60-percent efficiency. Therefore, a correction is applied to the recorded N-value to obtain the N_{60}-value for use in geotechnical engineering equations.

- The base course is in a moist relative moisture condition. Based on our visual/manual observations of the base course material, it is our opinion that it is not a crushed material and would not meet WisDOT specifications for a crushed aggregate base course material. We recommend that this material **not** be reused as the base course for the pavement/base course section for the reconstructed parking lot. This material could be used as a structural fill material or general fill material as specified in Appendix B.

- The gray to dark gray with reddish-brown mottling LEAN CLAY (CL) encountered is in a moist relative moisture condition and of medium to hard consistency. We consider this soil to be of moderate strength for support of the proposed improvements.

- The reddish-brown fine CLAYEY SAND (SC) is in a moist relative moisture condition and in a loose state of relative density. We consider this soil to be of low strength for support of the proposed improvements.

- The reddish-brown LEAN CLAY (CL) is in a moist relative moisture condition and of stiff to very stiff consistency. We consider this soil to be of moderate strength for support of the proposed improvements.

We utilized the laboratory and field test results in our evaluation of the soils for the determination of design parameters, and to provide comments and recommendations for the design and construction of the proposed improvements.

IV. COMMENTS AND RECOMMENDATIONS

Based on the boring information and the results of the laboratory and field tests performed, we offer the following comments and recommendations regarding constructing the parking lot and driveway for the WANG Readiness Center located at 909 Division Street in the City of Mauston in Juneau County, Wisconsin.

A. Initial Site Preparation

Initial site preparation should include the removal of the existing HMA pavement and base course. The borings found the existing HMA pavement to be 1½ to 7½ inches thick and the existing base course to be 4 to 7 inches thick. The thickness of the pavement and base course could be thinner or thicker in unexplored locations. The removed base course could be stockpiled for reuse as structural fill material or general fill material as specified in Appendix B.

We recommend the horizontal limits of the initial site preparations be based on a 1:1 line extending down and away from the lower outer edge of the design base course thickness for each element.

B. Excavations

After completion of the initial site preparation of the construction areas, excavation of the existing soils can then take place to accommodate the design pavement/base course section thickness. We recommend that these excavations be performed using standard earth excavation equipment such as scrapers, bulldozers, or backhoes.

We anticipate that the soil exposed by these excavations will consist of either cohesive FILL, granular FILL, or native cohesive soils based on the borings. Following completion of the excavation and before placing any fill material to raise the grade for the new pavement/base course section, exposed granular soil be thoroughly compacted and exposed cohesive soil be proof-rolled as follows:

- Thorough compaction of granular excavation surfaces should be performed using a large self-propelled or tow-behind vibratory, steel-drum compactor; backhoe-mounted vibratory compactor; or large vibratory walk-behind vibratory compactor depending upon the area being compacted. Soils & Engineering Services, Inc. personnel should observe the thorough compaction procedure. The granular soil should be compacted to a density of at least 95 percent of the maximum dry density determined for the soil according to ASTM Designation D 1557 for a minimum depth of 18 inches below the excavation bottom. Soils & Engineering Services, Inc. personnel should test the compacted granular soil to verify that the minimum density has been achieved before placing compacted granular fill material. If the soils exposed by the excavation cannot be properly compacted, then additional undercut may be necessary.

- Proof-rolling of cohesive excavation surfaces should be performed using a heavily-loaded, triaxle dump truck or similar heavy rubber-tire equipment. The equipment used should traverse the exposed cohesive soil twice each in two directions that are perpendicular to each other. Soils & Engineering Services, Inc. personnel should observe the proof-rolling procedure. If the excavation surface soil exhibits rutting, pumping, or yielding during the initial proof-rolling, the proof-rolling should be stopped and the need for excavation surface stabilization should be considered. Excavation surface stabilization may consist of excavation of poor-quality soil, placement of a separation-type geotextile and coarse crushed stone, or other possible methods.

Following acceptance of the exposed soils in low areas, we recommend the placement of structural fill material as specified in Section B3 of Appendix B to raise the grade to the proposed finished subgrade elevation for the parking lot.

C. Excavation Sidewall Stability

We recommend the sidewalls of any excavations be adequately sloped or properly shored in accordance with the OSHA and Wisconsin Department of Safety and Professional Services regulations regarding construction excavations.

Saturated, or wet, fill and/or native soil strata can be unstable or may become unstable over time after exposure by excavation. Effective and efficient dewatering will be important to aid in maintaining sidewall stability, if groundwater is present.

D. Excavation Observations

We anticipate the excavations will terminate in predominantly cohesive native soil strata. To confirm the strength of the exposed soil to support the proposed improvements, Soils & Engineering Services, Inc. personnel should (1) observe and test the soils exposed by the excavations, (2) observe the thorough compaction and/or proof-rolling operations, (3) test the soils after thorough compaction, and (4) observe and test the fill material which is used to raise the grade and backfill the proposed improvements.

E. Site Filling

Following acceptance of an excavation bottom that is low in elevation below the design parking lot subgrade elevation, we recommend the placement of structural fill material to raise the grade to the design subgrade elevation as specified in Section B3 of Appendix B and as outlined above in Section IV.B.

F. Pavement Design Parameters

The pavement design parameters to use in the design of the proposed hardscape areas should be based on the type and condition of the subgrade soils situated within 3 feet of the design subgrade elevation for the proposed parking lot improvements. We used the information from the borings and the laboratory test results to estimate the pavement design parameters to utilize for pavement section design purposes.

Based on the information obtained by the borings and laboratory testing performed, we determined pavement design parameters for the cohesive and granular soils encountered at the locations of Borings 1 through 4. We present these pavement design parameters in Appendix C. We anticipate the finished grade for the reconstructed parking lot will be similar to the existing grade, therefore, the new pavement/base course section will bear on existing cohesive and granular soils. Due to the variation in the bearing soils for the parking lot, we recommend the following pavement design parameters for where only a base course layer is provided below the hardscape element:

Design Group Index =	12
Frost Index =	F-4
Soil Support Value =	4.2
Subgrade Modulus, "k" =	150 $^{psi}/_{in}$

G. Suitability of On-Site Soils

We provide the following recommendations regarding the suitability of the on-site soils for reuse on the project as fill materials.

- Excavated Cohesive and Cohesive/Granular Soils
  - Cohesive soil types encountered by the borings that may be excavated consisted of LEAN CLAY (CL) and SANDY LEAN CLAY (CL).
  - Cohesive/Granular soil types encountered by the boring that may be excavated consisted of CLAYEY SAND (SC).
  - Could be stockpiled for use as landscape fill material or general fill material as specified in Sections B1 and B2 in Appendix B.
  - Are not suitable to use as fill material:
    - to raise the grade beneath any structure.
    - to be placed to backfill the interior of below-grade sections of any foundation element.
    - to be placed to backfill the exterior of below-grade sections of any foundation element where a structural improvement will be located.
  - Are suitable to use as fill material:
    - to raise the grade beneath proposed hardscape improvements.
    - to raise the grade beneath proposed landscaped areas.
  - Wetting and/or drying of this soil type, as well as the use of thinner loose lifts, may be necessary to be able to achieve the recommended specified compaction levels.

- Excavated Granular Soils
  - Granular soil types encountered by the borings that may be excavated consisted of SILTY SAND (SM) FILL base course and SILTY SAND WITH GRAVEL (SM) FILL.
  - Could be stockpiled for use as structural fill material as specified in Section B3 of Appendix B.
  - Is suitable to use as fill material:
    - to raise the grade beneath any structure.
    - to raise the grade beneath any hardscape improvement.
    - to raise the grade beneath proposed landscaped areas.
    - to be placed to backfill the interior or exterior of below-grade sections of any foundation element.

H. Lateral and Vertical Support of Existing Improvements

To maintain the stability of existing improvements (e.g. structures, pavement, sidewalks, utilities, etc.), the soil supporting these existing improvements should be properly retained at all times. If any excavation accomplished for the proposed improvements will intersect a 1½H:1V line extending down and away from the exterior limits of the existing improvements (such as building foundations or paved areas), then a suitable earth retaining method should be implemented to support the existing improvements.

I. Site Grading Recommendations

As subsurface water (groundwater) can cause problems with construction, so can surface water from precipitation runoff if allowed to accumulate within the construction area. The contractor should grade the site to drain surface water away from the construction areas. Water accumulations in the construction area should be promptly removed. Any soil softened, loosened or disturbed by water should be excavated, removed and replaced with properly compacted structural fill material or coarse crushed stone. Temporary surface water diversion structures, such as ditches and berms, could be constructed in areas where surface water drainage into the work area is encountered.

J. Project Safety

Safety precautions, such as those required by OSHA and the Wisconsin Department of Safety and Professional Services, should be followed throughout the entire construction of the proposed project. They include, but are not limited to, the proper sloping and/or support of excavation sidewalls and adjacent embankments, roadways, access ramps, sidewalks, utility lines, towers, and/or buildings.

V. CLOSING COMMENTS

Soils & Engineering Services, Inc. prepared this report for the exclusive use of MSA Professional Services, Inc. to aid in the design and reconstruction of the parking lot and driveway located on 909 Division Street in the City of Mauston in Juneau County, Wisconsin. The recommendations in this report are based on the project information provided to our office. Soils & Engineering Services, Inc. should review any changes in the nature, design, or location of the proposed improvements after submittal of this *Geotechnical Exploration and Analyses Report* to revise the recommendations in the report, if necessary. The nature and extent of soil, bedrock, or groundwater variations at this project site may not become evident until the time of excavation or construction of the subject project. If soil, bedrock, or groundwater variations are evident at the time of excavation or construction, it will be necessary for Soils & Engineering Services, Inc. to re-evaluate the soil, bedrock, and groundwater, and other site conditions, which may result in revision of our recommendations in this report.

Please read the *Important Information about This Geotechnical-Engineering Report* advisory sheet enclosed in Appendix D which provides comments about how to interpret and use this *Geotechnical Exploration and Analyses Report* for the Parking Lot Reconstruction project.

Soils & Engineering Services, Inc. should review the final design and specification documents for this project to verify that our recommendations regarding the proposed improvements are interpreted correctly and implemented in the design of the subject project as they are intended. We recommend that Soils & Engineering Services, Inc. be present at the time of construction to observe compliance with the design concept and specifications, and to provide recommendations to modify the design if subsurface conditions differ from those anticipated

prior to construction. It is important that the exposed soil strength, degree of compaction, and other soil properties required be confirmed and/or determined at the time of excavation and construction activities for the subject project.

The recommendations provided in this report are based on our identification/classification and interpretation of the soils, bedrock, and other information given on the Boring Log Records, and may not be based solely on the contents of the driller's field logs.

Soils & Engineering Services, Inc. prepared this report for the subject project in accordance with generally accepted geotechnical engineering practices at this time. Soils & Engineering Services, Inc. offers no other expressed or implied warranty.

Soils & Engineering Services, Inc. will store the soil samples obtained from the borings performed for this project for a period of 60 calendar days after the date of this report. Please advise us if we should extend this period.

We recommend that this *Geotechnical Exploration and Analyses Report*, in its entirety, be made available to bidding contractors or subcontractors for information purposes. The Appendices, Boring Log Records, and/or other attachments referenced in this report should not be separated from the text of this report. This report should be considered invalid if used for purposes other than those described herein.

Soils & Engineering Services, Inc. respectfully submits this *Geotechnical Exploration and Analyses Report*, dated May 9, 2025, to **MSA Professional Services, Inc.**

APPENDIX A

Appendix A Contents

- Project Site Location Sketch
- Boring Location Sketch
- Notes and Legend Records
- Boring Log Records
- WDNR Well/Drillhole/Borehole Abandonment Forms
- Laboratory Test Result Records

Base drawing consists of AutoCAD provided Esri aerial photography of unknown date.

Soils & Engineering Services, Inc.

1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: 608-274-7600

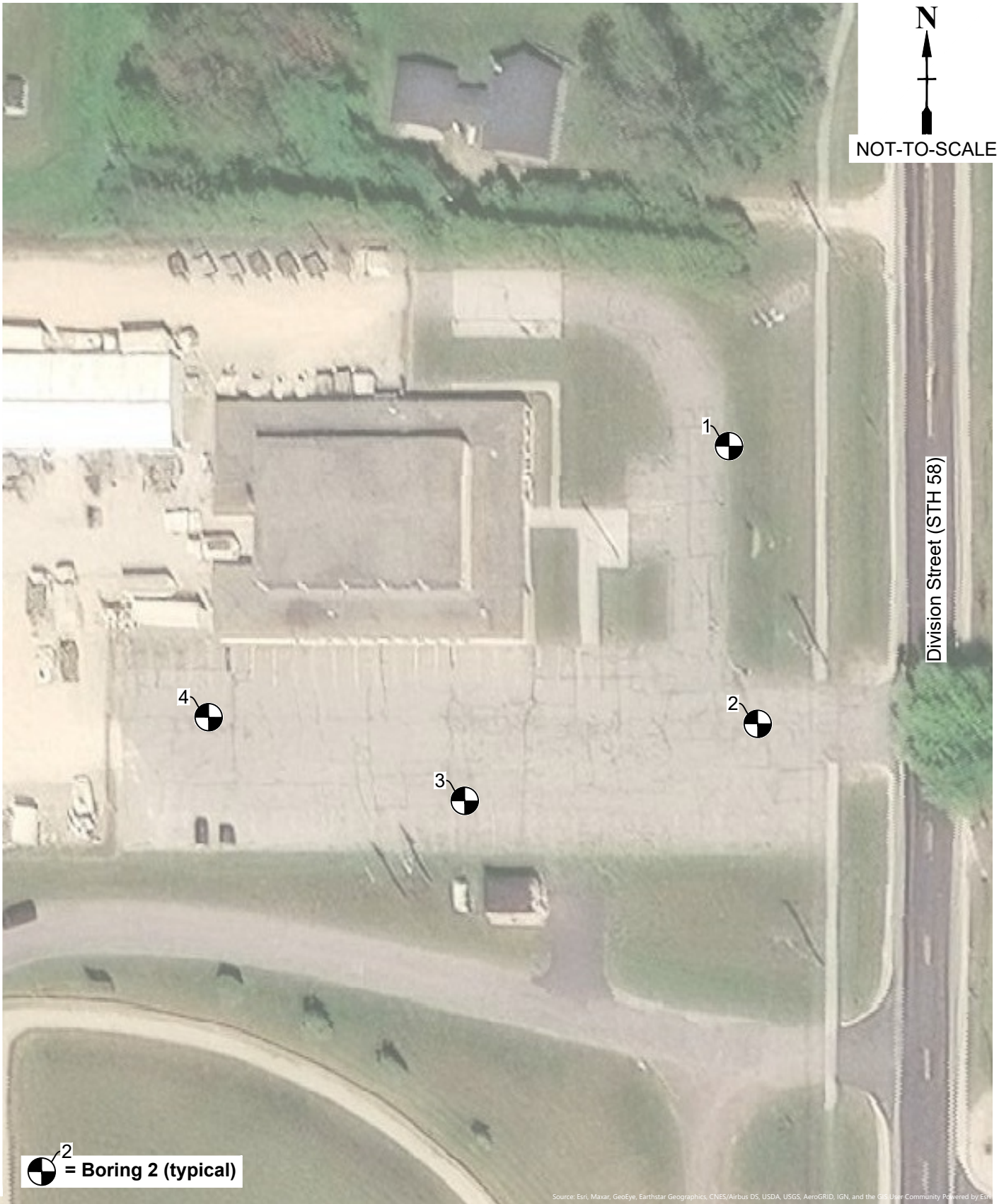
CONSULTING CIVIL ENGINEERS SINCE 1966

PROJECT SITE LOCATION SKETCH
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County County, Wisconsin
DFD Project No 24E8C

13618

DRAWING 25.001-A

Drawn CMB 04/17/2025 Revised



Soils & Engineering Services, Inc.
1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: 608-274-7600
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BORING LOCATION SKETCH
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County County, Wisconsin
DFD Project No 24E8C

13618

DRAWING 25.001-B

Drawn CMB 04/17/2025 Revised

BORING NOTES

1. The boundary lines between different subsurface strata shown on each Boring Log Record are approximate and may be gradual.

2. Each boring field log contains the visual/manual identification of soil/bedrock samples obtained and a description of the subsurface conditions between samples based on the equipment performance and the cuttings returned to the ground surface. Each Boring Log Record contains a description of the subsurface conditions as interpreted by a geotechnical engineer and/or a geologist after a review of the boring field logs, and subsurface samples and/or laboratory test results.

3. We define "at completion" for a boring as the time when our drilling crew has completed the removal of all drilling tools from the borehole.

4. We define "Caved Level" for a boring as the depth below the existing ground surface where material has collapsed into the borehole following the removal of all drilling tools from the borehole at the time indicated on each Boring Log Record.

5. We define "Water Level" for a boring as the depth below the existing ground surface at a boring location to the level of water in the open borehole, unless otherwise defined, at the time indicated on each Boring Log Record.

GENERAL NOTES

6. The Notes and Legend Records and the Boring Log Record(s) are part of the *Geotechnical Exploration and Analyses Report* for the subject project. The *Geotechnical Exploration and Analyses Report* should be included in the bid or reference documents.

SAMPLER TYPES LEGEND


Sample obtained from the auger flights


Grab sample


2-inch-outside-diameter, split-barrel sampler

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MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

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919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

13618

Printed on 5/5/2025

SOIL IDENTIFICATION/CLASSIFICATION NOTES

1. We use the Unified Soil Classification System (USCS) to identify/classify the soils encountered.
2. *Soil identification is specified in ASTM D2488,* Standard Practice for Description and Identification of Soils *(Visual-Manual Procedure)*. Soil Identification is based on estimating the particle size gradation of the soil and estimating the plasticity of the fine-grained portion of the soil using visual observations and manual testing to identify (estimate) the USCS soil group name.
3. *Soil classification is specified in ASTM D2487,* Standard Practice for Classification of Soils for Engineering *Purposes (Unified Soil Classification System)*. Soil Classification uses the results of particle size distribution analysis (gradation), Atterberg limits, and oven-dried liquid limit laboratory tests to classify the USCS soil group name.
4. Coarse-grained soils are defined in the USCS to have more than 50-percent of the soil particles retained on the No. 200-mesh sieve. They are principally called gravel or sand. The primary (predominant) particle size content of the retained soil determines whether the soil's group name is a GRAVEL or a SAND. The grading of the GRAVEL/SAND is added to the front of the group name, e.g., POORLY-GRADED SAND. Secondary and tertiary particle size contents determine the types of modifiers to be added to the front or behind the group name, e.g., SILTY SAND or POORLY-GRADED GRAVEL WITH SILT.
5. Fine-grained soils are defined in the USCS to have less than or equal to 50-percent of the soil particles retained on the No. 200-mesh sieve. The fine-grained portion of a coarse-grained soil is that portion of the soil particles that pass the No. 200-mesh sieve. They are principally called LEAN CLAY or FAT CLAY (if they are plastic or highly plastic) or SILT or ELASTIC SILT (if they are non-plastic or slightly plastic). Secondary and tertiary particle size contents determine the types of modifiers to be added to the front or behind the group name, e.g., SANDY LEAN CLAY or ELASTIC SILT WITH GRAVEL.

BEDROCK IDENTIFICATION NOTE

We use the US Department of the Interior Bureau of Reclamation (USBR) Engineering Geology Manual and available University Of Wisconsin-Extension Geological And Natural History Survey (WGNHS) literature to identify the bedrock encountered.

TEST RESULTS/REMARKS LEGEND

NR = No Recovery

q_p = Penetrometer reading, $^{ton}/_{ft^2}$

MC = Moisture Content, % moisture by weight

LL = Liquid Limit, % moisture by weight

PL = Plastic Limit, % moisture by weight

PI = Plasticity Index, % moisture by weight

P_4 = % Passing the No. 4-mesh Sieve

P_{10} = % Passing the No. 10-mesh sieve

P_{40} = % Passing the No. 40-mesh sieve

P_{200} = % Passing the No. 200-mesh sieve

WH = Weight of hammer and sampling rods.

DRILLING METHODS LEGEND

HSA = Continuous flight hollow-stem augers

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Soils & Engineering Services, Inc.
1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

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CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Field Approximation Criteria
Very Soft	0 to 0.25	Easily penetrated several inches by fist. Extrudes between fingers when squeezed.
Soft	0.26 to 0.50	Easily penetrated several inches by thumb. Molded by light to moderate finger pressure.
Medium	0.51 to 1.00	Can be penetrated several inches by thumb with moderate effort. Molded by moderate to firm finger pressure.
Stiff	1.01 to 2.00	Readily indented by thumb but penetrated only with great effort.
Very Stiff	2.01 to 4.00	Readily indented by thumbnail.
Hard	4.01 or more	Indented by thumbnail with difficulty.

PLASTICITY OF FINE-GRAINED SOILS (SILTS & CLAYS)

Descriptor	Field Approximation Criteria
Non-plastic	An $^{1}/_{8}$-inch thread cannot be rolled at any water content.
Low	An $^{1}/_{8}$-inch thread can barely be rolled. A lump of soil cannot be formed when drier than the plastic limit.
Medium	An $^{1}/_{8}$-inch thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. A lump of soil crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. An $^{1}/_{8}$-inch thread can be rerolled several times after reaching the plastic limit. A lump of soil can be formed without crumbling when drier than the plastic limit.

RELATIVE MOISTURE TERMS

Descriptor	Abbreviation	Criteria
Frozen	F	Frozen material.
Dry	—	Dusty, dry to touch, absence of moisture.
Moist	M	Damp to touch, no visible water.
Wet	W	Visible free water.

LAYERING STRUCTURE TERMS

Descriptor	Description
Varved	Sedimentary soil with alternating layers of clay, silt, and/or fine sand.
Stratified	Alternating ≥¼-inch-thick layers of varying material or color.
Laminated	Alternating <¼-inch-thick layers of varying material or color.

RELATIVE PERCENTAGE TERMS

Descriptor	Criteria
No	0%
Occasional	<1%
Trace	<5%
Few	5 to <10%
Little	10 to <30%
Some	30 to <50%

RELATIVE DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60}-Value (blows/foot)
Very Loose	0 to 4
Loose	5 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	50 or more

SOIL PARTICLE SIZES

Particle Name	Diameter (mm)	ASTM Sieve Size
Boulder	>305	>12"
Cobble	305 to 75	12" to 3"
Gravel	75 to 4.75	3" to No. 4
Coarse Grains	75 to 19.0	3" to ¾"
Fine Grains	19.0 to 4.75	¾" to No. 4
Sand	4.75 to 0.075	No. 4 to No. 200
Coarse Grains	4.75 to 2.00	No. 4 to No. 10
Medium Grains	2.00 to 0.425	No. 10 to No. 40
Fine Grains	0.425 to 0.075	No. 40 to No.200
Fines	< 0.075	< No. 200

LAYERING THICKNESS TERMS

Descriptor	Criteria
Partings	< $^{1}/_{8}$-inch
Lenses	$^{1}/_{8}$-inch to 1-inch
Seams	1-inch to 6 inches
Layers	>6 inches

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Unified Soil Classification System (USCS)
(ASTM D2487)

CRITERIA FOR ASSIGNING GROUP NAMES AND SYMBOLS USING LABORATORY TESTS FOR COARSE-GRAINED SOILS[A]

Soil Type	P_4 Content[B]	P_{200} Content[C]	Grading Classifies As[D]	Fines Classify As[E]	USCS Soil Classification Group Name (Symbol) §
Gravels[F]	$P_4 < 50\%$	$P_{200} < 5\%$	$C_u \geq 4$ and $1 \leq C_c \leq 3$	n/a	WELL-GRADED GRAVEL (GW)
			$C_u < 4$ and/or $1 > C_c > 3$	n/a	POORLY-GRADED GRAVEL (GP)
		$5\% \leq P_{200} \leq 12\%$	$C_u \geq 4$ and $1 \leq C_c \leq 3$	ML or MH	WELL-GRADED GRAVEL WITH SILT (GW-GM)
				CL, CL-ML, or CH	WELL-GRADED GRAVEL WITH CLAY (GW-GC)
			$C_u < 4$ and/or $1 > C_c > 3$	ML or MH	POORLY-GRADED GRAVEL WITH SILT (GP-GM)
				CL, CL-ML, or CH	POORLY-GRADED GRAVEL WITH CLAY (GP-GC)
		$P_{200} > 12\%$	n/a	ML or MH	SILTY GRAVEL (GM)
				CL-ML	SILTY CLAYEY GRAVEL (GC-GM)
				CL or CH	CLAYEY GRAVEL (GC)
Sands[G]	$P_4 \geq 50\%$	$P_{200} < 5\%$	$C_u \geq 6$ and $1 \leq C_c \leq 3$	n/a	WELL-GRADED SAND (SW)
			$C_u < 6$ and/or $1 > C_c > 3$	n/a	POORLY-GRADED SAND (SP)
		$5\% \leq P_{200} \leq 12\%$	$C_u \geq 6$ and $1 \leq C_c \leq 3$	ML or MH	WELL-GRADED SAND WITH SILT (SW-SM)
				CL, CL-ML, or CH	WELL-GRADED SAND WITH CLAY (SW-SC)
			$C_u < 6$ and/or $1 > C_c > 3$	ML or MH	POORLY-GRADED SAND WITH SILT (SP-SM)
				CL, CL-ML, or CH	POORLY-GRADED SAND WITH CLAY (SP-SC)
		$P_{200} > 12\%$	n/a	ML or MH	SILTY SAND (SM)
				CL-ML	SILTY CLAYEY SAND (SC-SM)
				CL or CH	CLAYEY SAND (SC)

Coarse-Grained Soils Footnotes

[A] Based on the material passing the 3-inch-mesh (75-mm) sieve and more than 50% of this material is retained on No. 200-mesh sieve.

[B] P_4 Content is the percentage of the material passing the No. 4-mesh (4.75-mm) sieve.

[C] P_{200} Content is the percentage of the material passing the No. 200-mesh (0.075-mm) sieve.

[D] $C_u = \frac{D_{60}}{D_{10}}$ $\quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[E] Atterberg limits test results for the Fine-Grained portion of the soil are plotted in the chart shown below to classify the Fines.

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

[G] If soil contains ≥15% gravel, add "WITH GRAVEL" to group name.

CRITERIA FOR ASSIGNING GROUP NAMES AND SYMBOLS USING LABORATORY TESTS FOR FINE-GRAINED SOILS OR THE FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS[I]

	Organic/Inorganic	Liquid Limit (LL)	Plasticity Index (PI)	USCS Soil Classification Group Name (Symbol) §
Silts and Clays[I, J, K, L]	Inorganic[M]	LL < 50	PI > 7 and plots on or above "A" line	LEAN CLAY (CL)
			Plot in hatched area	SILTY CLAY (CL-ML)
			PI < 4 or plots below "A" line	SILT (ML)
		LL ≥ 50	PI plots on or above "A" line	FAT CLAY (CH)
			PI plots below "A" line	ELASTIC SILT (MH)
	Organic[N]	LL < 50	PI ≥ 4 and plots on or above "A" line	ORGANIC CLAY (OL)
			PI < 4 or plots below "A" line	ORGANIC SILT (OL)
		LL ≥ 50	PI plots on or above "A" line	ORGANIC CLAY (OH)
			PI plots below "A" line	ORGANIC SILT (OH)

Fine-Grained Soils Footnotes

[H] Based on the material passing the 3-inch-mesh (75-mm) sieve and 50% or more of this material is passing the No. 200-mesh sieve.

[I] If soil contains 15 to 29% plus No. 200-mesh sieve material and the %sand ≥ %gravel, add "WITH SAND" to group name.

[J] If soil contains 15 to 29% plus No. 200-mesh sieve material and the %sand < %gravel, add "WITH GRAVEL" to group name.

[K] If soil contains ≥30% plus No. 200-mesh sieve material and %sand ≥ %gravel, add "SANDY" to group name.

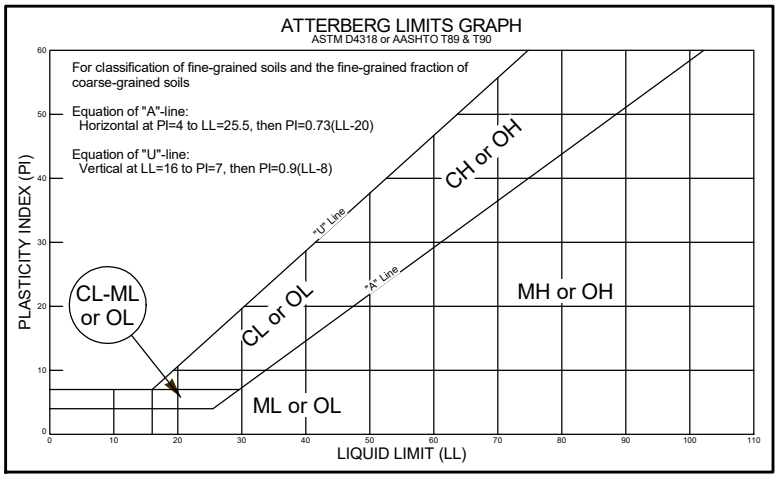
[L] If soil contains ≥30% plus No. 200-mesh sieve material and %sand < %gravel, add "GRAVELLY" to group name.

[M] If the $\frac{\text{Liquid Limit}_{\text{oven-dried}}}{\text{Liquid Limit}}$ is ≥75% for a soil, then the soil is inorganic.

[N] If the $\frac{\text{Liquid Limit}_{\text{oven-dried}}}{\text{Liquid Limit}}$ is <75% for a soil, then the soil is organic.

Coarse- or Fine-Grained Soils Footnote

§ If the field sample contained cobbles, boulders, or cobbles and boulders, add "WITH COBBLES", "WITH BOULDERS", or "WITH COBBLES AND BOULDERS" to group name.



This Notes and Legend Record is considered a part of each Boring Log Record(s) for the subject project.

Soils & Engineering Services, Inc.
1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

CONSULTING CIVIL ENGINEERS SINCE 1966

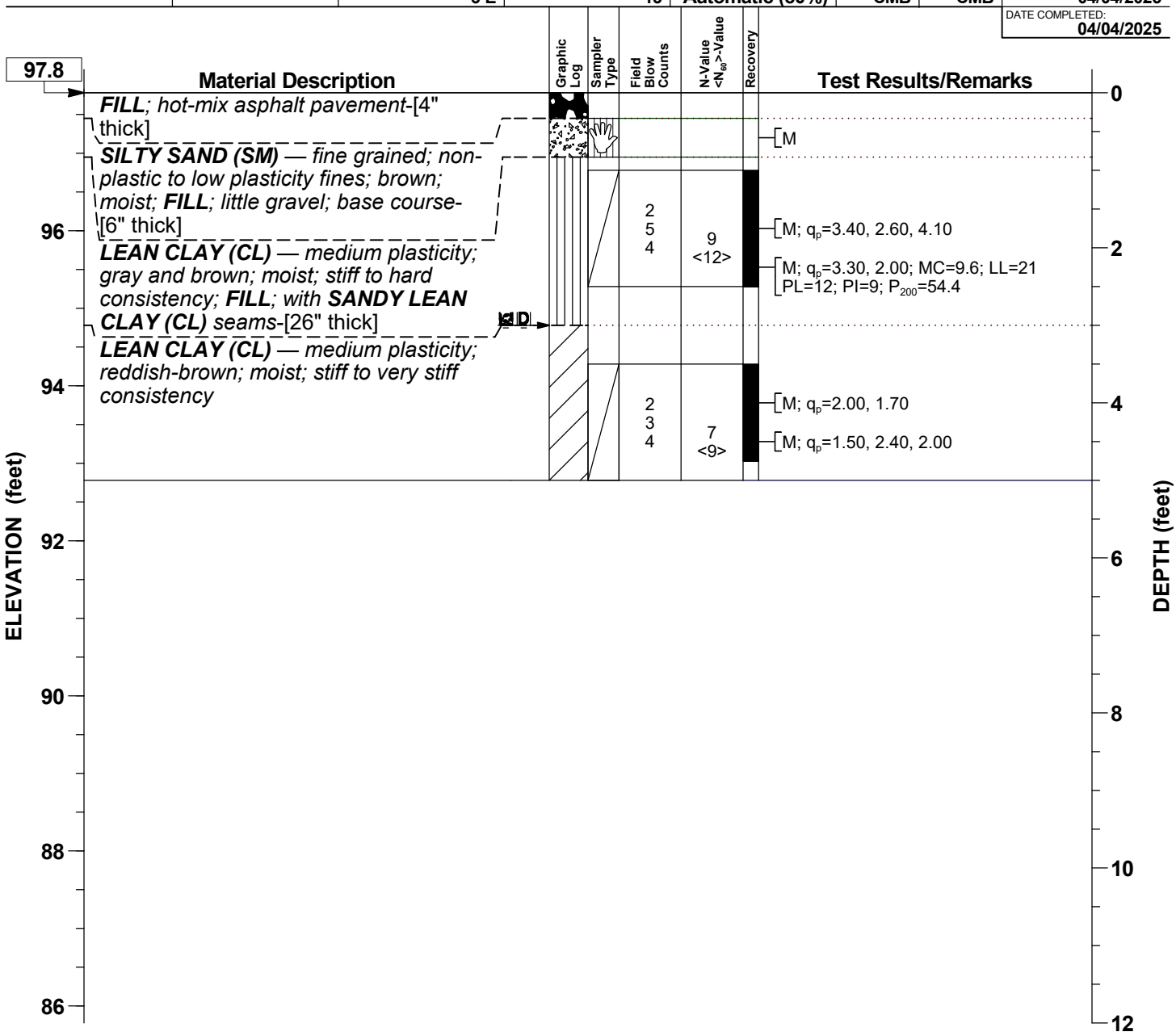
NOTES AND LEGEND RECORD
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

Printed on 5/5/2025

GENERAL LOCATION: **At marked location.**

Boring 1

LATITUDE:	LONGITUDE:	COUNTY:	¼ ¼:	DRILL CO.:	CREW CHIEF:	PAGE:
—	—	Juneau	NW	SES	MAG	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	DRILL RIG:	CREW:	TOTAL DEPTH:
—	—	(Lindina) 15 N	NE	Geoprobe 3100GT	EBP	5'-0"
STATION:	OFFSET:	RANGE:	SECTION:	HAMMER TYPE (EFFICIENCY):	LOG REVIEW: / LOG QC:	DATE STARTED:
—	—	3 E	13	Automatic (80%)	CMB / CMB	04/04/2025
						DATE COMPLETED: 04/04/2025



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
D 3'-0" Dry at completion	3'-0" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE ID	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	5'-0"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Caved Soil

The Notes and Legend Records are considered a part of this Boring Log Record.

Soils & Engineering Services, Inc.

1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

CONSULTING CIVIL ENGINEERS SINCE 1966

BORING LOG RECORD
Parking Lot Reconstruction
Mauston Readiness Center
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919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

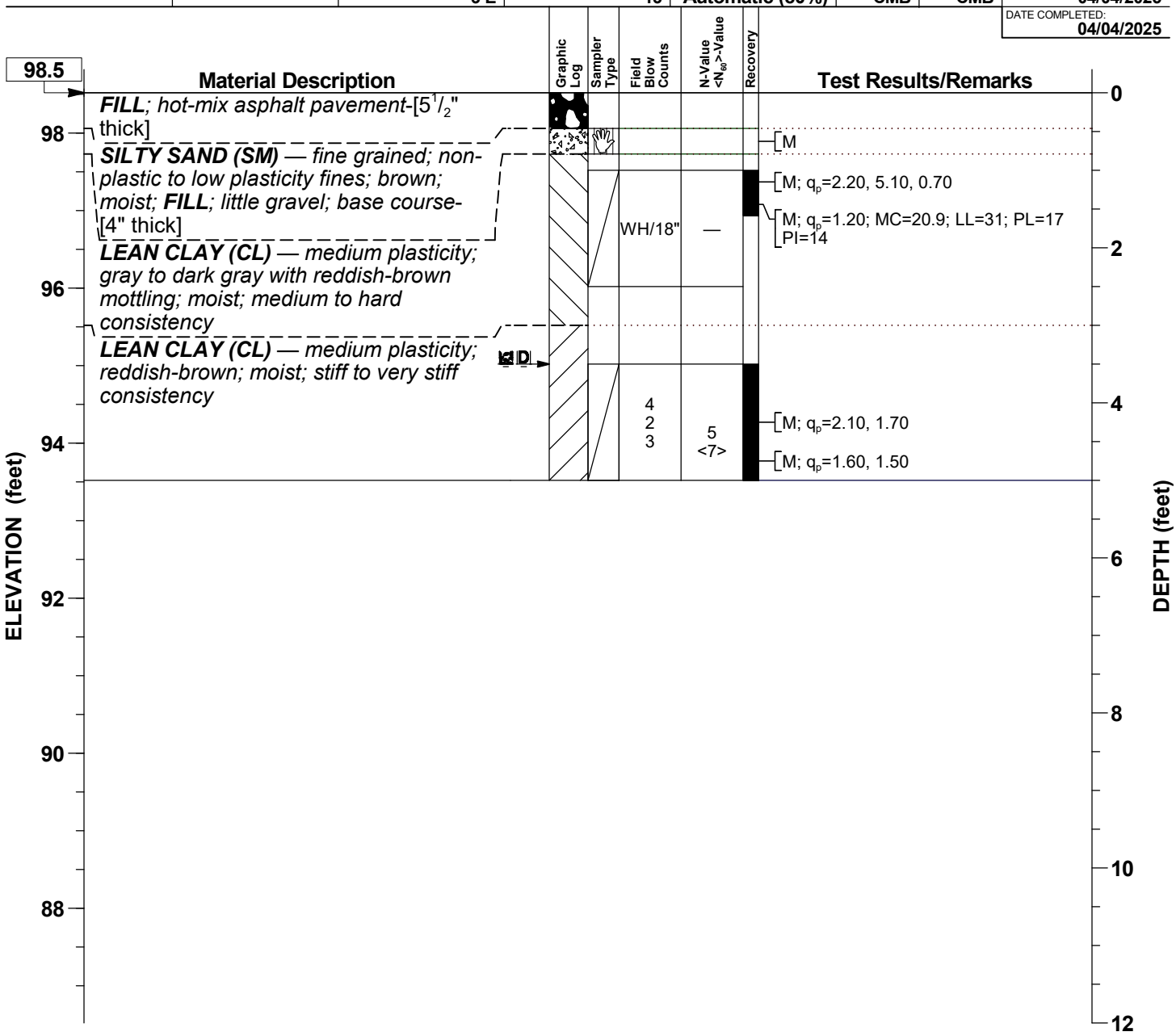
13618

Printed on 05/05/2025

GENERAL LOCATION: **At 12 feet east and 17 feet south of marked location.**

Boring 2

LATITUDE:	LONGITUDE:	COUNTY:	¼ ¼:	DRILL CO.:	CREW CHIEF:	PAGE:
—	—	Juneau	SW	SES	MAG	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	DRILL RIG:	CREW:	TOTAL DEPTH:
—	—	(Lindina) 15 N	NE	Geoprobe 3100GT	EBP	5'-0"
STATION:	OFFSET:	RANGE:	SECTION:	HAMMER TYPE (EFFICIENCY):	LOG REVIEW: / LOG QC:	DATE STARTED:
—	—	3 E	13	Automatic (80%)	CMB / CMB	04/04/2025
						DATE COMPLETED: 04/04/2025



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
ID 3'-6" Dry at completion	3'-6" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE ID	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	5'-0"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Caved Soil

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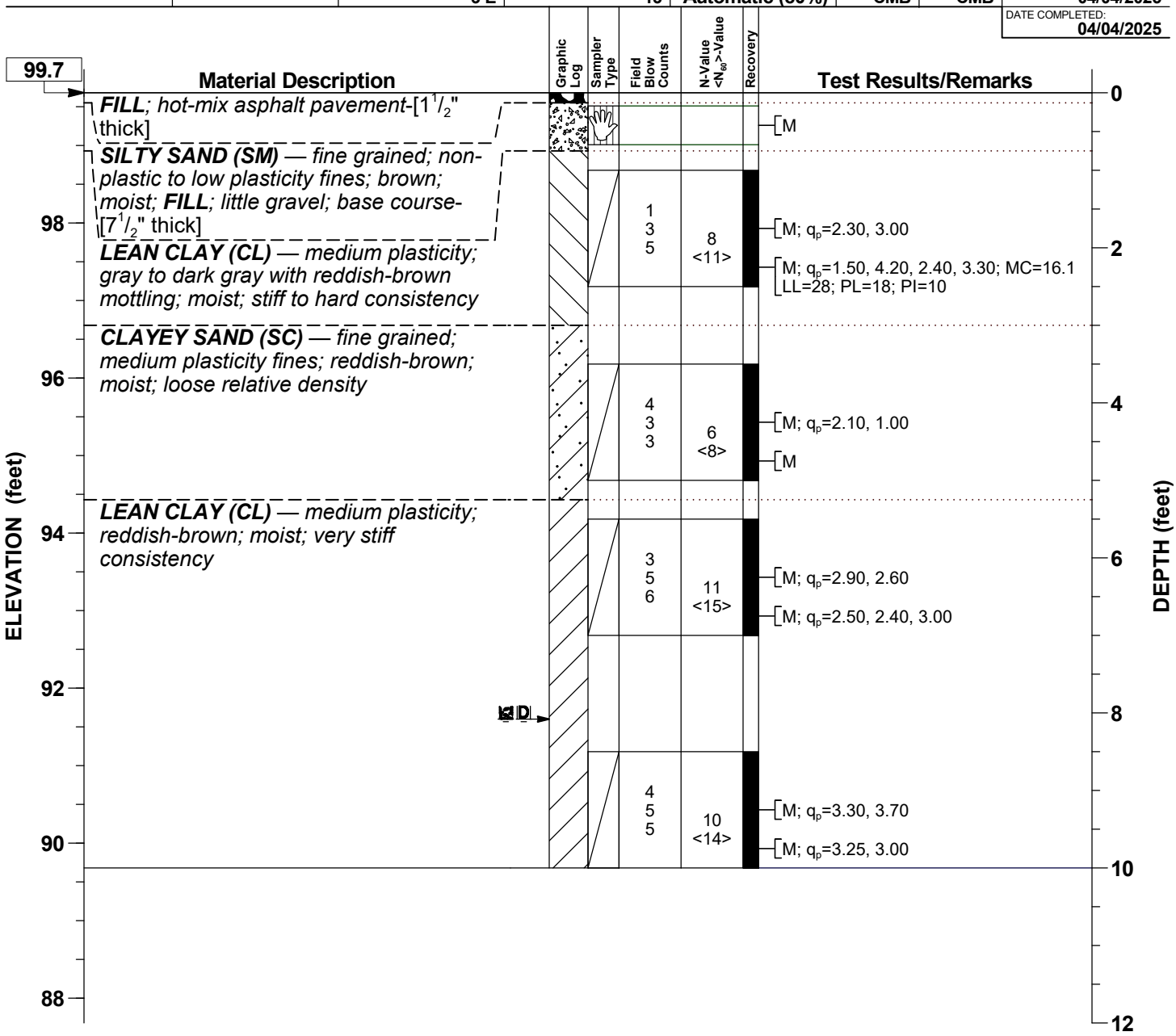
BORING LOG RECORD
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

13618

GENERAL LOCATION: **At 9 feet west of marked location.**

Boring 3

LATITUDE:	LONGITUDE:	COUNTY:	¼ ¼:	DRILL CO.:	CREW CHIEF:	PAGE:
—	—	Juneau	SW	SES	MAG	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	DRILL RIG:	CREW:	TOTAL DEPTH:
—	—	(Lindina) 15 N	NE	Geoprobe 3100GT	EBP	10'-0"
STATION:	OFFSET:	RANGE:	SECTION:	HAMMER TYPE (EFFICIENCY):	LOG REVIEW: / LOG QC:	DATE STARTED:
—	—	3 E	13	Automatic (80%)	CMB / CMB	04/04/2025
						DATE COMPLETED: 04/04/2025



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
ID 8'-1" Dry at completion	8'-1" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE ID	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	10'-0"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Caved Soil

The Notes and Legend Records are considered a part of this Boring Log Record.

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1102 STEWART STREET
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Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

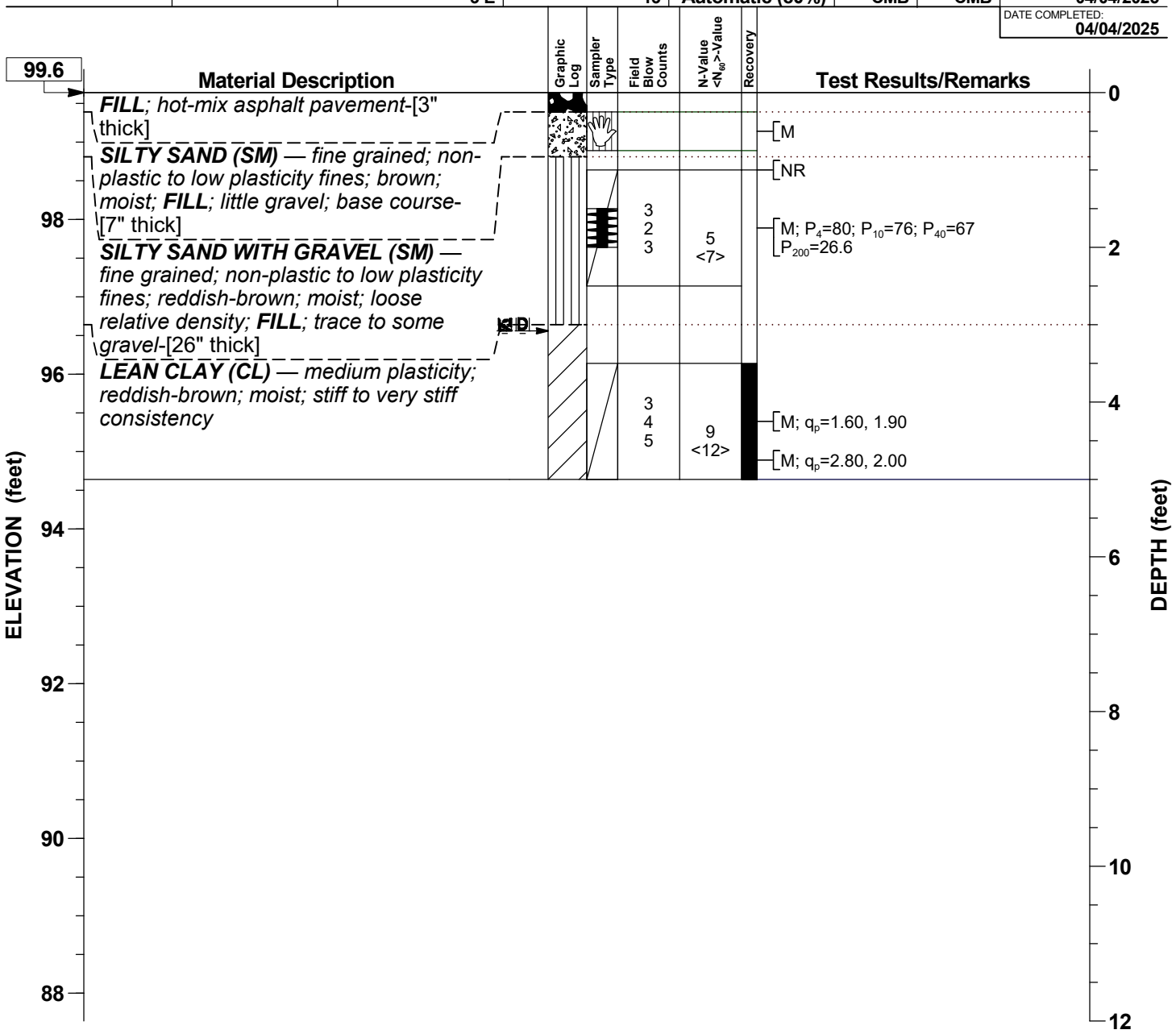
13618

Printed on 05/05/2025

GENERAL LOCATION: **At marked location.**

Boring 4

LATITUDE:	LONGITUDE:	COUNTY:	¼ ¼:	DRILL CO.:	CREW CHIEF:		PAGE:
—	—	Juneau	SW	SES	MAG		1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	DRILL RIG:	CREW:		TOTAL DEPTH:
—	—	(Lindina) 15 N	NE	Geoprobe 3100GT	EBP		5'-0"
STATION:	OFFSET:	RANGE:	SECTION:	HAMMER TYPE (EFFICIENCY):	LOG REVIEW:	LOG QC:	DATE STARTED:
—	—	3 E	13	Automatic (80%)	CMB	CMB	04/04/2025
							DATE COMPLETED: 04/04/2025



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
D 3'-1" Dry at completion	3'-1" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE ID	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	5'-0"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Caved Soil

The Notes and Legend Records are considered a part of this Boring Log Record.

Soils & Engineering Services, Inc.

1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

CONSULTING CIVIL ENGINEERS SINCE 1966

BORING LOG RECORD
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

13618

Printed on 05/05/2025

State of Wis., Dept. of Natural Resources
dnr.wi.govb

Well / Drillhole / Borehole Abandonment

Form 3300-005 (R 4/2015)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141 and 812, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

SES Project Number 13618

Route to:
☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment
☐ Waste Management ☐ Other:

1. ~~Well Location Information~~ Boring Location Information

County: **Juneau**
Boring Number: **1**
Latitude / Longitude (Degrees and Minutes): ____ N ____ W
Format Code: ☐ DD ☐ DDM
Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001
¼ / ¼: **NW** ¼ **NE**
or Gov't Lot #
Section: **13**
Township: **15** N
Range: ■ E ☐ W
~~Well~~ Boring Street Address: **919 Division Street**
~~Well~~ Boring City, Village or Town: **City of Mauston/Civil Township of Lindina**
~~Well~~ Boring ZIP Code:
Subdivision Name:
Lot #:
Reason For Removal ~~From Service~~: **Boring for GEOTECHNICAL sampling.**
WI Unique Well # of Replacement Well: **NA**

2. Facility / Owner Information

Facility Name: **Parking Lot Reconstruction, Mauston Readiness Center**
Facility ID (FID or PWS): **NA**
License/Permit/Monitoring No: **NA**
Original Well Owner: **NA**
~~Present Well Owner~~ **Present Property Owner**: **Unknown**
Mailing Address of Present Owner:
City of Present Owner:
State:
Zip Code:

3. Well / Drillhole / Borehole Information

☐ Monitoring Well
☐ Water Well
■ Drillhole / Borehole
~~Original Construction~~ Boring Completion Date (mm/dd/yyyy): **04/04/2025**
If a Well Construction Report is available, please attach: **NA**

Construction Type:
■ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (specify):

Formation Type:
■ Unconsolidated Formation ☐ Bedrock

Total ~~Well~~ Boring Depth From Ground Surface (ft.): **5.0**
Casing Diameter (in.): **NA**
~~Lower~~ Drillhole Diameter (in.): **6.3**
Casing Depth (ft.): **NA**
Was well annular space grouted? **NA** ☐ Yes ☐ No ☐ Unknown
If yes, to what depth (feet)?
Depth to Water (Feet): **Dry**

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	■ N/A
Liner(s) removed?	☐ Yes	☐ No	■ N/A
Screen removed?	☐ Yes	☐ No	■ N/A
Casing left in place?	☐ Yes	☐ No	■ N/A
Was casing cut off below surface?	☐ Yes	☐ No	■ N/A
Did sealing material rise to surface?	■ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	■ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	■ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	■ No	☐ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
■ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealings Materials
☐ Neat Cement Grout ☐ Concrete
☐ Sand-Cement (Concrete) Grout ■ Bentonite Chips

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

5. Material Used To Fill Well / Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
Auger Cuttings	Surface	3.00	0.64 ft^3	
Caved Soil	3.00	5.00	0.43 ft^3	

6. Comments

NA = Not applicable to soil borings.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: **SOILS & ENGINEERING SERVICES, INC.**
License #:
Date of Filling & Sealing (mm/dd/yyyy): **04/04/2025**
Street or Route: **1102 Stewart Street**
Telephone Number: **(608) 274-7600**
City: **Madison**
State: **WI**
ZIP Code: **53713**
Signature of Person Doing Work: Craig M Brown
Date Signed: **04/07/2025**

DNR Use Only
Date Received:
Noted By:
Comments:

DFD Project No. 24E8C
02 32 00.01-28

State of Wis., Dept. of Natural Resources
dnr.wi.govb

Well / Drillhole / Borehole Abandonment

Form 3300-005 (R 4/2015)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141 and 812, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

SES Project Number 13618

Route to:
☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment
☐ Waste Management ☐ Other:

1. ~~Well Location Information~~ Boring Location Information

County: **Juneau**
Boring Number: **2**
Latitude / Longitude (Degrees and Minutes): ____ N / ____ W
Format Code: ☐ DD ☐ DDM
Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001
¼ / ¼: **SW** ¼ **NE**
Section: **13**
Township: **15** N
Range: ■ E ☐ W
or Gov't Lot #:
~~Well~~ Boring Street Address: **919 Division Street**
~~Well~~ Boring City, Village or Town: **City of Mauston/Civil Township of Lindina**
~~Well~~ Boring ZIP Code:
Subdivision Name:
Lot #:
Reason For Removal ~~From Service~~: **Boring for GEOTECHNICAL sampling.**
WI Unique Well # of Replacement Well: **NA**

2. Facility / Owner Information

Facility Name: **Parking Lot Reconstruction, Mauston Readiness Center**
Facility ID (FID or PWS): **NA**
License/Permit/Monitoring No: **NA**
Original Well Owner: **NA**
~~Present Well Owner~~ **Present Property Owner**: **Unknown**
Mailing Address of Present Owner:
City of Present Owner:
State:
Zip Code:

3. Well / Drillhole / Borehole Information

☐ Monitoring Well
☐ Water Well
■ Drillhole / Borehole
~~Original Construction~~ Boring Completion Date (mm/dd/yyyy): **04/04/2025**
If a Well Construction Report is available, please attach: **NA**

Construction Type:
■ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (specify):

Formation Type:
■ Unconsolidated Formation ☐ Bedrock

Total ~~Well~~ Boring Depth From Ground Surface (ft.): **5.0**
Casing Diameter (in.): **NA**
~~Lower~~ Drillhole Diameter (in.): **6.3**
Casing Depth (ft.): **NA**
Was well annular space grouted? **NA** ☐ Yes ☐ No ☐ Unknown
If yes, to what depth (feet)?
Depth to Water (Feet): **Dry**

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	■ N/A
Liner(s) removed?	☐ Yes	☐ No	■ N/A
Screen removed?	☐ Yes	☐ No	■ N/A
Casing left in place?	☐ Yes	☐ No	■ N/A
Was casing cut off below surface?	☐ Yes	☐ No	■ N/A
Did sealing material rise to surface?	■ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	■ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	■ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	■ No	☐ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
■ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealings Materials
☐ Neat Cement Grout ☐ Concrete
☐ Sand-Cement (Concrete) Grout ■ Bentonite Chips

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
Auger Cuttings	Surface	3.50	0.75 ft^3	
Caved Soil	3.50	5.00	0.32 ft^3	

6. Comments

NA = Not applicable to soil borings.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: **SOILS & ENGINEERING SERVICES, INC.**
License #:
Date of Filling & Sealing (mm/dd/yyyy): **04/04/2025**
Street or Route: **1102 Stewart Street**
Telephone Number: **(608) 274-7600**
City: **Madison**
State: **WI**
ZIP Code: **53713**
Signature of Person Doing Work: Craig M. Bauer
Date Signed: **04/07/2025**

DNR Use Only
Date Received:
Noted By:
Comments:

DFD Project No. 24E8C
02 32 00.01-29

State of Wis., Dept. of Natural Resources
dnr.wi.govb

Well / Drillhole / Borehole Abandonment

Form 3300-005 (R 4/2015)

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SES Project Number 13618

Route to:
☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment
☐ Waste Management ☐ Other:

1. ~~Well Location Information~~ Boring Location Information

County: **Juneau**
Boring Number: **3**
Latitude / Longitude (Degrees and Minutes): ____ N ____ W
Format Code: ☐ DD ☐ DDM
Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001
¼ / ¼: **SW** ¼ **NE**
or Gov't Lot #
Section: **13**
Township: **15** N
Range: ■ E ☐ W
~~Well~~ Boring Street Address: **919 Division Street**
~~Well~~ Boring City, Village or Town: **City of Mauston/Civil Township of Lindina**
~~Well~~ Boring ZIP Code:
Subdivision Name:
Lot #:

Reason For Removal ~~From Service~~: **Boring for GEOTECHNICAL sampling.**
WI Unique Well # of Replacement Well: **NA**

2. Facility / Owner Information

Facility Name: **Parking Lot Reconstruction, Mauston Readiness Center**
Facility ID (FID or PWS): **NA**
License/Permit/Monitoring No: **NA**
Original Well Owner: **NA**
~~Present Well Owner~~ **Present Property Owner**: **Unknown**
Mailing Address of Present Owner:
City of Present Owner:
State:
Zip Code:

3. Well / Drillhole / Borehole Information

☐ Monitoring Well
☐ Water Well
■ Drillhole / Borehole

~~Original Construction~~ Boring Completion Date (mm/dd/yyyy): **04/04/2025**
If a Well Construction Report is available, please attach: **NA**

Construction Type:
■ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (specify):

Formation Type:
■ Unconsolidated Formation ☐ Bedrock

Total ~~Well~~ Boring Depth From Ground Surface (ft.): **10.0**
Casing Diameter (in.): **NA**
~~Lower~~ Drillhole Diameter (in.): **6.3**
Casing Depth (ft.): **NA**

Was well annular space grouted? **NA** ☐ Yes ☐ No ☐ Unknown
If yes, to what depth (feet)?
Depth to Water (Feet): **Dry**

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	■ N/A
Liner(s) removed?	☐ Yes	☐ No	■ N/A
Screen removed?	☐ Yes	☐ No	■ N/A
Casing left in place?	☐ Yes	☐ No	■ N/A
Was casing cut off below surface?	☐ Yes	☐ No	■ N/A
Did sealing material rise to surface?	■ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	■ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	■ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	■ No	☐ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
■ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealings Materials
☐ Neat Cement Grout ☐ Concrete
☐ Sand-Cement (Concrete) Grout ■ Bentonite Chips

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

Material	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
Auger Cuttings	Surface	8.08	1.7 ft^3	
Caved Soil	8.08	10.00	0.41 ft^3	

6. Comments

NA = Not applicable to soil borings.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: **SOILS & ENGINEERING SERVICES, INC.**
License #:
Date of Filling & Sealing (mm/dd/yyyy): **04/04/2025**
Street or Route: **1102 Stewart Street**
Telephone Number: **(608) 274-7600**
City: **Madison**
State: **WI**
ZIP Code: **53713**
Signature of Person Doing Work: Craig M. Bauer
Date Signed: **04/07/2025**

DNR Use Only
Date Received:
Noted By:
Comments:

DFD Project No. 24E8C
02 32 00.01-30

State of Wis., Dept. of Natural Resources
dnr.wi.govb

Well / Drillhole / Borehole Abandonment

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SES Project Number 13618

Route to:
☐ Drinking Water ☐ Watershed/Wastewater ☐ Remediation/Redevelopment
☐ Waste Management ☐ Other:

1. ~~Well Location Information~~ Boring Location Information

County: **Juneau**

Boring Number: **4**

Latitude / Longitude (Degrees and Minutes): _____ N _____ W

Format Code: ☐ DD ☐ DDM

Method Code: ☐ GPS008 ☐ SCR002 ☐ OTH001

¼ / ¼ **SW** ¼ **NE**

Section: **13**

Township: **15** N

Range: ■ E ☐ W

or Gov't Lot #

~~Well~~ Boring Street Address: **919 Division Street**

~~Well~~ Boring City, Village or Town: **City of Mauston/Civil Township of Lindina**

~~Well~~ Boring ZIP Code:

Subdivision Name:

Lot #:

Reason For Removal ~~From Service~~: **Boring for GEOTECHNICAL sampling.**

WI Unique Well # of Replacement Well: **NA**

2. Facility / Owner Information

Facility Name: **Parking Lot Reconstruction, Mauston Readiness Center**

Facility ID (FID or PWS): **NA**

License/Permit/Monitoring No: **NA**

Original Well Owner: **NA**

~~Present Well Owner~~ **Present Property Owner**: **Unknown**

Mailing Address of Present Owner:

City of Present Owner:

State:

Zip Code:

3. Well / Drillhole / Borehole Information

☐ Monitoring Well
☐ Water Well
■ Drillhole / Borehole

~~Original Construction~~ Boring Completion Date (mm/dd/yyyy): **04/04/2025**

If a Well Construction Report is available, please attach.: **NA**

Construction Type:
■ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (specify):

Formation Type:
■ Unconsolidated Formation ☐ Bedrock

Total ~~Well~~ Boring Depth From Ground Surface (ft.): **5.0**

Casing Diameter (in.): **NA**

~~Lower~~ Drillhole Diameter (in.): **6.3**

Casing Depth (ft.): **NA**

Was well annular space grouted? **NA** ☐ Yes ☐ No ☐ Unknown

If yes, to what depth (feet)?

Depth to Water (Feet): **Dry**

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	■ N/A
Liner(s) removed?	☐ Yes	☐ No	■ N/A
Screen removed?	☐ Yes	☐ No	■ N/A
Casing left in place?	☐ Yes	☐ No	■ N/A
Was casing cut off below surface?	☐ Yes	☐ No	■ N/A
Did sealing material rise to surface?	■ Yes	☐ No	☐ N/A
Did material settle after 24 hours?	☐ Yes	■ No	☐ N/A
If yes, was hole retopped?	☐ Yes	☐ No	■ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	■ No	☐ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
■ Screened & Poured (Bentonite Chips) ☐ Other (Explain):

Sealings Materials
☐ Neat Cement Grout ☐ Concrete
☐ Sand-Cement (Concrete) Grout ■ Bentonite Chips

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

5. Material Used To Fill Well / Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
Auger Cuttings	Surface	3.08	0.66 ft^3	
Caved Soil	3.08	5.00	0.41 ft^3	

6. Comments

NA = Not applicable to soil borings.

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing: **SOILS & ENGINEERING SERVICES, INC.**

License #:

Date of Filling & Sealing (mm/dd/yyyy): **04/04/2025**

Street or Route: **1102 Stewart Street**

Telephone Number: **(608) 274-7600**

City: **Madison**

State: **WI**

ZIP Code: **53713**

Signature of Person Doing Work: Craig M Bower

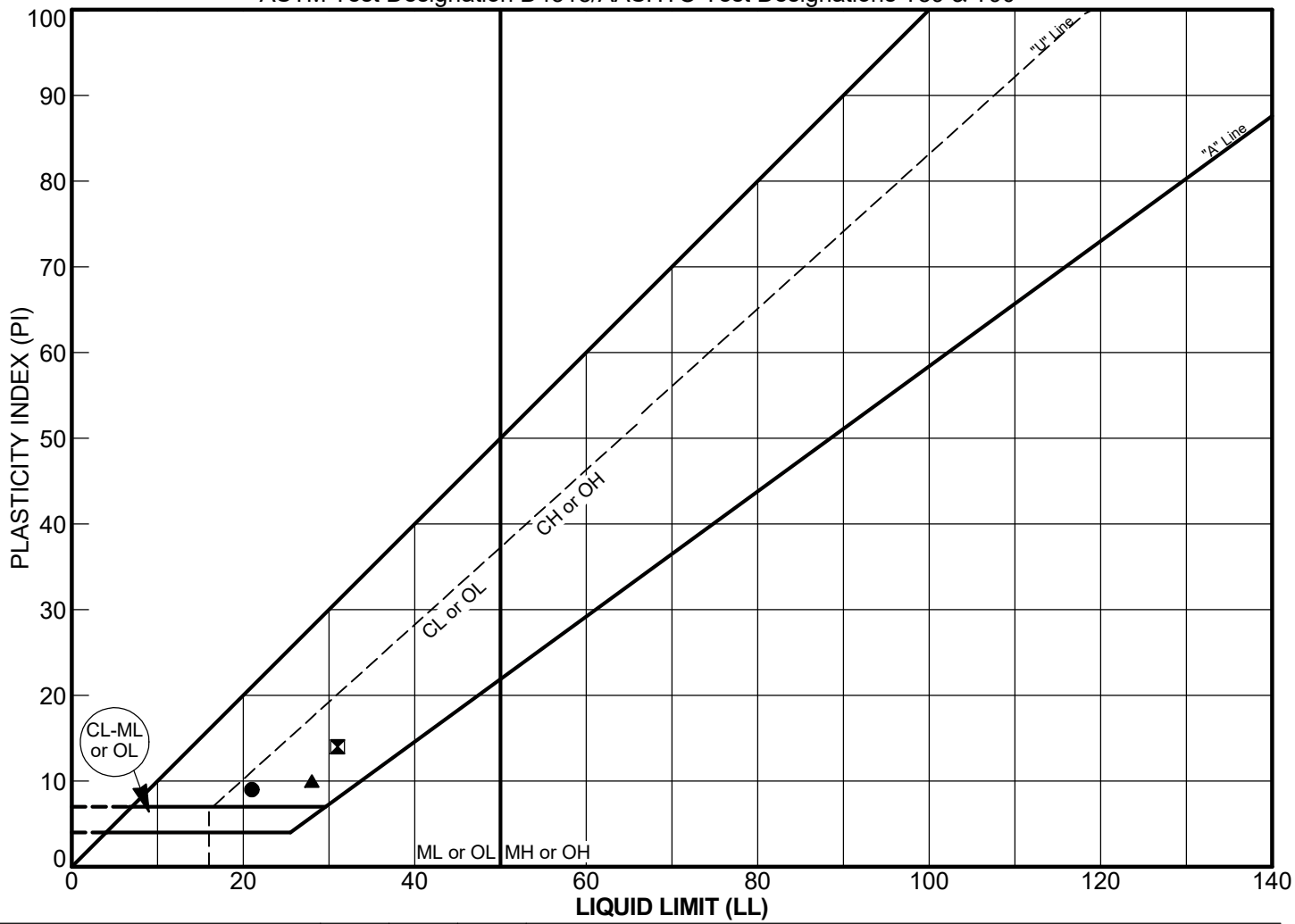
Date Signed: **04/07/2025**

DNR Use Only
Date Received:
Noted By:
Comments:

DFD Project No. 24E8C
02 32 00.01-31

ATTERBERG LIMITS TEST REPORT

ASTM Test Designation D4318/AASHTO Test Designations T89 & T90



	Specimen Identification	LL	PL	PI	Sample Classification
●	**Boring 1, 2'-3" Depth**	**21**	**12**	**9**	***SANDY LEAN CLAY (CL)*** *— medium plasticity; brown; moist; stiff consistency;* ***FILL***
⊠	**Boring 2, 1'-5 1/4" Depth**	**31**	**17**	**14**	***LEAN CLAY (CL)*** *— medium plasticity; gray with reddish-brown mottling; moist; stiff consistency*
▲	**Boring 3, 2'-3" Depth**	**28**	**18**	**10**	***LEAN CLAY (CL)*** *— medium plasticity; dark yellowish-brown; moist; stiff to hard consistency*

Soils & Engineering Services, Inc.

1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

CONSULTING CIVIL ENGINEERS SINCE 1966

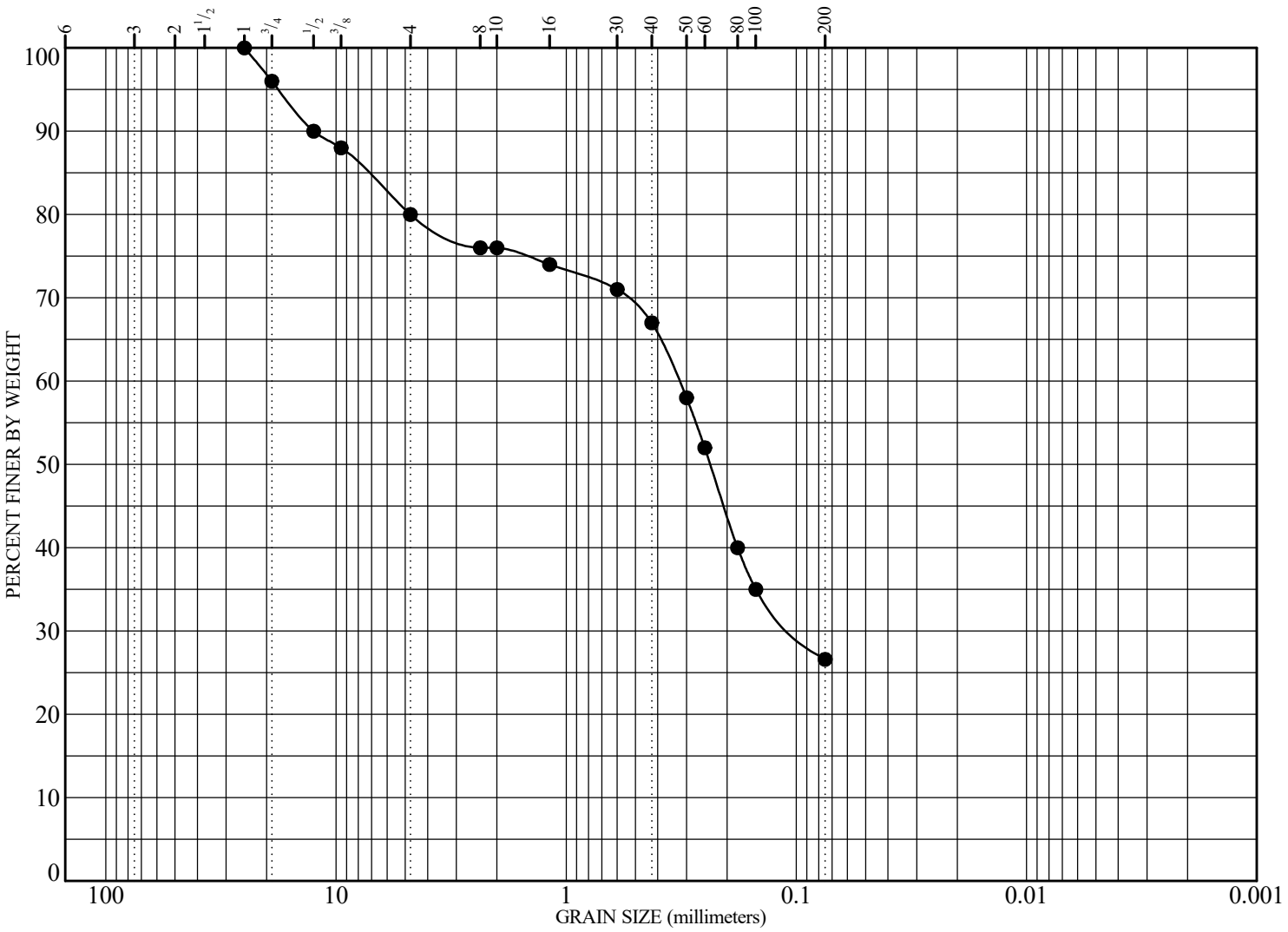
LABORATORY TEST RESULT RECORD
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

13618

FIGURE 1

Printed on 05/05/2025

PARTICLE SIZE DISTRIBUTION ANALYSIS REPORT



	COBBLES (%)	GRAVEL (%)		SAND (%)			FINES (%)	
		coarse	fine	coarse	medium	fine	SILT (%)	CLAY (%)
●	0	4	16	4	9	40	26.6	

Sieve Size	Percent Finer ●
1-inch	100
3/4-inch	96
1/2-inch	90
3/8-inch	88
#4	80
#8	76
#10	76
#16	74
#30	71
#40	67
#50	58
#60	52

Sieve Size	Percent Finer ●
#80	40
#100	35
#200	26.6

	Grain Size (mm)			Coefficients	
	D_{60}	D_{30}	D_{10}	C_c	C_u
●	0.33	0.10			

	Sample Information
●	Boring 4, 1'-9" Depth: ***SILTY SAND WITH GRAVEL (SM)*** — *fine grained; non-plastic to low plasticity fines; reddish-brown; moist;* ***FILL***

Soils & Engineering Services, Inc.

1102 STEWART STREET
MADISON, WISCONSIN 53713-4648
Phone: {608) 274-7600

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LABORATORY TEST RESULT RECORD
Parking Lot Reconstruction
Mauston Readiness Center
Wisconsin Army National Guard
919 Division Street
City of Mauston, Juneau County, Wisconsin
DFD Project No 24E8C

13618

FIGURE 2

Printed on 05/05/2025

APPENDIX B

Appendix B Contents

- Fill Material Recommendations

We provide the following recommendations regarding fill material used to raise the grade below proposed improvements and used to backfill below-grade foundation elements and structures.

All materials and the placement of those materials are to conform to applicable sections of the project specifications and drawings or the recommendations presented below. If there is a conflict between the project specifications/drawings and the recommendations presented below, we recommend the more stringent requirements for the intended use be followed. The Project Civil/Structural Engineer should be consulted for any clarification of the recommendations provided herein and in the project specifications/drawings.

B1. Landscape Fill Material

We recommend landscape fill material be used to raise the grade below areas that will not have any type of improvement constructed on top of it. It may consist of either cohesive, granular, or a mixture of cohesive and granular soils with a maximum aggregate size of 3 inches in the greatest dimension. It shall be free of construction debris and free from sod, stumps, logs, and other perishable and deleterious matter.

We recommend the landscape fill material be placed in maximum 1-foot-thick loose layers and compacted to at least 88 percent of the maximum dry density determined for the material according to ASTM Designation D1557. Cohesive or cohesive/granular material should be placed at a moisture content within 3 percent above or below the optimum moisture content for the material as determined by ASTM Designation D1557. Improper or poor densification of the landscape fill material could result in settlement of the soils and subsequent depressions in the landscaped area surface.

We recommend the placement and compaction of the landscape fill material be monitored and/or tested as specified in Section B10 of this appendix.

B2. General Fill Material

We recommend the general fill material used to raise the grade below roadways or similar hardscaped surface areas. It may consist of cohesive or a mixture of cohesive and granular soils with a maximum aggregate size of 3 inches in the greatest dimension. It shall be free of construction debris and free from sod, stumps, logs, and other perishable and deleterious matter.

Be advised that this type of fill material will typically retain more moisture than and will have a lower permeability rate than structural fill material. Thus, the potential for frost heave to occur will be greater. Therefore, providing a positive slope to the subgrade surface to drain moisture away from any structural improvement should be included in the project design.

We recommend the general fill material be placed at a moisture content at the optimum moisture to approximately 2 percent above the optimum moisture of the material in maximum 6- to 12-inch-thick loose lifts depending upon the composition of the material. The allowable loose lift thickness of the material will be dependant upon the composition of the material, the optimum moisture content of the material, and the size of the compactor to be used to compact the material.

We recommend each lift of the general fill material be compacted using segmented-pad compactors. This type of compactor will help to kneed the placed material into a well-knit soil mass. The size of the compactor used to compact the cohesive or cohesive/granular mixed fill material is anticipated to be larger than what would be needed to compact structural fill material. We recommend smooth drum or flat plate vibratory compactors not be used to compact general fill material. We recommend each lift of general fill material be compacted to at least 90 or 95 percent of the maximum dry density determined for the material according to ASTM Designation D 1557 as follows:

- Inside a 1:1 line from the lower exterior limits of a roadway or hardscape surface improvement, compact the material placed 3 feet or more below the design finished subgrade to at least 90 percent of the maximum dry density and the material placed within 3 feet of the design finished subgrade to at least 95 percent of the maximum dry density.

- Outside a 1:1 line from the lower exterior limits of a roadway or hardscape surface improvement, each lift should be thoroughly compacted to at least 90 percent of the maximum dry density.

- In addition, where the general fill material consists of predominantly cohesive material (soils identified/classified with USCS symbols of CL, CL-ML, CH, or MH), the compacted material shall be well-knit together to eliminate voids within the soil mass and have a minimum unconfined compressive strength of 1.5 tons per square foot as measured with a spring penetrometer.

We recommend the placement and compaction of the general fill material be monitored and/or tested as specified in Section B10 of this appendix.

B3. Structural Fill Material

We recommend the structural fill material be used to backfill any below-grade section of a foundation element that is adjacent to or below an area that will have a structural improvement constructed on it. We recommend the structural fill material consist of a granular soil (e.g., soils identified/classified with USCS symbols of SC, SM, SP-SC, SP-SM, SP, GC, GM, GP-GC, GP-GM, or GP) with a maximum aggregate size of 2½ inches in the greatest dimension, not

more than 30 percent of the material retained on the ¾-inch sieve, and not more than 25 percent passing the No. 200-mesh sieve.

We recommend the structural fill material be placed in 8- to 12-inch-thick loose lifts. Depending upon the selected granular soil's particle-size composition, thinner loose lift thicknesses, drying out of the material, and/or the addition of water to the material may be necessary to achieve the recommended percent compaction. We recommend each loose lift of material be compacted to at least 90 or 95 percent of the maximum dry density determined for the material according to ASTM Designation D 1557 as follows:

Below Structures and Foundation Backfill
We recommend each lift be compacted to at least 95 percent of the maximum dry density.

Below Hardscape Surfaces[6]
We recommend each lift be compacted to at least 95 percent of the maximum dry density for material placed within 3 feet of the design hardscape surface subgrade elevation and to at least 90 percent of the maximum dry density for material placed below a depth of 3 feet from the design hardscape surface subgrade elevation.

We recommend the placement and compaction of the structural fill material be monitored and/or tested as specified in Section B10 of this appendix.

B4. Free-Draining Fill Material

We recommend the free-draining fill material consist of a granular (i.e., sand and/or gravel) soil with a maximum of 8 percent of particles passing the No. 200-mesh sieve, a maximum of 35 percent retained on a 1-inch sieve, and 100 percent of the material passing the 1½-inch sieve. The free-draining fill material should be placed and compacted as described for structural fill material in Section B3 of this appendix. Depending upon the type of soils the free-draining fill material is resting on, placement of a woven geotextile (See Section B5 of this appendix) may be needed to minimize the intrusion of fine particles into the free-draining fill material. Intrusion of fine particles would reduce the capability of the free-draining fill material to perform as intended.

We recommend the placement and compaction of the free-draining fill material be monitored and/or tested as specified in Section B10 of this appendix.

We recommend free-draining fill material be placed below the slab-on-grade floor for a structure to aid in providing a moisture break between the underlying material and the slab-on-

[6]Hardscape surfaces, at a minimum, consist of the pavement for roadways, parking lots, driveways, etc.; sidewalks, and landscaping pavers.

grade floor. It is also used in situations where frost protection of a foundation element terminating above the recommended frost depth is needed. In frost protection situations, the bottom of the free-draining fill material is placed at or below the recommended frost depth.

B5. Woven Geotextile

Depending upon the soil and groundwater conditions exposed in the excavations to accommodate the proposed improvements, it may be necessary to install a woven geotextile on the excavation surface and possibly extending up the sidewalls of the excavation and/or to cover the top of a layer of coarse crushed stone or breaker run. We recommend the geotextile consist of Mirafi 600X, Contech C300, or equivalent. The geotextile should be pulled taut to remove wrinkles and slack prior to placement of any fill material on it.

The geotextile is intended to aid in forming a working mat upon which placement of coarse crushed stone or breaker run can take place without disturbing or loosening the soil at the bottom of the excavations.

B6. Non-Woven Geotextile

Depending upon the soil and groundwater conditions exposed in the excavations to accommodate the proposed improvements, it may be necessary to install a non-woven geotextile on the excavation surface and possibly extending up the sidewalls of the excavation and/or to cover the top of a layer of coarse crushed stone. We recommend the geotextile consist of Mirafi 140N, Contech C-45NW, or equivalent. The geotextile should be pulled taut to remove wrinkles and slack prior to placement of any fill material on it. The use of a non-woven geotextile should be limited to those situations where prevention of the infiltration of fines into the coarse crushed stone is the primary purpose of the geotextile. Where strength as well as fines infiltration prevention is the purpose of the geotextile then a woven geotextile as specified in Section B5 of this appendix should be used.

The geotextile is intended to aid in forming a working mat upon which placement of coarse crushed stone or breaker run can take place without disturbing or loosening the soil at the bottom of the excavations.

B7. Coarse Crushed Stone

Depending upon the soil and groundwater conditions exposed in the excavations to accommodate the proposed improvements, it may be necessary to install coarse crushed stone mat over exposed soil in an excavation. We recommend coarse crushed stone consist of Number 2 stone as defined in ASTM Designation C33. Number 2 stone consists of particles primarily in the 1½- to 2½-inch range without fines as follows:

Sieve Size	Percent Passing
3-inch	100
2½-inch	90 to 100
2-inch	35 to 70
1½-inch	0 to 15
¾-inch	0 to 5

The coarse crushed stone should be placed in maximum 1-foot-thick loose layers. Each layer of coarse crushed stone should be thoroughly-compacted with a large, vibratory smooth-drum compactor, or a backhoe-mounted plate compactor, to densify the placed stone until no further consolidation is evident.

Coarse crushed stone is normally intended to form a working mat upon which placement of other fill material, or construction of proposed improvements or spread footings, can take place without disturbing or loosening the soil at the bottom of the excavations.

Depending upon the soil and groundwater conditions, the coarse crushed stone may need to be underlain by or even wrapped by a woven geotextile.

We recommend the placement and compaction of the coarse crushed stone be monitored and/or tested as specified in Section B10 of this appendix.

B8. Breaker Run Material

Depending upon the soil and groundwater conditions exposed in the excavations to accommodate the proposed improvements, it may be necessary to place breaker run on the excavation surface. If needed, a woven geotextile may also be needed as specified in Section B5 of this appendix. If breaker run is needed, the thickness of the breaker run can be considered to replace an equal thickness of structural fill material (i.e., 1-foot of breaker run equals 1-foot of structural fill material).

We recommend the breaker run material consist of crushed stone meeting the requirements for Section 312, Select Crushed Material, of the WisDOT *Standard Specifications for Highway and Structure Construction* specifications. Select Crushed Material consists of particles primarily in the 1½- to 5-inch range without fines as follows:

Sieve Size	Percent Passing
5-inch	100
1½-inch	20 to 50
No. 10	0 to 10

We recommend the breaker run be placed in maximum 1-foot-thick loose layers. Each layer of breaker run should be thoroughly-compacted with a large, vibratory smooth-drum compactor, or a backhoe-mounted plate compactor, to densify the placed breaker run until no further consolidation is evident.

The breaker run is intended to aid in forming a working mat upon which placement of other fill material, or construction of proposed improvements or spread footings, can take place without disturbing or loosening the soil at the bottom of the excavations.

Depending upon the soil and groundwater conditions, the breaker run may need to be underlain by or even wrapped by a woven geotextile.

We recommend the placement and compaction of the breaker run be monitored and/or tested as specified in Section B10 of this appendix.

B9. Aggregate Base Course

We recommend the aggregate base course which is placed below vehicular or hardscaped improvements consist of material meeting the requirements for 1¼-inch Dense Graded Base per Section 305 of the WisDOT *Standard Specifications for Highway and Structure Construction*. If desired, the top 6 inches of aggregate base course could consist of ¾-inch Dense Graded Base.

We recommend the aggregate base course material be placed on top of the approved subgrade surface following completion of the site excavation, thorough compaction/proof-rolling, and site filling as recommended in the appropriate sections of this report. We recommend the aggregate base course material be placed and compacted in two or more lifts with a maximum loose lift thickness of 6-inches and with each lift being compacted to a density of at least 95 percent of the maximum dry density determined for the material in accordance with ASTM Designation D1557.

We recommend the placement and compaction of the aggregate base course material be monitored and/or tested as specified in Section B10 of this appendix.

B10. Fill Material Monitoring

We recommend the compactive effort of the Landscaped Fill Material, Structural Fill Material, Free-Draining Fill Material, Coarse Crushed Stone, Breaker Run Material, and/or Aggregate Base Course be monitored during construction by Soils & Engineering Services, Inc. personnel at regular depths and intervals to verify that the minimum density has been achieved, especially during initial placement of the fill material. Any compacted lift that does not meet the specified density should receive additional compactive effort and then be retested until the required

density has been achieved. Subsequent lifts should not be placed until the specified minimum density has been achieved on the preceding lift.

B11. Cold Weather Fill Material Placement

During cold weather conditions, Landscaped Fill Material, Structural Fill Material, Free-Draining Fill Material, Coarse Crushed Stone, Breaker Run Material, and/or Aggregate Base Course used to backfill any excavation or to raise the grade should not be deposited over frozen soil, either frozen native soil or frozen fill material. Also, any of the fill materials to be placed and compacted should not be frozen or contain snow or ice.

APPENDIX C

Appendix C Contents

- Pavement Design Parameters Based on Laboratory Testing

Pavement Design Parameters Based on Laboratory Testing

Based on the laboratory test results and the types of soils encountered by the borings completed, we determined the pavement design parameters, as presented in the table below, for the various soil strata encountered at the locations of Borings 1 through 4 performed for the subject project.

We include improved pavement design parameters in the table below for use in the pavement design if a Subgrade Select Material is selected to be placed and compacted as a sub-base course material for a project as specified in WisDOT FDM Chapter 11 Section 5 Part 15 (FDM 11-5-15) and FDM 14-5-5. For rural state trunk highway projects and urban freeway projects, the use of Subgrade Select Material is required. For other projects, the pavement designer may opt to use the Subgrade Select Material to provide a more robust subgrade support system to support the selected HMA or PCC pavement for a project. When a Subgrade Select Material is used for a sub-base course material then subgrade soils with a Design Group Index of 8 or higher have an "Improved Soil Support Value" and an "Improved Modulus of Subgrade Reaction" assigned to them for use in the pavement design.

Subgrade Soil Type	Pavement Design Parameters
Fill Material: LEAN CLAY (CL) Native Soil: LEAN CLAY (CL) CLAYEY SAND (SC)	AASHTO Classification = A-4, A-6 Design Group Index = 12, 15 Frost Index = F-3 Soil Support Value = 4.2, 3.8 Improved Soil Support Value = 4.7, 4.4 Subgrade Modulus, "k" = 150, 125 $^{psi}/_{in}$ Improved Subgrade Modulus = 375
Fill Material: SILTY SAND WITH GRAVEL (SM)	AASHTO Classification = A-2-4 Design Group Index = 8 Frost Index = F-3 Soil Support Value = 4.7 Improved Soil Support Value = 5.0 Subgrade Modulus, "k" = 225 $^{psi}/_{in}$ Improved Subgrade Modulus = 375

APPENDIX D

Appendix D Contents

- *Important Information about This Geotechnical-Engineering Report* advisory

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

SECTION 02 41 13
DEMOLITION
BASED ON DFD MASTER SPECIFICATION DATED 5/20/2025

PART 1 - GENERAL

SCOPE

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

RELATED WORK

Applicable provisions of the General Conditions and Division 01 shall govern work under this section.

Section 02 00 00 – Existing Conditions
Section 31 25 00 – Erosion Control

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 the 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 that all gas and electrical utilities have been abandoned or disconnected 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.

PERMITS

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

If necessary, file and maintain a copy of the Notification of Demolition and/or Renovation and Application for Permit Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter NR447. Any complete structure demolition or removal of load-bearing components will require filing.

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 a 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 a secure location until the trade responsible for re-installation mobilizes equipment and/or storage facilities to the site, or otherwise accepts responsibility for the salvaged item.

PART 2 - MATERIALS

EQUIPMENT

Use Contractor's normal equipment for demolition purposes and which meets all safety requirements imposed on such equipment.

PART 3 – EXECUTION

PROTECTION OF EXISTING WORK AND FACILITIES

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

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

Verify the 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 workmen, public, adjacent construction and occupants of existing building(s).

Report damage of any facilities or items scheduled for salvaging to the DFD Construction Representative.

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

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

Demolish and remove all buildings and structures scheduled for demolition as shown on the drawings.

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 the project boundaries or as defined or indicated on the drawings, but not in locations that block vehicular traffic on the streets or pedestrian traffic on adjacent public walks.

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

Conduct demolition operations and the 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.

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

Masonry and concrete shall be demolished in small sections. Use braces and shores as necessary to support the inegrity 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 in a manner to minimize damage to plaster which is to remain, and to keep dust and dirt to a minimum.

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 damaged drain tiles not scheduled for

demolition. Report damage to the DFD Construction Representative. 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 identified obstructions, retest until satisfactory.

TRANSPORTATION AND DISPOSAL OF DEMOLITION WASTE

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

Recycle demolition waste whenever possible, or as otherwise required by the Contract Documents.

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

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

END OF SECTION

SECTION 02 42 00
REMOVAL, SALVAGE AND ABANDONMENT

PART 1 - GENERAL

SCOPE

This section includes requirements for the submittal log and administrative and procedural requirements for electronically submitting fabrication drawings, product data, samples and other submittals. Included are the following topics:

PART 1 – GENERAL
- Scope
- Applicable Provisions
- Applicable Publications
- Description Of Work
- Related Work Elsewhere
- Submittals (None)
- Operation/Maintenance Manuals And Instructions (None)

PART 2 – PRODUCTS AND MATERIALS (N/A)

PART 3 – EXECUTION
- Remove, Salvage, & Reinstall Existing Mailbox
- Remove, Salvage, & Reinstall Existing Sign
- Remove Fence
- Remove Pipe
- Remove Asphaltic Pavement
- Remove Concrete
- Sawcut & Match Existing Asphaltic Pavement
- Sawcut & Match Existing Concrete, Full Depth
- Other Removals
- Disposal

APPLICABLE PROVISIONS

Applicable provisions of Division 1 shall govern the work of this section.

APPLICABLE PUBLICATIONS

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

DESCRIPTION OF WORK

The work under this section shall include removals and abandonments of existing improvements as specified herein and marked in the field.

RELATED WORK ELSEWHERE

Procurement and Contracting Requirements - Division 00 (All Sections)

SUBMITTALS (NONE)

OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 - PRODUCTS AND MATERIALS (NONE)

PART 3 - EXECUTION

REMOVE EXISTING MAILBOX
Remove and dispose of the existing mailbox.

REMOVE EXISTING SIGN
Remove and dispose of existing signs where indicated on the Drawings.

REMOVE FENCE
Remove and dispose of existing chain link fence where indicated on the Drawings including post, wire, and all other appurtenances.

REMOVE PIPE
Verify that all connections to/from the pipe have been disconnected and redirected to new facilities. Remove pipes and culverts, including endwalls, valves and any other appurtenant items. Contractor to dispose.

Backfill trench in accordance with Section 31 23 33.

REMOVE ASPHALTIC PAVEMENT
Remove asphaltic roadway (including asphaltic curbs, if any), driveway and trail. Sawcut straight joint to aid in removal. Contractor to dispose – Agency preference is to use elsewhere (not on this project) as recycled material.

REMOVE CONCRETE
Remove concrete driveway, sidewalk and steps at existing joint and/or sawcut straight joint to aid in removal. Contractor to dispose – Agency preference is to use the material elsewhere (not on this project) as recycled material.

SAWCUT & MATCH EXISTING ASPHALTIC PAVEMENT
Asphaltic pavement sawcuts shall be cut a minimum of 2 inches deep.

Contractor shall endeavor to minimize dust.

Sludge from sawing shall not be allowed to flow onto, or be deposited on, any live traffic lane. If sludge from sawing is deposited onto adjacent concrete surfaces that will remain after the completion of the project, it shall be promptly removed to avoid staining.

SAWCUT & MATCH EXISTING CONCRETE, FULL DEPTH
Concrete sawcuts shall be a minimum depth of one-third the concrete thickness.

Contractor shall endeavor to minimize dust.

Sludge from sawing shall not be allowed to flow onto, or be deposited on, any live traffic lane. If sludge from sawing is deposited onto adjacent concrete surfaces that will remain after the completion of the project, it shall be promptly removed to avoid staining.

OTHER REMOVALS
Includes all removals and salvaged items within the project area not specifically designated as a contract bid item in the bid form.

Includes existing utilities designated for replacement and/or abandonment as part of the project.

Shall be performed in accordance with the requirements of Section 204, State of Wisconsin, Department of Transportation, Standard Specifications.

Where new pipe or structures are laid in the same location or below, the removal of any existing pipe or structures shall be incidental to the construction of the new system.

DISPOSAL

All removed materials not designated for salvage, shall be removed from the project site and abandoned in accordance with all applicable laws and regulations. The Contractor is responsible for providing all necessary erosion control measures at disposal sites. No materials shall be deposited in wetland areas. Contractor is encouraged to recycle as much material as is practical.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING
BASED ON DFD MASTER SPECIFICATION DATED 9/10/2024

PART 1 - GENERAL

SCOPE

Section includes concrete reinforcing including steel reinforcement bars and welded-wire reinforcement. The work under this section consists of providing all work, materials, labor equipment and supervision necessary to provide concrete reinforcing as required in these specifications and the drawings.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:

03 30 00 – Cast-In-Place Concrete

03 30 10 – Cast-In-Place Concrete for Site Work

REFERENCES

Specifications

American Concrete Institute (ACI):

- ACI SP-066 – ACI Detailing Manual
- ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
- ACI 315 - Standards on Details and Detailing of Concrete Reinforcement.
- ACI 318 - Building Code Requirements for Structural Concrete and Commentary.
- ACI 440.1R-15 (2015) “Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer Bars”, ACI Committee 440, American Concrete Institute
- ACI 440.3R-12 (2012) “Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures” ACI Committee 440, American Concrete Institute

ACI 440.4R-04 (Reapproved 2011) “Prestressing Concrete Structures with FRP Tendons” ACI Committee 440, American Concrete Institute
ACI 440R-07 (2007) “Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures,” ACI Committee 440, American Concrete Institute
ACI 440.5-08 (2008) “Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bar”, ACI Committee 440, American Concrete Institute

ASTM International (ASTM):

ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes
ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
ASTM A775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A884 – Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
ASTM A934 – Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
ASTM A955 - Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement
ASTM A1022 - Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
ASTM A1055 - Standard Specification for Zinc and Epoxy Dual-Coated Steel Reinforcing Bars
ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3963 – Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
ASTM D7957 (2017) “Standard Specification for Solid Round Glass Fiber Reinforced Polymer Bars for Concrete Reinforcement”, American Society for Testing and Materials (ASTM International)

American Welding Society (AWS)

AWS D1.4 – Structural Welding Code – Reinforcing Steel

CRSI – Manual of Standard Practice
CRSI – Placing Reinforcing Bars

SUBMITTALS

Product Data: For each of the following:

Each type of steel reinforcement
Stud Rails
Epoxy repair coating
Zinc repair material
Bar supports
Mechanical splice couplers
Structural thermal break insulated connection system

Shop Drawings: Comply with ACI SP-066:

Include placing drawings that detail fabrication, bending, and placement.

Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

Qualification Statements: For delegated design engineer; and testing and inspection agency.

Delegated Design Engineer Qualifications: Include the following:

Experience providing delegated design engineering services of the type indicated.

Documentation that delegated design engineer is licensed in the State of WI in which Project is located.

Welding certificates.

Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

Material Certificates: For each of the following, signed by manufacturers:

Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

Material Test Reports: For the following, from a qualified testing agency:

Steel Reinforcement:

For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

Mechanical splice couplers.

Stud Rails.

Field quality-control reports.

QUALITY ASSURANCE

Testing Agency Qualifications: An independent agency, acceptable to the AE and DFD , qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

DELIVERY, STORAGE, AND HANDLING

Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.

Store reinforcement to avoid contact with earth.

Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 - PRODUCTS

STEEL REINFORCEMENT

Epoxy-Coated Reinforcing Bars:

Steel Bars: ASTM A615/A615M, Grade 60 deformed bars.

Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.

Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

REINFORCEMENT ACCESSORIES

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 in accordance with 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, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.

For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

Finish: Plain ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length

Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

Zinc Repair Material: ASTM A780/A780M.

FABRICATING REINFORCEMENT

Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

PREPARATION

Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

STEEL REINFORCEMENT INSTALLATION

Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

Accurately position, support, and secure reinforcement against displacement.

Locate and support reinforcement with bar supports to maintain minimum concrete cover.

Do not tack weld crossing reinforcing bars.

Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

Provide concrete coverage in accordance with ACI 318.

Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

Splices: Lap splices as indicated on Drawings.

Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.

Stagger splices in accordance with ACI 318.

Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

Dual-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material in accordance with ASTM A780/A780M.

JOINTS

Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

Place joints perpendicular to main reinforcement.

Continue reinforcement across construction joints unless otherwise indicated.

Do not continue reinforcement through sides of strip placements of floors and slabs.

INSTALLATION TOLERANCES

Comply with ACI 117 and tolerances listed below.

Reinforcement location

Placement of non-prestressed reinforcement
When member depth (or thickness) is 4 in. or less
.....±1/4 in.

When member depth (or thickness) is over 4 in. and not over 12 in.
.....±3/8 in.

When member depth (or thickness) is over 12 in.
.....±1/2 in.

Concrete cover measured perpendicular to concrete surface
When member depth (or thickness) is 12 in. or less
..... –3/8 in.

When member depth (or thickness) is over 12 in.
..... –1/2 in.

Reduction in cover shall not exceed 1/3 the specified concrete cover.

Reduction in cover to formed soffits shall not exceed 1/4 in.

Vertical deviation for slab-on-ground reinforcement
..... ±3/4 in.

Clearance between reinforcement or between reinforcement and embedment
One-quarter specified distance not to exceed
.....±1 in.

Distance between reinforcement shall not be less than the greater of the bar diameter or 1 in. for unbundled bars.

For bundled bars, the distance between bundles shall not be less than the greater of 1 in. or a bar diameter derived from the equivalent total area of all bars in the bundle.

Spacing of non-prestressed reinforcement, measured along a line parallel to the specified spacing Except as noted below.....±3 in.

Stirrups, the lesser of ±3 in. or ±1 in. per ft of beam depth

Ties, the lesser of ±3 in. or ±1 in. per ft of least column width

The total number of bars shall not be fewer than that specified.
Placement of prestressing reinforcement or prestressing ducts, measured from form surface

Horizontal deviation
Element depth (or thickness) 24 in. or less .....±1/2 in.
Element depth (or thickness) over 24 in. ..... ±1 in.

Vertical deviation
Element depth (or thickness) 8 in. or less ..... ±1/4 in.
Element depth (or thickness) over 8 in. and not over 24 in.
..... ±3/8 in.

Element depth (or thickness) more than 24 in..... ±1/2 in.

Longitudinal location of bends in bars and ends of bars

At discontinuous ends of corbels and brackets ... ±1/2 in.
At discontinuous ends of other elements ..... ±1 in.
At other locations..... ±2 in.

Embedded length of bars and length of bar laps
No. 3 through 11 bar sizes ..... –1 in.
No. 14 and 18 bar sizes..... –2 in.

Bearing plate for prestressing tendons, deviation from specified plane
..... ±1/4 in. per ft, but not less than ±1/8 in.

Placement of smooth rod or plate dowels in slabs-on-ground

Centerline of dowel, vertical deviation measured from bottom of concrete slab at the joint for element depth 8 in. or less.....±1/2 in.

When element depth is over 8 in. .....±1 in.

Spacing of dowels, measured along a line parallel to the specified spacing.....±3 in.

The total number of dowels shall not be fewer than that specified.

Centerline of dowel with respect to a horizontal line that is perpendicular to the plane established by the joint
Horizontal deviation .....±1/2 in.
Vertical deviation.....±1/2 in.

Placement of embedded items, excluding dowels in slabs-on-ground

Clearance to nearest reinforcement shall be the greater of the bar diameter, largest aggregate size, or
..... 1 in.

Centerline of assembly from specified location
Horizontal deviation ..... ±1 in.
Vertical deviation ..... ±1 in.

Surface of assembly from surface of element

Assembly dimension 12 in. or smaller
..... ±1/2 in. per 12 in.
but not less than ..... ±1/4 in.

Assembly dimension greater than 12 in. ..... ±1/2 in.

Anchor bolts in concrete

Top of anchor bolt from specified elevation
Vertical deviation ..... ±1/2 in.
Centerline of individual anchor bolts from specified location

Horizontal deviation
for 3/4 in. and 7/8 in. bolts ..... ±1/4 in.
for 1 in., 1-1/4 in., and 1-1/2 in. bolts ..... ±3/8 in.
for 1-3/4 in., 2 in., and 2-1/2 in. bolts ..... ±1/2 in.

FIELD QUALITY CONTROL

Special Inspections: Engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

Inspections:

Steel-reinforcement placement.

END OF SECTION

SECTION 03 30 10
CAST-IN-PLACE CONCRETE FOR SITE WORK
BASED ON DFD MASTER SPECIFICATION DATED 5/1/2025

PART 1 GENERAL

SCOPE

The work under this section consists of providing all work, materials, labor and supervision necessary to provide cast-in-place concrete as required for site concrete such as curb and gutter, steps, pavement, pole bases, and exterior flatwork and ancillary concrete. Requirements of this section do not apply to structural concrete such as manholes, duct banks, buildings, or retaining structures. Structural concrete work is included in 03 30 00. Included in the section are the following topics:

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

30 05 00 – Common Work Results for All Exterior Work
32 11 23.33 – Dense Graded Base

REFERENCES

Incorporated Guides and References

- American Concrete Institute (ACI):
  - ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
  - ACI 305R - Hot Weather Concreting.
  - ACI 306R – Cold Weather Concreting.
  - ACI 309R – Guide for the Consolidation of Concrete.
  - ACI 347 – Guide to Formwork for Concrete.
- State of Wisconsin, Department of Transportation (WisDOT):
  - Standard Specifications for Highway and Structure Construction (SSHSC)
  - Construction and Materials Manual (CMM)

SUBMITTALS

Mix Design: Submit mix design for review at least ten days prior to use. Mix design shall be derived from tests performed by a qualified testing laboratory or from previous tests performed on aggregate from same source.

Product Data: Submit product data for joint fillers, curing compound, admixtures, reinforcing, and all other concrete components.

Delivery Tickets: Submit delivery tickets to DFD Construction Representative for each load of concrete delivered to project.

Test Reports: Submit reports for laboratory and field tests required under "Testing" article.

Make submittals in accordance with Division 01.

QUALITY ASSURANCE

Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

Manufacturer certified according to National Ready Mixed Concrete Association's "Certification of Ready Mixed Concrete Production Facilities."

Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

TESTING

Contractor shall arrange and pay for concrete testing by a qualified testing agency, acceptable to State and independent of Contractor.

Testing agency shall test concrete to measure slump, entrained-air content, temperature, and compressive strength to determine compliance with specifications. Furnish test apparatus and cylinders, perform on-site sampling and testing, and have compressive strength cylinders tested by a qualified laboratory.

- On-site tests shall be performed under observation of A/E unless waived.
- Perform slump, air content, and temperature tests prior to concrete placement each day, whenever there is a change in consistency of concrete, and when concrete cylinders are prepared. If measured slump, air content, or temperature falls outside specified limits, immediately check another portion of same batch. In event of a second failure, concrete shall be rejected.
- During progress of work, prepare three test cylinders per **100 cu yd** fraction thereof for each class of concrete placed each day. Identify samples, moist cure in accordance with ASTM C31, and ship samples to testing laboratory for one 7-day compressive strength test and two 28-day tests.
- Test procedures shall be in accordance with ASTM C31, C39, C143, C172, C231, and C1064.
- Cost of tests, including materials and transportation, shall be paid by Contractor and shall be considered incidental to the various items of concrete work.

The Quality Management Program (QMP) provisions of the referenced WisDOT SSHSC sections do not apply to this concrete work.

NOTIFICATION

Notify DFD and AE 48 hr. prior to placing any concrete.

PART 2 PRODUCTS

CONCRETE

Concrete shall be in accordance with WisDOT SSHSC, Section 501, for grade A, air entrained concrete.

CLASS	Min. Comp. Strength, PSI	Slump, In.	Min. Cement. Lbs/ Cu Yd	Max. Water-Cement Ratio	Air Content, % By Volume	Use
A	4,000 (28-day)	1-4, 2 ½ for slip form	565	0.45	6-8	Pavements, curbs, sidewalks, slabs, pole bases, manhole benches
HES	3,000 (3-day)	1-3	660	0.45	6-8	High Early

Use epoxy coated rebar unless otherwise specified.

REINFORCEMENT

Reinforcing Bars: ASTM A615, Grade 60, deformed steel bars, epoxy-coated in accordance with ASTM A775, with less than 2 percent damaged coating in each 12-inch bar length.

FORMS

Forms may be either stationary or slip-form type. If slip forms are used, finished product shall be of quality equal to that produced by stationary forms.

Provide forms of steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects, extending full depth of concrete.

Use flexible spring steel forms or laminated boards to form radius bends as required.

Coat forms with a form release agent which will not discolor or deface surface of concrete.

EXPANSION JOINT FILLER

Expansion joint filler meeting requirements of WisDOT SSHSC, Subsection 415.2.

CURING COMPOUND

Curing compounds and curing agents meeting requirements of WisDOT SSHSC, Subsection 415.2.

ADMIXTURES

Admixtures to be used in the concrete mixture shall be submitted for approval as part of the mixture design. No other admixtures will be allowed except those listed without the A/E's approval.

Air-Entraining Admixture: ASTM C 260/C 260M.

Water reducing admixture shall conform to ASTM C494, Class A.

Other admixtures which do not adversely affect strength and durability of concrete may be used with permission of A/E, if used in strict accordance with manufacturer's instructions. Care shall be exercised to ensure that the admixture does not increase or decrease air content outside of allowable limits. Do not use salt or chemical anti-freeze admixtures.

DETECTABLE WARNING PLATES

Detectable warning plates shall consist of pre-manufactured cast iron panels with raised truncated domes complying with the Americans with Disabilities Act (ADA) Accessibility Guidelines. Panels shall have a skid-resistant finish. Finish color shall be natural cast iron . Provide panels from WisDOT's current approved products list.

PART 3 EXECUTION

PREPARATION FOR CONCRETE

Remove loose material from compacted subgrade. Proof-roll subgrade; give notice of unstable areas. Moisten subgrade to provide a uniformly damp condition.

Set clean forms to required grades and lines, rigidly braced and secured. Provide minimum concrete thicknesses as indicated on Drawings.

Check tolerances as follows (slip form methods shall produce equivalent results):

- Top of form: 1/8 in. in 10 ft.
- Alignment of vertical face: 1/4 in. in 10 ft.

Adjust manholes and utility structures to grade.

JOINTS

General: Form construction, expansion, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

- When abutting existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at expansion joints.

- Provide tie bars at sides of paving strips where indicated.
- Drill and epoxy tie bars where new concrete abuts existing concrete, as shown. If not shown, then provide two tie bars for curb and gutter and provide tie bars at 24” on center at other locations. Tie bars must be minimum of 18” with 6” embedment unless otherwise shown. Tie bars shall be minimum #4 size.
- Butt Joints: Provide butt joints for joints not subject to traffic. Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys for joints subject to traffic, except where doweled joints are designated. Embed keys at least 1-1/2 in. into concrete.

Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete radius points, catch basins, manholes, inlets, structures, existing concrete, other fixed objects, and where indicated.

- Locate additional expansion joints in curb and gutter at a maximum of 300 ft on center, unless otherwise indicated. Locate additional expansion joints in other concrete work at a maximum of 100 ft on center, unless otherwise indicated.
- Extend joint fillers full width and depth of joint.
- Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
- Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
- During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to one-fourth to one-third of the concrete thickness by forming or sawing.

- Formed Joints: Form contraction joints by using parting strips or by grooving to depth shown on details, or herein.
- Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- Locate joints in curbs and gutters at between 12 ft and 20 ft on center, unless otherwise shown. Joints in sidewalks shall be a distance equal to the sidewalk width, but no more than 7 ft on center.
- Locate joints in pavements as shown on the Drawings. Joints shall be continuous across slab, unless interrupted by an expansion joint. If not shown, then develop a joint layout plan.

CONCRETE PLACEMENT

Mix and place concrete in accordance with the following.

Place concrete in accordance with the most stringent of either ACI 304 or this section.

Concrete must be placed within the timeframe specified in WisDOT SSHSC 501. Retarders may be used if approved by the DFD Construction Representative and AE.

Before placing concrete, remove debris, ice, snow, and other foreign materials from the subgrade or formwork.

Remove standing water from subgrade. Dry and compact subgrade in accordance with the requirements of Division 2. Do not place concrete on soft or frozen subgrade.

Place and secure steel reinforcement prior to placing concrete.

Position and secure expansion joint material, sleeves, waterstops and other embedded items prior to placing concrete. Place embedded items in accordance with the most stringent of either drawings or manufacturer recommendations.

Apply bonding agent to existing concrete surfaces requiring a bond with new concrete.

Convey concrete from truck to final position by method that will prevent separation. Unless otherwise approved, limit free fall of concrete to 4’ maximum height to avoid separation.

Place concrete continuously so that concrete is deposited on or adjacent to concrete that is still plastic. When placing of concrete is temporarily halted or delayed, provide construction joints.

Place concrete in lifts not exceeding 18”.

Consolidate concrete by mechanical vibration. Allow vibrator to penetrate the full depth of the slab or lift. Overlap previously vibrated areas by 25%.

After striking off and consolidating concrete, smooth surface by screeding and floating. Test surface for trueness with a 10 ft straightedge. Remove surface irregularities and refloat repaired areas to provide a continuous, smooth finish of uniform texture.

Work edges of slabs and formed joints with edging tool to form a 1/4 in. radius.

After floating and when excess moisture has disappeared, provide broom finish by drawing a fine-hair broom perpendicular to direction of travel.

After 24 hours, remove forms, clean ends of joints, and repair honeycombed areas by means approved by the AE.

CONCRETE CURB AND GUTTER

Concrete work shall meet the requirements of Division 3, and WisDOT SSHSC, Sections: 601 - Concrete Curb and Gutter.

Provide curb and gutter as shown on the drawings and transition to match adjacent existing curb and gutter.

Construct joints true-to-line with face perpendicular to surface. Construct transverse joints at right angles to centerline, unless otherwise shown.

When abutting to existing walks, align transverse joints with previously placed joints, unless otherwise shown.

Where curb and gutter are located adjacent to sidewalks, provide a continuous ½" thick expansion joint.

The location and type of joints in curb and gutter shall match joints in adjacent pavement whenever possible.

SIDEWALKS, DRIVEWAY APRONS, BIKE PATHS

Concrete work shall meet the requirements of Division 3, and WisDOT SSHSC, Sections: 602.

Provide Standard Duty concrete sidewalk with a minimum thickness shown on the plans for all sidewalks, bike lanes, and plaza/patio areas with little or no motorized vehicle traffic. If no thickness is shown on the plans, then provide a minimum of 5-inches.

Provide Heavy Duty concrete for concrete drives, fire lanes, handicap ramps, the concrete walk through driveways, and any pavement subject to vehicular traffic, with a minimum concrete pavement thickness as shown on the plans. If no thickness is shown on the plans, then provide a minimum of 7-inches.

Unless otherwise shown on the drawings, provide all walks with a cross slope of 1/4" per foot and scored contraction joints of width approximately equal to the length.

Provide expansion joints between the walk and the back of the abutting parallel curb. Provide expansion joints where abutting existing concrete pavements as directed by DFD Construction Rep.

Dowel replacement concrete adjacent to existing slabs or to building walls or retaining walls with epoxy coated reinforcing rod set into the new slab 12" and into the structural wall 4" at 18" on centers.

Provide a boxed out square 12" larger than the casting, where manholes or valve boxes occur in a walk.

Unless otherwise noted, joint all replacement concrete work to match adjacent work. Generally provide square layout of joints, subject to the DFD Construction Representative's approval. Consult with AE and DFD Construction Representative before laying out joints for large areas and areas of intersecting walks.

Hand tool all joints outside of concrete pavement areas and stamped concrete.

Remove and replace, at no cost to the Owner, any adjacent slabs not noted for removal, but which are broken or cracked by the Contractor's activities.

Contractor shall review sidewalk grades with the AE prior to concrete placement to verify that positive drainage will be provided. Contractor shall provide minor adjustment of sidewalk grades as requested by the AE to provide positive drainage. Minor adjustments of up to 3" +/- in elevation shall be considered incidental. Contractor shall be responsible for remedial actions required to provide positive drainage for all areas identified following placement of surface materials where this requirement has not been met.

CONCRETE PAVEMENT

Construct concrete pavement (roads, driveways, parking areas) per WisDOT SSHSC, Subsection 415.3. WisDOT SSHSC, Subsection 415.3 supersedes Part 3 of Section 03 30 10 if a discrepancy arises.

COLD WEATHER PLACING

Protect concrete work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures, in compliance with ACI 306R and as specified below.

1. When air temperature falls to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 60 deg F (50 deg F for heavy sections) and not more than 90 deg F at point of delivery.

- Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Verify forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow and ice before placing concrete.
- During seasons when atmospheric temperatures may be expected to drop below 40 deg F, concrete shall be protected by covering with impermeable paper and not less than 12 in. of loose dry hay or straw or thick insulating blankets. Retain covering for ten days.

HOT WEATHER PLACING

When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305R and as specified below.

- Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated in total amount of mixing water.
- Cover reinforcing steel with water-soaked burlap if it becomes too hot to prevent steel temperature from exceeding the ambient air temperature immediately before embedment in concrete.
- Spray forms, reinforcing steel, and subgrade just before concrete is placed.
- Do not use set-control admixtures, unless approved by A/E.

DECTECTABLE WARNING PLATE INSTALLATION

Locate detectable warning plates where indicated on the Drawings. Embed detectable warning plate arrays in plastic concrete conforming to manufacturer-recommended procedures. Do not install on hardened concrete. Do not field cut plates except where ends of radial arrays abut ramp edges. Smooth edges of field cuts. Edges of warning plate shall fit surrounding concrete with no variation in height at edges. Completed warning plates shall be free of concrete, curing compound, and other foreign materials. Clean warning plate as required.

CURING

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Cure formed and unformed concrete for seven days or until 75 percent of the required 28-day compressive strength is obtained, whichever is less.

For standard gray concrete, methods may include plastic sheets, constant wetting of surface with water, curing paper, or commercial curing compound. Apply curing compound at not less than 200 sq ft per gal in accordance with manufacturer's recommendations.

REPAIR AND PROTECTION

Analyze and repair defects or deficiencies per Section 424 of the WisDOT CMM. Repair or replace broken or defective concrete. Remove surface stains.

Exclude traffic from concrete until the specified curing period is complete (generally 7 days). Protect concrete from damage until Substantial Completion.

Prior to final inspection, sweep concrete and wash free of stains, dirt, and other foreign materials.

FIELD QUALITY CONTROL

Provide testing as described in Quality Assurance and Testing sections above.

Concrete Delivery Tickets: For each load delivered, collect and submit three copies of delivery tickets that include the reporting requirement of ASTM C94/C94M and include additional information as specified. Record jobsite addition of water or admixtures with a signature of person requiring the adjustment.

Compressive Strength Specimens: ASTM C31/C31M:

For strength specimens to be standard cured for acceptance of concrete, cast a set of cylinders and cure specimens at the jobsite in accordance with ASTM C31/C31M. Cast at least two specimens for each age that strength will be tested for information and additional reserve specimens as needed. Strength test results at the designated age shall be the average of two 6 × 12-in. or three 4 × 8-in. specimens.

If required, cast additional sets of cylinders for field-curing in accordance with ASTM C31/C31M

Transport specimens to the lab within 48 hours after casting and cure them in accordance with final curing requirements of ASTM C31/C31M until tested.

Compressive-Strength Tests: ASTM C39/C39M.

Test specimens for compressive strength at 7 days or at an alternative early age as required and one set at 28 days or at an alternate test age as designated for specified strength.
Acceptance of concrete shall be based on strength test results of standard cured cylinders in accordance with ASTM C31 and tested at 28 days in accordance with ASTM C39. Strength test results at the designated age shall be the average of two 6 × 12 inch or three 4 × 8 inch specimens.

When strength cylinders are made, tests of slump, air content, temperature and density shall be made and recorded with the strength test results.

Strength of each concrete class shall be deemed satisfactory when both of the following criteria are met:

The average of three consecutive compressive-strength tests equals or exceeds specified compressive strength.

Any individual compressive-strength test result does not fall below specified compressive strength, $f'c$:

by more than 500 psi when $f'c \leq 5000$ psi

by more than $0.1f'c$ when $f'c > 5000$ psi

When compressive strength tests fail to meet the provisions of (d), follow procedure in ACI 301 for evaluation of concrete strength tests.

When it is deemed necessary to evaluate the adequacy of concrete strength, at least 3 cores shall be obtained from the portion of the structure represented by the low strength tests. Cores shall be removed and conditioned in accordance with ASTM C42. The strength of cores shall comply with the following:

Average strength of 3 cores $\geq 0.85f'c$

Individual core strength $\geq 0.75f'c$

A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

Additional Tests:

Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents. Concrete loads that do not meet the on-site field test criteria will be rejected.

END OF SECTION

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SECTION 07 84 00
FIRE STOPPING

BASED ON DFD MASTER SPECIFICATION DATED 12/01/14

PART 1 - GENERAL

SCOPE

The work under this section includes all labor, material, equipment and related services necessary to provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire or smoke rated construction in accordance to the Building Code. The fire stopping systems shall maintain an effective barrier against the spread of flame, smoke, and/or hot gases through penetrations, blank openings and construction joints in fire or smoke rated construction, or at perimeter fire containment in or adjacent to fire-rated barriers.

RELATED WORK

Applicable provisions of Division 1 shall govern work under this Section. Contractor shall consult these provisions in detail prior to proceeding with work.

- Section 21 05 00 “Common Work Results for Fire-Suppression”
- Section 22 05 00 “Common Work Results for Plumbing”
- Section 23 05 00 “Common Work Results for HVAC”
- Section 26 05 00 “Common Work Results for Electrical”

REFERENCES STANDARDS

- ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials.
- ASTM E 119 Test Method for Fire Tests of Building Construction and Materials.
- ASTM E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F.
- ASTM E 814 Fire Tests of Through-Penetration Fire Stops.

ASTM E 1399 Cyclic Movement and Measuring Minimum and Maximum Joint Widths.
ASTM E 1966 Test Method for Resistance of Building Joint.
ASTM E 2174 Standard Practice for On-Site Inspection of Installed Fire Stops.
ASTM E 2393 Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems.
ASTM E 2307 Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA).
ASTM G 21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

NFPA 70 National Electric Code.
NFPA 101 Life Safety Code.
NFPA 221 Standard for High Challenge Firewalls, Firewalls, and Fire Barriers Walls
NFPA 251 Tests of Fire Resistance of Building Construction and Materials.

UL 263 Fire Tests of Building Construction and Materials.
UL 555 Fire Dampers.
UL 723 Surface Burning Characteristics of Building Materials.
UL 1479 Fire-Tests of Through-Penetration Fire Stops.
UL 2079 Tests for Fire Resistance of Building Joint Systems.

International Firestop Council Guideline for Evaluating Firestop System Engineering Judgments.

SYSTEM PERFORMANCE REQUIREMENTS

Fire or Smoke Rated Construction Requirements: Maintain barrier containment and structural floor fire resistance ratings including resistance to smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and at other fire or smoke rated construction gaps. Provide fire stopping systems that resist the spread of fire and the passage of smoke and other gases according to the requirements indicated, including but not limited to the following:

Penetrations:

Firestop all penetrations passing through fire resistance rated construction or smoke barriers. Provide and install complete penetration fire stopping systems that have been tested and approved by a third party testing agency.

F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F Flame spread ratings indicated, as determined per ASTM E 814, but not less than one hour or the fire-resistance rating of the construction being penetrated.

T - Rated Through-Penetration Firestop Systems: Provide firestop systems with T Thermal Transmission ratings, in addition to F ratings, as determined per ASTM E 814, where required by code and as otherwise indicated.

L – Rated Through-Penetration Firestop Systems: Provide firestop systems with L Air Leakage ratings, in addition to F and T ratings, as determined per UL 1479, where required by code and as otherwise indicated.

W – Rated Through-Penetration Firestop Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, as determined per UL 1479, where indicated.

Penetration Fire stopping Assembly: Assemblies are specified generally under UL system categories by penetrating item. Manufacturers' product applications shall have specific UL system designations.

UL Through Penetration Classifications

	Fire Stopping System	Construction Penetrated	Type of Construction	System Identification
1	No Penetrating Items	F, W, C	A, B, J, K, L	0001-0999
2	Metallic Pipes, Conduit or Tubing	F, W, C	A, B, J, K, L	1001-1999
3	Nonmetallic Pipe, Conduit or Tubing	F, W, C	A, B, J, K, L	2001-3999
4	Electric Cables	F, W, C	A, B, J, K, L	4001-4999
5	Cable, Trays with Electric Cables:	F, W, C	A, B, J, K, L	5001-5999
6	Insulated Pipes	F, W, C	A, B, J, K, L	6001-6999
7	Electrical Bus duct Penetrations	F, W, C	A, B, J, K, L	7001-7999
8	Mechanical Ductwork Penetrations:	F, W, C	A, B, J, K, L	8001-8999
9	Multiple Penetrations Through Common Openings	F, W, C	A, B, J, K, L	9001-9999

***F** = Floor* — ***A** = concrete floors 5" or less*
***W** = Wall* — ***B** = concrete floors greater than 5"*
***C** = Floor or Wall* — ***J** = concrete or masonry walls 8" or less*
***K** = concrete or masonry walls greater than 9"*
***L** = framed wall*

Joints and Perimeter Systems:

Firestop all connections with other surfaces or types of construction, at separations required to permit building movement and at other fire rated or smoke barrier construction gaps.

Provide and install complete fire stopping systems that have been tested and approved by a third party testing agency.

Provide fire-resistive joint systems with fire and smoke resistance ratings indicated and as determined per ASTM E 1966 or UL 2079, but not less than the fire or smoke resistance rating of the construction in which the joint occurs.

Provide perimeter fire barrier systems with fire and smoke resistance ratings indicated and as determined per ASTM E 2307, but not less than the fire or smoke resistance rating of the floor construction.

UL Joint & Curtainwall Classifications

System Type:	Movement Capability	Joint Width
Floor to Floor (FF):	S, D	0000-0999
Wall to Wall (WW):	S, D	0000-0999
Floor to Wall (FW):	S, D	0000-0999
Head of Wall (HW):	S, D	0000-0999
Floor to Wall (FW):	S, D	0000-0999
Curtain Wall (CW*)	S, D	0000-0999

***S** = Static* — *0000-0999 = less than or equal to 2"*
***D** = Dynamic* — *1000-1999 = greater than 2", less than or equal to 6"*
2000-2999 = greater than 6", less than or equal to 12"
3000-3999 = greater than 12", less than or equal to 24"
4000-4999 = greater than 24"

*Note: If **Intertek Curtain Wall** Classification system is used, nomenclature will be* **CEJ** *or* **HI/BP**

Smoke Partition Penetrations and Joints: Fully seal penetrations and joints to prevent the passage of smoke.

Provide products that upon curing do not re-emulsify, dissolve, break down or deteriorate from exposure to atmospheric moisture or moisture characteristic to construction.

SUBMITTALS

The following information shall be included on all submitted documents:

Building Name and DFD Project Number taken from bidding documents.

Submit Manufacturers Product Data Sheets and material safety data sheets (MSDS) for each type of product selected.

Where there is no specific third party tested and listed, classified firestop system available for a particular firestop configuration, the contractor shall obtain from the firestop manufacturer, an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal following the "Recommended International Firestop Council Guidelines for Evaluating Firestop Systems in Engineering Judgments".

Submit the following:

Firestopping schedule. Listing agency approved installation detail for each type of penetration treatment with drawing reference of where each is used (type of penetration).

Certification that Firestop Material is asbestos free and complies with local regulations.

Certification by fire stopping manufacturer that products supplied comply with specified requirements for volatile organic compounds (VOC's) and are nontoxic to building occupants.

Contractor qualifications as noted in "Quality Assurance" article, including certification of manufacturer's training.

Product Data for Credit IEQ 4.1: For fire stopping sealants and sealant primers, documentation including printed statement of VOC content.

QUALITY ASSURANCE

Provide Fire-resistive System Listing by a testing and inspection agency in accordance with the appropriate ASTM Standard(s) listed. A qualified testing and inspection agency may be UL, FM Research, Intertek Testing Services, Omega Point Laboratories (OPL) or another agency performing testing and follow-up inspection services for fire-resistive system materials that is acceptable to the authority having jurisdiction.

Contractor Qualifications: Acceptable installer firms shall be:

A firm experienced in installing fire stopping systems similar in material, design, and scope to that indicated for this Project, and who has a record of completing past projects. Qualifications include having three years of fire stopping installation experience, staff, and training to install manufacturer's products per specified requirements. Provide statement from manufacturer certifying contractor's staff has successfully completed manufacturer's training on installation requirements of fire stopping systems that will be used on this Project.

Single Source Responsibility:

Materials made by different manufacturers shall not be intermixed in the same opening.

Tested and listed, classified fire-resistive systems are to be used.

If another manufacturer has a tested and listed system, then that system shall be considered before an Equivalent Fire Resistance Rated Assembly (EFRRA) is considered.

Field Constructed Mockup: Prior to installing fire-resistive systems, erect mockups for each different fire-resistive system indicated to verify product selections and to demonstrate qualities of materials and execution:

Provide mockups complying with the following requirements, using materials indicated for final installations, for the following applications:

Provide mock-up in conjunction with other required mock-ups where fire stopping assemblies will be part of the construction.
Locate mockups on site in locations indicated or, if not indicated, as directed by Architect. Include mockup for each type of system.
Notify Architect in advance of the dates and times when mockups will be installed.
Obtain DFD acceptance of mockups before start of Work.
Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work. Accepted mockups in an undisturbed condition at time of Substantial Completion may become part of completed unit of Work.

DELIVERY, STORAGE, AND HANDLING

Deliver fire stopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer.

Store and handle fire-resistive materials in accordance with manufacturer’s written instructions.

PROJECT CONDITIONS

Environmental Conditions: Install fire-resistive system in accordance with manufacturer’s written instructions.

Ventilation: Ventilate per manufacturers' instructions or Material Safety Data Sheet (MSDS).

PREINSTALLATION COORDINATION

A firestopping specific preinstallation coordination meeting shall be conducted prior to installing any construction affected by or penetrated by firestopping. This meeting shall include the General Prime Contractor and all contractors installing firestopping, as well as DFD. Each type of firestopping shall be discussed, identifying the penetrating component, the building component or system being penetrated, the firestopping system to be utilized and the contractor responsible to install the firestopping. All firestopping submittals should be consistent with the conclusions of this meeting.

PART 2 - PRODUCTS

Where specific manufacturers are named, products by other manufacturers may be considered equal in accordance with the provisions of Article 17 of the General Conditions.

MANUFACTURERS

Systems listed by approved testing agencies may be used providing they conform to the construction type, penetrant type, annular space requirements, and fire rating required for each separate instance.

Manufacturers of fire stopping shall have been successfully producing and supplying these products for a period of not less than 3 years, and shall be able to show evidence of at least 10 projects where similar products have been installed and accepted.

Subject to compliance with requirements, provide products by one of the following manufacturers:
3M Fire Protection Products.
HILTI, Inc.
ProSet Systems, Inc.
Specified Technologies, Inc.
Tremco Construction Division.

PENETRATION FIRE STOPPING

Penetrations in Fire-Resistance-Rated Walls: Provide penetration fire stopping with the following ratings determined per ASTM E 814 or UL 1479:

Fire-resistance-rated walls include fire walls and fire-barrier walls.

F-Rating: Not less than the fire-resistance rating of constructions penetrated.

Penetrations in Horizontal Assemblies: Provide penetration fire stopping with the following ratings determined per ASTM E 814 or UL 1479:

Horizontal assemblies include floor assemblies, floor/ceiling assemblies, roof/ceiling assemblies and roof assemblies.

F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall or shaft enclosure above the floor or below the floor.

Penetrations in Smoke Barriers: Provide penetration fire stopping with the following ratings determined per UL 1479 with required "L" rating:

L-Rating: Air leakage rate of the penetration assemblies measured at .30 inches of water column in both the ambient temperature and elevated temperature tests shall not exceed 5.0 cfm/square foot of penetration opening for each through penetration fire stop system or a total cumulative leakage of 50 cfm for any 100 sf of wall or floor area.

Penetrations in Smoke Partitions:

Seal penetrations with mildew resistant water based latex smoke and acoustic sealant with flame-spread smoke-developed rating of less than 25 as tested in accordance with ASTM E84.

Penetrations with Insulated Piping or Ductwork:

Provide penetration fire stop systems designed for continuous insulation except when penetrating piping is constructed of plastic which shall penetrate fire stop without insulation.

Penetrations in Floors with Annular Spaces Exceeding 4" and Exposed to Loading and Traffic:

Provide approved means of supporting floor loads and protecting firestop systems.

Penetrations for Telecom Equipment Rooms or Where Cable Tray is Discontinuous:

Provide a manufactured re-enterable system that features a built-in fire and smoke sealing system that allows cables to be added or removed without the need to remove or reinstall fire stopping materials. Examples of such systems are the STI EZ Path and HILTI Speed Sleeve.

Penetrations for All Other Communication Cabling Applications 2" Diameter and Larger:

Provide a system that utilizes removable and reusable fire stop material. Examples of such systems are the 3M Pass-Through Device, STI FP fire stop plug and HILTI CFS-PL fire stop plug.

Penetrations Designed for Future Penetrants:

Provide removable non-sealant fire stop for spare penetrations.

Flame Spread and Smoke Developed Ratings:

Provide products with flame-spread and smoke-developed indexes of 25 and 450 or less, respectively, or 25 and 50 or less in air plenums, as determined per ASTM E 84.

VOC Content: Penetration fire stopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

Sealants: 250 g/L.

Sealant Primers for Nonporous Substrates: 250 g/L.

Sealant Primers for Porous Substrates: 775 g/L.

Accessories:

Provide components for each penetration fire stopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration fire stopping manufacturer and approved by qualified testing and inspecting agency for fire stopping indicated.

Refer to Section 21 05 00 “Common Work Results for Fire-Suppression”, Section 22 05 00 “Common Work Results for Plumbing”, Section 23 05 00 “Common Work Results for HVAC” and Section 26 05 00 “Common Work Results for Electrical” for sleeves and openings and for additional requirements at penetrations.

FIRE-RESISTIVE JOINT FIRE STOPPING

Where required, provide fire-resistive joint fire stopping that is produced and installed to resist spread of fire according to code and requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint stopping is installed. Fire-resistive joint fire stopping shall accommodate building movements without impairing its ability to resist the passage of fire and hot gases.

Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with the following ratings determined per ASTM E 1966 or UL 2079:

Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.

Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.

Joints at Exterior Curtain Wall/Floor Intersections and Perimeter Fire Barriers: Provide fire-resistive joint systems and perimeter fire barrier systems with the following rating determined by ASTM E 2307.

Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

Joints in Smoke Barriers:

Fire-resistive Rated Construction: Provide fire-resistive joint systems with the following ratings determined per UL 2079 with required “L” rating.

L-Rating: Not exceeding 5.0 cfm/ft (0.00775 cu. m/s x m) of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.

Joints in Smoke Partitions:

Seal joints with mildew resistant water based latex smoke and acoustic sealant with flame-spread smoke-developed rating of less than 25 as tested in accordance with ASTM E84.

Flame Spread and Smoke Developed Ratings:

Provide products with flame-spread and smoke-developed indexes of 25 and 450 or less, respectively, or 25 and 50 or less in air plenums, as determined per ASTM E 84.

VOC Content: Fire-resistive joint system and perimeter fire barrier sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

Architectural Sealants: 250 g/L.

Sealant Primers for Nonporous Substrates: 250 g/L.

Sealant Primers for Porous Substrates: 775 g/L.

Accessories:

Provide components of fire-resistive joint systems and perimeter fire barrier systems, including primers and forming materials, which are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

APPLICATION

Fire stopping systems shall be used in applications approved by the manufacturer and in locations including, but not limited to, the following where required by code and as otherwise indicated:

Penetrations through fire-resistance-rated floor assemblies, floor/ceiling assemblies, roof/ceiling assemblies and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.

Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.

Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.

Joints in fire-resistance-rated assemblies to allow independent movement.

Perimeter joints between fire-resistance-rated floor assemblies, floor/ceiling assemblies, roof/ceiling assemblies or roofs and exterior wall assemblies.

Joints, through penetrations, and membrane penetrations in Smoke Barriers and Smoke Partitions.

EXAMINATION

Examine substrates and conditions, with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of fire-resistive system. Notify the Project Representative of any unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

PREPARATION

Cleaning and Preparation: Clean and prepare surfaces as recommended by system manufacturer.

Verify system components are clean, dry, and ready for installation.

Verify field dimensions are as shown on the Drawings, are as tested and listed for classified systems, and meet manufacturer requirements and recommendations.

PENETRATION FIRE STOPPING

Comply with the "System Performance Requirements" listed in Part 1 and with the manufacturer's installation instructions and drawings pertaining to products and applications indicated. Protect fire stopping systems, including those raised 2” above surrounding floor, from damage due to construction activities.

SMOKE BARRIERS AND SMOKE PARTITIONS

Comply with the "System Performance Requirements" listed in Part 1 and with the manufacturer's installation instructions and drawings pertaining to products and applications indicated.

FIRE-RESISTIVE JOINT FIRE STOPPING

Comply with the "System Performance Requirements" listed in Part 1 and with the manufacturer's installation instructions and drawings pertaining to products and applications indicated.

Install tested and listed classified systems that result in fire-resistive joint and perimeter fire barrier materials:

- Directly contacting and fully wetting joint substrates.
- Completely filling recesses provided for each joint configuration,
- Providing uniform, cross-sectional shapes and depths relative to joint width that optimize movement capability and meet tested and listed system requirements.

Tool non-sag materials immediately after their application and prior to the time skinning begins. Form smooth, uniform beads of configuration indicated or required to:

- Produce fire-resistance rating
- To eliminate air pockets
- To ensure contact and adhesion with sides of joint.

FIELD QUALITY CONTROL

Inspection: Independent inspection agency may be employed and paid by Owner to examine and photograph fire stopping.

Where deficiencies are found or fire stopping systems are damaged or removed because of testing, repair or replace fire stopping to comply with requirements.

Proceed with enclosing fire stopping with other construction only after inspection reports are issued and installations comply with requirements.

IDENTIFICATION

Identify fire stopping with preprinted labels. Attach labels permanently to surfaces adjacent to and within 6 inches (152 mm) of fire stopping edge so labels will be visible to anyone seeking to remove penetrating items or fire stopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

- "FIRESTOPPED PENETRATION"
- Installed Product
- UL System Number
- Date of Installation
- Installing Contractor and Phone Number

Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling which include the hourly rating. Such identification shall:

- Be located in accessible concealed floor, floor-ceiling or attic spaces;
- Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
- Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in a contrasting color incorporating the wording.
- "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS, _ HOURLY RATING"

CLEANING

Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of fire stopping products and or assemblies in which openings and joints occur.

END OF SECTION

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SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL
BASED ON DFD MASTER ELECTRICAL SPEC DATED 12/26/23

PART 1 – GENERAL

The electrical work included in all other divisions is the responsibility of the contractor performing the division 26 work unless noted otherwise.

PROJECT OVERVIEW
Work included under this contract shall provide all materials, equipment, and work to construct a complete and operable exterior lighting system as shown herein and in the drawings. Work will include but is not limited to the following:

- Construct in compliance with these specifications.
- Provide 208V-single phase circuit breaker from existing switchboard located in the basement mechanical room.
- Provide new lighting control panel connected into existing exterior lighting control system.
- Provide site wiring, conduit, and pole mounted luminaires as shown in the drawings. Wiring methods shall comply with these specifications.
- Connect all new luminaires as identified herein and on the drawings.
- Install and assemble pole mounted luminaires.
- Connect and install all proposed equipment and fixtures required to provide a complete and operable system as shown in these documents.
- Refer to drawings and schedules.

SCOPE
The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:

PART 1 - GENERAL
- Project Overview
- Scope
- Related Work
- Reference Standards
- Regulatory Requirements
- Quality Assurance
- Continuity of Existing Services and Systems
- Protection of Finished Surfaces
- Approved Electrical Testing Laboratories
- Sleeves and Openings
- Sealing and Fire Stopping
- State and/or User Agency Furnished Equipment
- Work by State and/or User Agency
- Provisions for Future Work
- Intent
- Omissions
- Submittals
- Project/Site Conditions
- Work Sequence and Scheduling
- Work by Other Trades
- Offsite Storage
- Salvage Materials
- Certificates and Inspections
- Operating and Maintenance Data
- Record Drawings

PART 2 - PRODUCTS
- Access Panels and Doors
- Identification
- Sealing and Fire Stopping

PART 3 - EXECUTION

Excavation and Backfill
Concrete Work
Cutting and Patching
Building Access
Equipment Access
Coordination
Sleeves and Openings
Sealing and Fire Stopping
Housekeeping and Clean Up
Agency Training

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories, Inc.
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
ISA	Instrument Society of America
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
UL	Underwriters Laboratories Inc.
DSPS	Wisconsin Department of Safety and Professional Services
UFC	Unified Facilities Criteria (UFC 3-530-01) Interior and Exterior Lighting Systems

REGULATORY REQUIREMENTS

All work and materials are to conform in every detail to applicable rules and requirements of the Wisconsin State Electrical Code (SPS 316), the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

All Division 26 work shall be done under the direction of a currently licensed State of Wisconsin Master Electrician.

All Division 26 work shall comply with SPS 101.862 and SPS 305.40 for electrical wiring integral with pre-manufactured structures.

QUALITY ASSURANCE

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space, and for obtaining the performance from the system into which these items are placed.

Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

All materials, shall be listed by and shall bear the label of an approved Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupational Safety and Health Administration (OSHA), per the OSHA Nationally Recognized Testing Laboratory Program. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by DFD, shall apply and such items shall bear those

labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, shall be so labeled.

CONTINUITY OF EXISTING SERVICES AND SYSTEMS

No outages shall be permitted on existing systems except at the time and during the interval specified by the user agency and by the DFD Project Representative. The institution may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.

This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven-day week schedule.

The Contractor shall coordinate any interruption electrical circuits affected by the work with the Building Staff, DFD, and A/E. Any interruptions should be planned, submitted, and approved a minimum of 5 business days ahead of the shut down date. Shutdowns shall not occur during adverse weather, on Mondays, on Fridays, on weekends, holidays, and days when staff is not available.

PROTECTION OF FINISHED SURFACES

Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

APPROVED ELECTRICAL TESTING LABORATORIES

The following laboratories are approved for providing electrical product safety testing, listing and labeling services as required in these specifications:

A Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupational Safety and Health Administration (OSHA), per the OSHA Nationally Recognized Testing Laboratory Program.

SLEEVES AND OPENINGS

Refer to Division 1, General Requirements, Sleeves and Openings.

SEALING AND FIRE STOPPING

Sealing and fire stopping of sleeves/openings between conduits, cable trays, wireways, troughs, cablebus, busduct, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening..

STATE AND/OR USER AGENCY FURNISHED EQUIPMENT

None anticipated at this time.

WORK BY STATE AND/OR USER AGENCY

None anticipated at this time.

PROVISIONS FOR FUTURE WORK

None anticipated at this time.

INTENT

The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the DFD's intent (as determined by the DFD Project Manager). Refer to the General Conditions of the Contract for further clarification.

It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.

All sizes as given are minimum except as noted.

Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the DFD's and/or A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.

Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

OMISSIONS

No later than ten (10) days before bid opening, the Contractor shall call the attention of the DFD to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

SUBMITTALS

Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.

On request from the DFD, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.

Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

The submittals must be approved before fabrication is authorized.

Submit sufficient quantities of submittals to allow the following distribution:

Operating and Maintenance Manuals	2 copies
User agency	1 copy
A/E	1 copy
DFD Field Office	1 copy

PROJECT/SITE CONDITIONS

Install Work in locations shown on drawings, unless prevented by project conditions.

Tools, materials and equipment shall be confined to areas designated by the DFD and user agency.

WORK SEQUENCE AND SCHEDULING

Install work in phases to accommodate user agency's occupancy requirements. During the construction period coordinate electrical schedule and operations with DFD's Construction Representative.

WORK BY OTHER TRADES

Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.

Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

OFFSITE STORAGE

Prior approval by DFD and the A/E will be needed. The contractor shall submit Storage Agreement Form DOA-4528 to DFD for consideration of off-site materials storage. In general, building wire, conduit, fittings and similar rough-in material will not be accepted for off-site storage. No material will be accepted for off-site storage unless shop drawings for the material have been approved.

SALVAGE MATERIALS

No materials removed from this project shall be reused unless specifically noted otherwise. All materials removed shall become the property of and shall be disposed of by the Contractor.

CERTIFICATES AND INSPECTIONS
Obtain and pay for all required installation inspections, except those provided by the DFD, in accordance with the Wisconsin Administrative Code. Deliver originals of these certificates to the DFD's Project Representative.

The Electrical Contractor is responsible for coordination of DFD electrical inspections. Prior to the start of significant on-site electrical work, the contractor shall schedule a pre-installation meeting with the DFD Electrical Inspector to discuss the inspection requirements and review the contract requirements (also see Article 15 of the General Conditions). The Electrical Contractor shall be present when the DFD Electrical Inspector conducts the electrical inspections.

OPERATION AND MAINTENANCE DATA
All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

RECORD DRAWINGS
The Contractor shall maintain at least one copy each of the specifications and drawings on the job site at all times.

The DFD will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.

At completion of the project, the Contractor shall submit the marked-up record drawings to the Architect/Engineer prior to final payment.

PART 2 – PRODUCTS

IDENTIFICATION
See Electrical section 26 05 53 – Identification for Electrical Systems.

SEALING AND FIRE STOPPING
NON-RATED PENETRATIONS:

Conduit Penetrations Below Grade:
In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or water-stop type wall sleeve.

Conduit and Cable Tray Penetrations Above Grade:
At through-wall conduit and cable tray penetrations of non-rated interior and exterior walls, and floors, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 – EXECUTION

EXCAVATION AND BACKFILL
Perform all excavation and backfill work to accomplish indicated electrical systems installation unless noted otherwise.

CONCRETE WORK
The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

CUTTING AND PATCHING
Refer to Division 1, General Requirements, Cutting and Patching.
BUILDING ACCESS

Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

EQUIPMENT ACCESS

Install all piping, conduit, and accessories to permit access to equipment for maintenance.

COORDINATION

The Contractor shall cooperate with other trades and DFD in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the DFD, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc.

Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required. Coordinate the available fault current- equipment including control panels and internal components shall be rated to interrupt the available fault current.

SLEEVES AND OPENINGS

Conduit penetrations in existing concrete floors: Core drill openings.

SEALING AND FIRE STOPPING

NON-RATED PENETRATIONS:

In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.

At all interior and exterior walls, through-wall conduit penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve or cored opening and the conduit is completely blocked.

PENETRATIONS SUBJECT TO WATER INTRUSION:

For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:

- Conduit penetration where steel pipe sleeve is used extend steel sleeve 2” above the floor.
- Conduit penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2” above the floor (provided it meets the device’s UL listing).
- Conduit penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2”x 2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8”on center. Seal corners water tight with urethane caulk.

Floors subject to water intrusion or rooms housing electrical equipment include the following locations:

- Mechanical/Plumbing Equipment Rooms
- Maintenance/Industrial Shops
- Electrical Equipment Rooms

HOUSEKEEPING AND CLEAN UP

The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

AGENCY TRAINING

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 1 hours.

END OF SECTION

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SECTION 26 05 02
ELECTRICAL DEMOLITION FOR REMODELING
BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/21

PART 1 - GENERAL

SCOPE
The work under this section includes the following topics:
Demolition of existing site lighting control equipment (timeclock, enclosed contactors, and conduit).

PART 1 - GENERAL
Scope
Related Work
PART 2 - PRODUCTS
Materials and Equipment
PART 3 - EXECUTION
Examination
Preparation
Demolition and Extension of the Existing Electrical Work

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

PART 2 – PRODUCTS

MATERIALS AND EQUIPMENT
Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 – EXECUTION

EXAMINATION
Verify field measurements and circuiting arrangements as shown on Drawings.

Verify that abandoned wiring and equipment serve only abandoned facilities.

Demolition Drawings are based on casual field observation and/or existing record documents. Report discrepancies to the User Agency, Architect/Engineer and DFD Field Representative before disturbing existing installation.

Beginning of demolition means installer accepts existing conditions.

PREPARATION
Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

Coordinate utility service outages with the User Agency, DFD Field Representative, and Architect/Engineer. Also, if applicable, coordinate utility service outages with the local Utility Company.

Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations and follow the safe working practice requirements of NFPA 70E.

Existing Site Lighting System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from the User Agency and DFD Field Representative at least 72 hours before partially or completely disabling system. Minimize outage duration. If required, make temporary connections to maintain service in areas adjacent to work area.

DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

Remove, relocate, and extend existing installations as necessary, to accommodate new construction and to meet all requirements of these specifications. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

Remove abandoned wiring to source of supply.
Remove exposed abandoned conduit and abandoned conduit above accessible ceiling finishes, unless noted otherwise on drawings. Cut conduit flush with walls and floors, and patch surfaces. If certain conduits and boxes are abandoned but not scheduled for removal, they shall be shown on the "As Built Drawings".

Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

Disconnect and remove existing site lighting time clock, and enclosed contactors. Salvage wiring and reroute to new lighting control panel.

Provide revised typed circuit directory in panelboards that have circuits removed.

Repair adjacent construction and finishes damaged during demolition and extension work.

Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

Provide supplemental support for conduits that are routed through demolition area, and are to remain. Supplemental support shall be added so that the conduit meets the support requirements of electrical specification section 26 05 33.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
BASED ON DFD MASTER ELECTRICAL SPEC DATED 12/22/21

PART 1 – GENERAL

SCOPE
The work under this section includes furnishing and installing required wiring and cabling systems including pulling, terminating and splicing. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals
- Project Conditions

PART 2 - PRODUCTS
- General
- Building Wire
- Aboveground Wire for Exterior Work
- Underground Wire for Exterior Work
- Wiring Connectors

PART 3 - EXECUTION
- General Wiring Methods
- Wiring Installation in Raceways
- Wiring Connections and Terminations
- Field Quality Control
- Wire Color
- Branch Circuits
- Emergency Circuits
- Construction Verification Items

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Section 26 05 33 – Raceway and Boxes for Electrical Systems.
Section 26 05 53 – Identification for Electrical Systems.
Section 26 08 00 - Commissioning of Electrical.
Section 01 91 01 or 01 91 02 – Commissioning Process

REFERENCES
SPS 316- Electrical

SUBMITTALS
Submit product data: Provide for each cable assembly type.

Submit factory test reports: Indicate procedures and values obtained.

Submit shop drawings for modular wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.

Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

PROJECT CONDITIONS
Verify that field measurements are as shown on Drawings.

Conductor sizes are based on copper.

Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required for project conditions.
Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 - PRODUCTS

GENERAL

All wire shall be new, delivered to the site in unbroken cartons and shall be less than one year old out of manufacturer's stock.

All conductors shall be copper. Aluminum conductors size #1/0 and larger may be substituted for copper and used for phase and neutral conductors for transformer feeders, switchboard feeders, and panelboard feeders. All ground conductors shall be copper.

Aluminum conductors shall not be used for serving individual motors, chillers, VFD's and motor controllers.

The following requirements shall be met when aluminum conductors are used:

Aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).

It is the responsibility of the contractor to increase the size of the conduit, wire gutter, or enclosure, if necessary, to accommodate the aluminum conductors and meet allowable code requirements.

It is the responsibility of the contractor to increase the size of the aluminum conductor and associated termination lugs to match the ampacity of the copper conductor circuit shown on the Drawings.

The contractor shall submit a feeder schedule to the Engineer for all conductor substitutions indicating the aluminum conductor wire size and the conduit size. The contractor shall not begin the installation until written approval is granted by the Engineer.

All aluminum conductors shall terminate on a mechanical screw-type connector or mechanical compression-type connector. Connector shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors, and sized to accept aluminum conductors of the required ampacity. When using compression-type connectors, the lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably color-coded. Using a suitable stripping tool, remove insulation from the required length of the conductor. Wire brush the conductor and apply a Listed joint compound. Tighten or crimp the connection per the connector manufacturer's recommendation. Wipe off any excess joint compound.

When terminating aluminum conductors to aluminum bus, prepare a mechanical screw-type or compression-type connection. Bolts shall be anodized alloy and conform to current ANSI and ASTM chemical and mechanical property limits. Nuts shall be aluminum alloy and conform to current ANSI standards. Washers shall be flat aluminum alloy, Type A plain, standard wide series conforming to current ANSI standards. Lubricate and tighten the hardware per manufacturer's recommendations.

When terminating aluminum conductors to copper bus, prepare a mechanical screw-type or compression-type connection. Bolts shall be plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to current ASTM standard or SAE grade 5. Nuts shall conform to current ANSI standards. Washers shall be steel, Type A plain, standard wide series conforming to current ANSI standards. Belleville conical spring washers shall be of hardened steel, cadmium plated or silicone bronze. Lubricate and tighten the hardware per manufacturer's recommendations.

The final tightening torque shall be recorded for all aluminum conductor mechanical screw-type connections and provided in report form, in the completed O&M manuals.

The contractor shall perform an infrared survey of all aluminum conductor connections after the installation is complete and in normal service. Infrared surveys shall be performed during periods of maximum possible loading with at least 30% of rated load of the equipment being inspected. All connections with elevated temperatures shall be corrected by the contractor. The infrared survey results shall be provided in report form, in the completed O&M manuals.

No copper-to-aluminum transitions permitted when splicing onto existing copper feeders.

Insulation shall have a 600 volt rating.

All conductors shall be stranded.

Stranded conductors may only be terminated with UL OR ETL Listed type terminations or methods: e.g. stranded conductors may not be wrapped around a terminal screw but must be terminated with a crimp type device or must be terminated in an approved back wired method.

BUILDING WIRE
Description: Single conductor insulated wire 90 degree C.

Insulation: Type THHN/THWN-2, XHHW-2 insulation.

ABOVEGROUND WIRE FOR EXTERIOR WORK
Description: Single conductor insulated wire, 90 degree C.

Insulation: Type XHHW-2 insulation.

UNDERGROUND WIRE FOR EXTERIOR WORK
Description: Stranded single or multiple conductor insulated wire, 90 degree C.

Insulation: Type USE-2, XHHW-2, RHW-2 insulation.

This wiring shall be used in all underground feeder and branch circuit applications, except THHN/THWN-2 is permitted when run in a concrete-encased ductbank.

WIRING CONNECTORS
Split Bolt Connectors: Not acceptable.

Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment terminals. Not approved for splicing.

Twist Type Wire Connectors: Solderless twist type spring connector (wire-nut) with insulating cover for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller. The manufacturer's wire fill capacity must be followed. Use Silicone filled twist type spring connectors in all wet location areas.

Mechanical Spring Actuation Connectors: Toolless type spring actuation connector (push-in) with spacers for copper wire splices and taps. Use for conductor sizes 12 AWG and smaller. The manufacturer's wire fill capacity must be followed. Use in interior, dry locations only.

All wire connectors used in underground or exterior pull boxes or hand holes shall be gel filled twist connectors or a connector designed for damp and wet locations. Gel filled twist type connectors can be used for copper conductor sizes 6 AWG and smaller for site lighting applications. The manufacturer's wire fill capacity must be followed.

Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps. Connector must be installed with a crimper tool listed for use with the manufacturer and type of compression connector.

Insulation Piercing Connectors: Molded insulated body, copper teeth, wrench tightened, UL 486B Listed. May be used only for connection of a tap conductor in run and tap type applications when main conductor is 8 AWG and larger.

PART 3 – EXECUTION

GENERAL WIRING METHODS
All wire and cable shall be installed in conduit.

Do not use wire smaller than 12 AWG for power and lighting circuits.
All phase, neutral and ground conductors shall be sized to prevent excessive voltage drop at rated circuit ampacity. As a minimum use 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 100 feet (30 m), and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet (61 m).

Ground conductor size shall be increased per NEC 250.122(B) when phase and phase/neutral conductors are increased in size.

Make conductor lengths for parallel conductors equal.

Splice only in junction, pull, or outlet boxes.

No conductor less than 10 AWG shall be installed in exterior underground conduit.

Identify ALL low voltage wire, 600V and lower, per section 26 05 53.

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

WIRING INSTALLATION IN RACEWAYS

Pull all conductors into a raceway at the same time. Use Listed water or silicone based wire pulling lubricant for pulling 4 AWG and larger wires and for other conditions when necessary. Wax based lubricants are not allowed. Pulling lubricant is not required for low friction type products where the cable manufacturer recommends that cables be pulled without lube.

Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

Completely and thoroughly swab raceway system before installing conductors.

Place all conductors of a given circuit (this includes phase wires, neutral (if any), and ground conductor) in the same raceway. If parallel phase and/or neutral wires are used, then place an equal number of phase and neutral conductors in same raceway or cable.

Manufacturers maximum pulling tensions shall be not be exceeded and individual pulls shall not exceed 270 degrees.

In high ambient spaces, mechanical rooms, utility rooms and exterior exposed conduit, 90 degree C, XHHW-2 conductors shall be utilized.

WIRING CONNECTIONS AND TERMINATIONS

Splice only in accessible junction boxes.

Wire splices and taps shall be made firm, and adequate to carry the full current rating of the respective wire without soldering and without perceptible temperature rise.

All splices shall be so made that they have an electrical resistance not in excess of two feet (600 mm) of the conductor.

Use solderless twist type spring connectors (wire nuts) with insulating covers for copper wire splices and taps, 10 AWG and smaller or toolless type actuation connectors (push-in) with spacers for copper wire splices and taps, 12 AWG and smaller. Use mechanical or compression connectors for wire splices and taps, 8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of the wiring.

Thoroughly clean wires before installing lugs and connectors.

At all splices and terminations, leave tails long enough to cut splice out and completely re-splice.

FIELD QUALITY CONTROL

Field inspection and testing will be performed under provisions of Section 26 05 04.

Additional testing as follows shall be performed if aluminum conductors are used:
Feeders terminated with aluminum conductors shall be tested with a thermal imager and recorded.

Conductors shall be closely checked for loose or poor connections, and for signs of overheating or corrosion.

Test procedures shall meet NETA guidelines.

Test results and report shall be provided to the engineer and included in O&M manual under AL conductors/ tests.

Contractor shall correct all deficiencies reported in the test report.

WIRE COLOR

General:

Solid colored insulation is required for all THHN/THWN-2 wire. For other wire types use colored wire or identify wire with colored tape at all terminals, splices and boxes. Wire shall be colored as indicated below.

In existing facilities, use existing color scheme.

In new facilities, use black and red for single phase circuits at 120/240 volts, use Phase A black, Phase B red and Phase C blue for circuits at 120/208 volts single or three phase, and use Phase A brown, Phase B orange and Phase C yellow for circuits at 277/480 volts single or three phase. Note: This includes fixture whips except for Listed whips mounted by the fixture manufacturer on the fixture and Listed as a System.

Switch legs shall be the same color as their associated circuit, except for the second switch leg used for dual-level switching. The second switch leg shall be the next phase color, e.g. if the first switch leg is brown (277/480V phase A), the second switch leg shall be orange (277/480V phase B).

Traveler conductors run between 3 and 4 way switches shall be colored pink or purple.

Neutral Conductors: White for 120/208V and 120/240V systems, Gray for 277/480V systems. Where there are two or more neutrals in one conduit, each shall be individually identified with a different stripe.

Branch Circuit Conductors: Three or four wire home runs shall have each phase uniquely color coded.

Feeder Circuit Conductors: Each phase shall be uniquely color coded.

Ground Conductors: Green colored insulation for THHN/THWN-2 wire. For other wire types use green colored wire or identify wire with green tape at both ends and at all access points, such as panelboards, motor starters, disconnects and junction boxes. When isolated grounds are required, contractor shall provide green with yellow tracer.

BRANCH CIRCUITS

The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All single-phase branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

CONSTRUCTION VERIFICATION

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/23

PART 1 – GENERAL

SCOPE
The work under this section includes grounding electrodes and conductors, equipment grounding conductors, and bonding for Electrical and Communications systems. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Performance Requirements
- Submittals
- Project Record Documents
- Regulatory Requirements

PART 2 - PRODUCTS
- Rod Electrode
- Mechanical Connectors
- Compression Connectors
- Exothermic Connections
- Conductors
- Bus/Busbar

PART 3 - EXECUTION
- Examination
- General
- Less Than 600 Volt System Grounding
- Field Quality Control
- Identification and Labeling
- Construction Verification Items
- Warranty

All hardware, cables and related termination and support hardware shall be furnished, installed, wired, tested, labeled, and documented by the Contractor, as detailed in this and related sections.

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Section 26 08 00 - Commissioning of Electrical.
Section 01 91 01 or 01 91 02 – Commissioning Process

REFERENCES
ANSI/IEEE 81 (Latest edition) - Guide to Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System
ANSI/IEEE 142 (Latest edition) - Recommended Practice for Grounding of Industrial and Commercial Power Systems
UL 467 Electrical Grounding and Bonding Equipment
IEEE 837 - IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding
TIA-607-C - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

PERFORMANCE REQUIREMENTS
Grounding System Resistance:
- Equipment Rated 500 KVA and Less: 10 ohms maximum at building service entrance.
- Equipment Rated 500 to 1000 KVA: 5 ohms maximum at building service entrance.
- Equipment Rated more than 1000 KVA: 3 ohms building service entrance.
- Communications Ground Busbars: 5 ohms maximum.

Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations. Perform fall-of-potential test in accordance with ANSI/ IEEE 81 on main grounding electrode system.

Testing of grounding system resistance is to be witnessed by the DFD Electrical Inspector or Construction Representative.

Provide test report of grounding system overall resistance and resistance of each electrode in final O&M manuals and noted on record documents.

SUBMITTALS
Product Data: Provide data for grounding electrodes and connections.

Provide samples of ground labels.

Test Reports: Indicate overall resistance to ground and resistance of each electrode.

Manufacturer's Instructions: Include instructions for preparation, installation and examination of exothermic connectors.

PROJECT RECORD DOCUMENTS
Record locations of all electrical and telecommunications grounding electrodes, busbars and grounding conductors as installed including recorded ground resistance test results.

REGULATORY REQUIREMENTS
Conform to requirements of NFPA 70.

Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 – PRODUCTS

ROD ELECTRODE
Material: Copper-clad steel.

Diameter: 3/4 inch (19 mm) minimum.

Length: 10 feet (3.5 m) minimum. Rod shall be driven at least 9' 6" deep.

CONCRETE-ENCASED GROUNDING ELECTRODE FOR POLE BASES
Fabricate per NFPA 70, Article 250.52 (A)(3)(2) using 20 feet (6m) of bare copper wire not smaller than bare seven-strand #4 AWG. If concrete foundation is less than 20 feet (6m) long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts.

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 two hole, two bolt type.

Split bolt connector types are NOT allowed. Exception: the use of split bolts is acceptable for grounding of wire-basket type cable tray, and for cable shields/straps of medium voltage cable.

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% by IACS standards.

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

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

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

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

Pre-crimping of the ground rod is required for all irreversible compression connections to a ground rod.

Terminal lug for communication system grounding shall be compression type and conform to the following:

Material: Tin Plated Copper (aluminum not permitted).
Wire Size: to match conductor
Number of Stud Holes: 2
Stud Hole Size: 3/8”
Bolt Hole Spacing: per TIA-607-C
Tongue Angle: Straight

EXOTHERMIC CONNECTIONS

As manufactured by Erico Cadweld, Harger Ultraweld or similar.

CONDUCTORS

Material: Stranded copper (aluminum not permitted).

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

Foundation Electrodes: As shown on drawings.

Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used at the same facility.

Branch Circuit Equipment Ground shall be proportionately increased in size when routed with phase conductors increased in size.

PART 3 – EXECUTION

EXAMINATION

Verify that final backfill and compaction has been completed before driving rod electrodes.

GENERAL

Install Products in accordance with manufacturer's instructions.

Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them. Attach grounds permanently before permanent building service is energized.

All grounding conductor connections to Busbars shall be via two hole lugs.

Terminate each grounding conductor on its own terminal lug. Sharing a single lug by multiple conductors is not allowed.

All grounding electrode conductors and individual grounding conductors shall be installed in SCH 80 PVC conduit, in exposed locations.

Each grounding electrode conductor shall be labeled at each terminated end as to system served and location of second termination.

LESS THAN 600 VOLT ELECTRICAL SYSTEM GROUNDING

Equipment Grounding Conductor: Provide separate, insulated equipment grounding conductor within each raceway. Terminate each end on suitable lug, bus, enclosure or bushing. Provide a ground wire from each device to the respective enclosure.

Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.

FIELD QUALITY CONTROL

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

Testing of grounding system resistance is to be witnessed by the DFD Electrical Inspector or Construction Representative. Provide test report of grounding system resistance in final O&M manuals and noted on record drawings.

Provide resistance test at each electrical and telecommunications Busbar to ground.

IDENTIFICATION AND LABELING

Label Grounds at point of termination.

Label for Bus Bars and Ground Bars shall be engraved laminate or Pre-printed (manufactured) plastic and include the following:

IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING MANAGER.

CONSTRUCTION VERIFICATION

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

Record locations of all electrical and telecommunications grounding electrodes, busbars and grounding conductors as installed including recorded ground resistance test results.

WARRANTY

See Division 1, General Conditions, and General Requirements.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/23

PART 1 – GENERAL

SCOPE
The work under this section includes conduit and equipment supports, straps, clamps, steel channel, etc., and fastening hardware for supporting electrical work. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals
- Quality Assurance

PART 2 - PRODUCTS
- Support Channel
- Conduit Supports
- Nylon Anchors
- Threaded Rod
- Hardware

PART 3 - EXECUTION
- Installation

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process
Section 26 05 53 – Identification for Electrical Systems

SUBMITTALS
Product Data: Provide data for support channel.

QUALITY ASSURANCE
Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 – PRODUCTS

SUPPORT CHANNEL
Hot-dip Galvanized Steel
Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be hot-dip galvanized after fabrication in accordance with ASTM A123.

Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123.

All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3.

All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.

Stainless Steel
All strut, fittings and hardware shall be made of AISI Type 304 or Type 316 stainless steel as indicated.

CONDUIT SUPPORTS
Conduit clamps, straps, supports, etc., shall be steel or malleable iron.

One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.

Bar joist conduit/box hangers: Spring Steel Clips with Snap-Close Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees and shall snap close around the conduit. Push-in type conduit clamps are not allowed. Spring clips shall require a hammer to install onto supporting surface.

Stud wall applications: Spring Steel Clips with Push-in or Snap-Close Conduit Clamps (Conduit Supports): Conduit clamps shall pivot a full 360 degrees. Spring clips shall require a fastener to install onto stud.

Box/conduit hanger with rod/wire clip (a.k.a. antlers): One assembly provides support for electrical box and conduit from drop wire or rod. Conduit clamps shall snap close around the conduit.

Spring Steel Clip products shall be provided with corrosion resistance and be warranted against failure from corrosion for a period of ten (10) years from date of manufacture.

NYLON ANCHORS

Nylon anchors may only be used in limited applications with the pre-approval of the State of Wisconsin DFD Electrical Inspector. See Part 3 – Execution for examples of applications of where nylon anchors may be allowed.

Nylon wall plugs shall be designed for 2-way expansion, providing rapid fixing with high pull-out values. Nylon wall plugs shall be molded with protruding side fins which restrict rotation and prevent fall out from overhead holes. Examples of these include Mungo types MN or MU, or Fischer type S nylon plugs.

Nylon one-piece self-drilling anchors designed for use in hollow gypsum wallboard for light duty loads. Anchors shall be engineered nylon or Zamac alloy. Examples of these are the Zip-It ® or Zip-It Jr. ® self-drilling anchors.

Manufacturer's names and catalog numbers are used for quality and performance only. Anchors manufactured by others shall be equally acceptable provided they meet or exceed in performance and quality as specified.

THREADED ROD

Minimum sized threaded rod for supports shall be 3/8” for trapezes and single conduits 1-1/4” and larger, and ¼” for single conduits 1” and smaller.

HARDWARE

Corrosion resistant, or as noted for each product above.

PART 3 – EXECUTION

INSTALLATION

Fasten hanger rods, conduit clamps, and outlet-, junction-, and pull-boxes to building structure using pre-cast insert system, preset inserts, beam clamps, or expansion anchors.

Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.

Powder-actuated fasteners are not permitted.

Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.

Do not fasten to suspended ceiling systems.

Do not drill structural steel members unless approved by DFD.

In wet locations, mechanical rooms, and electrical rooms, install free-standing electrical equipment on 3.5-inch (89 mm) concrete pads.

Install surface-mounted cabinets and panelboards with a minimum of four anchors. At all cabinet and panelboard locations on concrete or concrete block walls, and at ALL locations below grade, provide steel channel supports to stand cabinet one inch (25 mm) off wall (7/8” Uni-strut or 3/4” painted fire-retardant

plywood is acceptable). In above-grade equipment rooms that have drywall walls, the cabinets and panelboards may be mounted to the drywall if backing is provided in the stud walls behind the equipment.

Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

Support Channel

Use one of the following types of support channel as appropriate for the installed environment:

- Indoor: Hot-dipped Galvanized Steel, or as noted on the drawings.

- Exterior and wet locations: Hot-dipped Galvanized Steel or Stainless Steel, as appropriate for the environment or as noted on the drawings. Type 316 stainless steel shall be used for Food Service type environments. Epoxy painted support channel shall not be used for exterior installations.

- Field cuts: File and de-bur cut ends of support channel and paint to prevent rusting. For hot-dipped galvanized support channel, spray cut ends with cold galvanized paint.

Support Wires

Support wires that are installed in addition to the ceiling grid support wires to provide secure support for raceways, cables assemblies, boxes, cabinets, and fittings shall be secured at both ends (e.g., the ceiling structure at the top and the ceiling grid at the bottom) per NEC 300.11(A).

Compressed-air power-actuated fasteners may ONLY be used for the installation of separate ceiling wires required for support of conduits and aircraft cable hung light fixtures.

Support wires shall be identified per specification section 26 05 53.

Spring Steel Clip Conduit Supports for 30 amp or less branch circuits

Spring steel clips with snap-close clamps may be used to support conduit/ box from bar joist (steel truss) systems.

Stud wall applications: Spring steel clips with push-in or snap-close conduit clamps may be used to support conduit in interior metal stud wall applications. Use screw fasteners to install conduit clamp onto stud.

Conduit/box hanger with rod/wire clip (a.k.a. antlers) and multi conduit/box support systems: Above suspended ceiling only.

Nylon anchor applications

Nylon anchors may only be used in limited light duty applications with the pre-approval of the State of Wisconsin DFD Electrical Inspector.

Nylon anchors shall be designed for the construction material in which they are intended to be installed and shall be designed for the weight in which the anchors are intended to support.

Nylon wall plug applications may include attaching 4” square boxes or conduit straps to plaster-covered clay tile, drywall, or hollow concrete block. Screws used with nylon wall plugs shall be #10 minimum and shall be longer than the anchor.

Nylon one-piece self-drilling anchor applications may include attaching 4” square boxes or conduit straps to hollow gypsum wallboard for light duty loads. Use No. 8 screws with one-piece self-drilling anchors designed for 3/8” to 1” thick wallboard. Use No. 6 screws with anchors designed for 3/8” to 5/8” wallboard.

END OF SECTION

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SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
BASED ON DFD MASTER ELECTRICAL SPEC DATED 11/18/24

PART 1 – GENERAL

SCOPE
This section describes the products and execution requirements relating to furnishing and installing raceways and boxes and related systems as part of a raceway system for electrical, communications, and other low-voltage systems for the project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals

PART 2 - PRODUCTS
- General
- Rigid Metal Conduit (RMC) and Fittings
- Rigid Polyvinyl Chloride Conduit (PVC) and Fittings
- Conduit Supports
- Surface Metal Raceway
- Surface Nonmetal Raceway
- Conduit Water Sealant
- Pull and Junction Boxes
- In Grade Handholes and Boxes

PART 3 - EXECUTION
- Conduit Sizing, Arrangement, and Support
- Conduit Installation
- Conduit Installation Schedule
- Surface Metal Raceway and Multi-Outlet Assembly Installation
- Nonmetallic Surface Raceway Installation
- Coordination of Box Locations
- Pull and Junction Box Installation
- In Grade Handholes and Boxes
- Construction Verification Items

RELATED WORK
Applicable provisions of Division 1 govern work under this section.

Section 01 91 01 or 01 91 02 – Commissioning Process
Section 26 08 00 - Commissioning of Electrical.
Section 26 05 29 – Hangers and Supports for Electrical Systems.
Section 26 05 34 -- Underground HDPE Pathways for Electrical Systems

REFERENCES
Wisconsin Administrative Code SPS 316 - Electrical
ANSI/TIA-569-C-Telecommunications Pathways and Spaces
ANSI/SCTE 77-2017 – Specifications for Underground Enclosure Integrity

SUBMITTALS
Surface Raceway System - submit product data and catalog sheets for all components.

Boxes - provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 – PRODUCTS

GENERAL
All steel fittings and conduit bodies shall be galvanized.

All conduit transitional fittings shall be listed for installed application.

Condulet fittings shall be threaded rigid entering condulets.

No cast metal or split-gland type fittings permitted.

All condulet covers must be fastened to the condulet body with screws and be of the same manufacture.

Mogul-type condulets 2 inch (50 mm) and larger, shall be permitted.

C-condulets shall not be used in lieu of pull boxes.

All boxes shall be of sufficient size to provide free space for all conductors enclosed in the box and shall comply with NEC requirements.

RIGID METAL CONDUIT (RMC) AND FITTINGS
Conduit: Heavy wall threaded, galvanized steel.

Fittings and Conduit Bodies: Use all steel threaded fittings and conduit bodies.

Expansion Fittings/Expansion Joints: Expansion Fittings shall be Internal Grounding type and shall not rely on external bonding jumpers to maintain grounding continuity between raceway components.

RIGID POLYVINYL CHLORIDE CONDUIT (PVC) AND FITTINGS
Conduit: Rigid non-metallic conduit, Schedule 40 PVC minimum, Listed, sunlight resistant, rated for 90^0 C conductors. Schedule 80 for locations exposed to physical damage or as shown on drawings.

Fittings and Conduit Bodies: NEMA TC 2, Listed.

CONDUIT SUPPORTS
See specification Section 26 05 29.

SURFACE METAL RACEWAY
Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
As shown on Drawing.
Fittings: Couplings, elbows, and connectors designed for use with raceway system.

Boxes and Extension Rings: Designed for use with raceway systems.

SURFACE NONMETAL RACEWAY
Description: Nonmetallic channel with fitted cover, suitable for use as surface raceway.
As shown on Drawing.

Fittings: Couplings, elbows, and connectors designed for use with raceway system.

Boxes and Extension Rings: Designed for use with raceway systems.

CONDUIT WATER SEALANT
Description: Conduit sealant used to prevent water from entering buildings via conduits.

Sealant shall seal conduits against water and gas intrusion, such as Polywater® FST™-250 Foam Duct Sealant, Raychem RDSS Rayflate Duct Sealing System, or approved alternate. Sealant shall be re-enterable, shall be compatible with the conduit and conductor types being used, and shall comply with NEC 225.27, 230.8, and 300.5(G).

Manufacturer names and catalog numbers are used to develop quality and performance requirements only. Products manufactured by others may be acceptable provided they meet or exceed the specifications.

PULL AND JUNCTION BOXES
Interior Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot-welded joints and corners.

Interior Sheet Metal Boxes larger than 12 inches (300 mm) in any dimension shall have a hinged cover or a chain installed between box and cover. Boxes 9 square-feet or larger shall have hinged covers and a single cover shall not exceed 10 square-feet.

Interior Sheet Metal Boxes connected to an exterior underground raceway, shall have a drain fitting located in the bottom.

Exterior Boxes and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain-tight. Galvanized cast iron box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

Box extensions and adjacent boxes within 48 inches of each other are not allowed for the purpose of creating more wire capacity.

Junction boxes 6 inch-by-6 inch or larger size shall be without stamped knock-outs.

Wireways shall not be used in lieu of junction boxes.

IN GRADE HANDHOLES AND BOXES
Handholes and Boxes: Polymer- Concrete

Handhole and Box Covers: Polymer-Concrete

Handhole and box bottoms: Integral Closed.

Handholes and boxes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

Handhole and cover Assembly Load Rating: ANSI/SCTE Tier 22 or better.

Covers: Weatherproof, secured by tamper-resistant locking devices with non-skid finish.
Cover Label: ELECTRIC

Units shall be designed – typically with a flared wall and footed base – to prevent frost heaving.

PART 3 – EXECUTION

CONDUIT SIZING, ARRANGEMENT, AND SUPPORT
Size power conductor raceways for conductor type installed. Conduit size shall be 1/2 inch (16 mm) minimum except **all homerun conduits shall be 3/4 inch (21 mm),** or as specified elsewhere. **Caution: Per the NEC, the allowable conductor ampacity is reduced when more than three current-carrying conductors are installed in a raceway. Contractor must take the NEC ampacity adjustment factors into account when sizing the raceway and wiring system.**

Arrange conduit to maintain 6’-8” clear headroom and present a neat appearance.

Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.

Maintain minimum 6 inch (150 mm) clearance between conduit and piping. Maintain 12 inch (300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.

Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized pipe straps, conduit racks (lay-in adjustable hangers), clevis hangers, or bolted split stamped galvanized hangers.

Group conduit in parallel runs where practical and use conduit rack (lay-in adjustable hangers) constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

Do not fasten conduit with wire or perforated pipe straps. Before conductors are pulled, remove all wire used for temporary conduit support during construction.

Support and fasten metal conduit at a maximum of 8 feet (2.4 m) on center.
Supports shall be independent of the installations of other trades, e.g. ceiling support wires, HVAC pipes, other conduits, etc., unless so approved or detailed.

Conceal all conduits except where noted on the drawings or approved by the Architect/Engineer. Contractor shall verify with Architect/Engineer all surface conduit installations except in mechanical rooms.

Changes in direction shall be made with symmetrical bends, cast steel boxes, stamped metal boxes or cast steel conduit bodies.

For indoor and exposed exterior conduits, no continuous conduit run shall exceed 100 feet (30 meters) without a junction box.

For exterior below grade conduits, no continuous conduit run shall exceed 250 feet (75 meters) without hand hole, manhole or pull box without project specific DFDM electrical inspector approval.

All conduits installed in exposed areas shall be installed with a box offset before entering box.

CONDUIT INSTALLATION

Cut conduit square; de-burr cut ends.

Conduit shall not be fastened to the corrugated metal roof deck nor drywall or suspended ceiling grids. Bring conduit to the shoulder of fittings and couplings and fasten securely.

Use conduit hubs for fastening conduit to cast boxes. Use sealing locknuts or conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations.

Threads cut in the field, and factory threads of conduit and nipples not coated with corrosion protection, shall be coated with an approved electrically conductive compound per NEC 300.6.

Corrosion inhibitor, when used in the food service environment, shall be approved for Food Service locations.

Terminate all conduit (except for terminations into conduit bodies) using conduit hubs, or connectors with one locknut, or utilize double locknuts (one each side of box wall).

Provide bushings for the ends of all conduit not terminated in box walls. Refer to Section 26 05 26 – Grounding and Bonding for Electrical Systems for grounding bushing requirements.

Provide insulated bushings where raceways contain 4 AWG or larger conductors.

Communication and Low Voltage systems conduits shall terminate in horizontal plane.
Use pendants supported from swivel hangers in exposed ceiling/ structure locations where necessary to mount boxes supporting luminaires and wiring devices. Installation method shall comply with NEC 314.23 (H).

Install no more than the equivalent of the following for building:

Three 90 degree bends between boxes for electrical systems.

Two 90 degree bends between boxes for communications and other low voltage systems. Note: Offsets shall be considered 90 degrees.

No single bend may exceed 90 degrees.

Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch (50 mm) size unless sweep elbows are required.

Bend conduit according to manufacturer’s recommendations. Torches or open flame shall not be used to aid in bending of PVC conduit.

Use suitable conduit caps or other approved seals to protect installed conduit against entrance of dirt and moisture.

Provide 1/8 inch (3 mm) nylon pull string in empty conduit, except sleeves and nipples.

Install listed expansion-deflection fitting or other approved means shall be used where a raceway crosses a structural joint for expansion, contraction or deflection, used in buildings, bridges, parking garages or other structurers.

Install expansion joints where direct-buried conduit is subject to Earth Movement by settlement or frost per NEC 300.5(J), especially where conduit exits the ground exposed and enters a box, cabinet, or enclosure attached to a building or structure.

Install expansion fitting in exterior PVC conduit runs per NEC table 352.44 utilizing a minimum temperature change of 120 degree F.

Avoid moisture traps where possible. Where moisture traps are unavoidable, provide junction boxes with drain fittings at conduit low points.

Where conduit passes between areas of differing temperatures such as into or out of cool rooms, freezers, unheated and heated spaces, buildings, etc., provide condulet or box with duct seal or other means to prevent the passage of moisture and water vapor through the conduit.

Route conduit through roof openings for piping and ductwork where possible.

Where communication cabling is to be installed in conduit to the wiring hub (e.g. Telecom Room), multiple conduits may be consolidated into fewer, larger conduits. Capacity of shared conduits shall equal the capacity of the individual conduits unless otherwise noted.

Use NRTL listed metallic grounding clamps when terminating conduit to cable tray.

Ground and bond conduit under provisions of Section 26 05 26.

Conduit is not permitted in any slab topping of two inches (50 mm) or less.

PVC conduit in concrete pole bases shall transition to galvanized rigid metal conduit 12 inches before it enters a concrete pole base. Inside the pole base, the elbow shall be galvanized rigid metal conduit. From the elbow, the conduit shall transition back to PVC as it continues up and out the top of the concrete pole base.

PVC conduit shall transition to galvanized rigid metal conduit before it enters a foundation wall or up through a concrete floor.

PVC conduit shall be allowed without need of transition to galvanized rigid metal conduit up through concrete floor and concrete equipment pads for pad mounted transformers and switchgear. Provide a PVC connector and bushing, or bell-ends, on each conduit entry. Coordinate conduit installation with submittals and shop drawings for transformers and switchgear.
Identify conduit under provisions of Section 26 05 53.

All conduit installed underground (exterior to building) shall be buried a minimum of 24 inches below finished grade, whether or not the conduit is concrete encased. Install warning tape 12" below finish grade over all buried conduits. Underground warning tape shall be detectable, 2” wide minimum, 5 mil thickness, containing a foil core. Tape color shall be red and labeled with the words "CAUTION-BURIED ELECTRIC LINE BELOW" as manufactured by Presco or similar.

Conduits penetrating underground foundation walls: Individual conduits or each conduit as part of a ductbank penetrating underground foundation walls (excluding manholes) shall be sealed against water intrusion into the building.

Clean PVC conduit with solvent, and dry before application of glue. The temperature rating of glue/cement shall match weather conditions. Apply full even coat of cement/glue to entire area that will be inserted into fitting. The entire installation shall meet manufacturer’s recommendations.

CONDUIT INSTALLATION SCHEDULE
Conduit other than that specified below for specific applications shall not be used.

- Underground Installations That Penetrate Foundation Walls: Rigid metal conduit within five feet (1.5 m) of the foundation wall. Conduit may transition to PVC conduit five feet (1.5 m) from the foundation walls.

- Underground Installations That Do Not Penetrate Foundation Walls: PVC conduit.

- Underground Installations Emerging from Grade: Buried conduit emerging from grade shall be Rigid metal conduit extending from the minimum cover distance of 24 inches below grade to the conduit termination point above grade. Refer to DFD detail.

- Underground Installations Under Paved Roadways: Schedule 80 PVC conduit. All other areas outside of areas subject civilian and military traffic shall be Schedule 40, refer to drawings.

- Underground Installations Emerging through Concrete Slab: Rigid metal conduit.

- Exposed Outdoor Locations: Rigid Metal conduit

- Concealed Dry Interior Locations: Rigid metal conduit

- Exposed Dry Interior Locations: Rigid metal conduit

- Luminaire: Refer to specification section 26 51 13.

SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY INSTALLATION

Use flat-head screws to fasten channel to surfaces every twenty-four (24) inches. Mount plumb and level.

Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

Maintain grounding continuity between raceway components to provide a continuous grounding path under provisions of Section 26 05 26.

Fastener Option: Use clips and straps suitable for the purpose.

NONMETALLIC SURFACE RACEWAY INSTALLATION

Use flat headed screws with appropriate anchors to fasten channel to surfaces secured every twenty-four (24) inches. Mount plumb and level. All surface mounted devices shall be fastened to the wall utilizing flat head screws along with appropriate anchors. No device shall be adhered to the wall surface using two-faced tape or any means other than as described above.

Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

In areas where the walls cannot be fished, the station cable serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, and conference rooms or like facilities.

Non-metallic raceway shall have a screw applied base. Both the base and cover shall be manufactured of rigid PVC materials.

The raceway shall originate from a surface mounted box mounted adjacent to and at the same height as existing electrical boxes in the room, be attached to the wall and terminate above the ceiling.

All fittings including, but not limited to, extension boxes, elbows, tees, fixture bodies shall match the color of the raceway.

The raceway and all systems devices shall be UL listed and exhibit nonflammable self-extinguishing characteristics, tested to specifications of UL94V-0.

In raceway for communications and other low voltage systems, the inside bend radius minimum shall be as follows:

- Internal diameter of 2 in or less- 6 times the internal diameter.
- Internal diameter of more than 2 in- 10 times the internal diameter.

Conduit bends shall contain no kinks or other discontinuities.

COORDINATION OF BOX LOCATIONS

Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
Electrical box locations shown on Contract Drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

No outlet, junction, or pull boxes shall be located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.

Conduit and boxes shall not be fastened to the metal roof deck. If conduit and boxes are required to be located and installed on roof decks, the conduit and boxes are required to be spaced minimum 1-5/8 inch off the lowest part of the metal roof decking material, per NEC 300.4 (E).

It shall be the Contractor's responsibility to study drawings pertaining to other trades, to discuss location of outlets with workmen installing other piping and equipment and to fit all electrical outlets to job conditions.

In case of any question or argument over the location of an outlet, the Contractor shall refer the matter to the Architect/Engineer and install outlet as instructed by the Architect/Engineer.

The proper location of each outlet is considered a part of this contract and no additional compensation will be paid to the Contractor for moving outlets which were improperly located.

Locate and install boxes to allow access to them. Where installation is inaccessible, coordinate locations and provide 18 inch (450 mm) by 24 inch (600 mm) access doors. Boxes must be installed within 12” from edge of the access door.

Locate and install to maintain headroom and to present a neat appearance.

Install boxes to preserve fire resistance rating of partitions and other elements, using approved materials and methods.

Boxes installed in the building envelop shall be sealed with caulking materials or closed with gasketing systems compatible with the construction materials and locations per IEC 502.4.3.

PULL AND JUNCTION BOX INSTALLATION

Pull boxes and junction boxes shall be minimum 4 inches square (100 mm) by 2 1/8 inches (54 mm) deep for use with 1 inch (25 mm) conduit and smaller. On conduit systems using 1 1/4 inch (31.75 mm) conduit, minimum junction box size shall be 4 11/16 inches square by 2 1/8 inches deep.

Where used with raceway(s) containing conductors of 4 AWG or larger, pull box shall be sized as required unless otherwise noted on the drawings.

Where used with raceway(s) containing conductors on systems over 600V, size pull box per NEC 314 Part IV unless otherwise noted as larger on the drawings.

Size pull boxes for communications per ANSI/TIA-568-C

Locate pull boxes and junction boxes above accessible ceilings, in unfinished areas or furnish and install DFD approved access panels in non-accessible ceilings where boxes are installed. All boxes are to be readily-accessible.

Provide Pull and Junction boxes for communications and other low voltage applications (a) in any section of conduit longer than 100 feet, (b) where there are bends totaling more than 180 degrees between pull points or pull boxes and (c) wherever there is a reverse bend in run. Locate boxes on straight section of raceway (e.g. do not use boxes in place of raceway bends).

Support pull and junction boxes independent of conduit.

IN GRADE HANDHOLES AND BOXES

Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

Unless otherwise indicated and detailed, support units on a level bed of crushed stone or gravel, graded from 1/2 inch (12.5 mm) sieve to No. 4 (4.25 mm) sieve and compacted to same density as adjacent undisturbed earth.

Elevation: In finished areas, set so cover surface will be flush with finished grade.

Unless approved by DFD review staff, handholes and boxes shall **NOT** be installed in paved or concrete drives or walks.

Units shall be selected with depth sufficient to allow for conductor bending/ wire management and allow sufficient conduit elevation above compacted bed to prevent water infiltration in conduit.

Provide four (4) sets of the tool(s) required to access tamper resistant locking covers. In addition, provide the tool(s) model number to allow for ordering of additional sets. Tools and bits, shall be turned over to owners representative, prior to project closeout.

Provide conduit sealant to seal conduits against water and gas intrusion, such as Polywater® FST™-250 Foam Duct Sealant, Raychem RDSS Rayflate Duct Sealing System, or approved alternate. Sealant shall be re-enterable, shall be compatible with the conduit and conductor types being used, and shall comply with NEC 225.27, 230.8, and 300.5(G).

CONSTRUCTION VERIFICATION

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS
BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/23

PART 1 – GENERAL

SCOPE
The work under this section includes the requirements relating to the furnishing and installation of Identification for Electrical Systems. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals

PART 2 - PRODUCTS
- Materials

PART 3 - EXECUTION
- General
- Box Identification
- Power, Control and Signal Wire Identification
- Wiring Device Identification

- Nameplate Engraving for Electrical Equipment
- Panelboard Directories

RELATED WORK
Applicable provisions of Division 1 shall govern work under this section.

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
Section 01 91 01 or 01 91 02 – Commissioning Process

SUBMITTALS
Include schedule for nameplates.

Prior to installation, the contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used. Samples shall be mounted on 8 1/2" x 11" sheets, explaining their purposed use.

PART 2 - PRODUCTS

MATERIALS
Labels: All labels shall be permanent, and machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS ARE ALLOWED.

Wire Labels: All wiring labels shall be white/transparent nylon or vinyl, self-laminating, wraparound type. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

Tape (wiring phase identification only): Scotch #35 tape in appropriate colors for system voltage and phase. Embossed tape shall not be permitted for any application.

Nameplates: Engraved multi-layer laminated plastic. See Electrical Equipment Identification in the Execution section for nameplate color and size requirements.

See Box Identification and Wiring Device Identification sections for allowed usage of permanent marker.

PART 3 - EXECUTION

GENERAL

Clean all surfaces before attaching labels with the label manufacturer's recommended cleaning agent. Install all labels firmly as recommended by the label manufacturer. Labels shall be installed plumb and neatly on all equipment.

Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using screws, rivets or manufacturer approved adhesive or cement.

Provide all warning labels to electrical equipment as required per NEC 110.16 and 110.21. Provide available fault current labeling to service equipment as required per NEC 110.24.

Provide a sign at the service-entrance equipment indicating type and location of on-site emergency power sources and on-site legally required standby power sources, per NEC 700.7 and NEC 701.7.

Fire pump disconnecting means shall be identified as "Fire Pump Disconnecting Means", per NEC 695.4(B)(3)(c).

Provide a sign at each service disconnect indicating "Service Disconnect", per NEC 230.70(B).

Emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency system per NEC 700.10(A)(2). Identification shall be made by the following methods:

1. All boxes and enclosures shall be permanently identified by box color(s) or nameplate(s) as indicated under the headings Box Identification or Electrical Equipment Identification below.
2. Where boxes or enclosures are not encountered, exposed cable or raceway shall be labeled as described under the heading Wire Labels above. Wire Labels shall be color coded as defined under the heading Box Identification below. Labels shall be applied at intervals not to exceed 7.6 m (25 ft).

BOX IDENTIFICATION

All junction and pull boxes shall be identified by color, based on the following color scheme:

Power Systems	Color(s)
Secondary Power – 480Y/277V	Brown
Secondary Power – 208Y/120V, 240/120V	White

POWER, CONTROL AND SIGNALING WIRE IDENTIFICATION

Provide wire labels on each conductor in panelboard gutters, all boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control and signaling wires.

All wiring shall be labeled within 2 to 4 inches of terminations. Each end of a wire or cable shall be labeled as soon as it is terminated, including wiring used for temporary purposes.

WIRING DEVICE IDENTIFICATION

Wall switches, receptacles, occupancy sensors, photocells, poke-through fittings, access floor boxes, and time clocks shall be identified with circuit numbers and panelboard source (ex. Panel ABC-3). In exposed areas, identifications should be made inside of device covers, unless directed otherwise. Use machine-generated adhesive labels, or neatly hand-written permanent marker.

ELECTRICAL EQUIPMENT IDENTIFICATION

Nameplates for all panelboards, circuit breakers, disconnect switches, and transformers shall be based on the following color scheme:

Power Systems	Color(s)
Secondary Power – 480Y/277V	White letters on Brown background
Secondary Power – 208Y/120V, 240/120V	Black letters on White background

Provide nameplates of minimum letter height as scheduled below:

All Panelboards (Distribution, Branch, Sub-feed, and Feed-Through), Switchboards and Motor Control Centers: 1 inch (25 mm); identify equipment designation (same designation used by the main distribution center). 1/2 inch (13 mm); identify voltage rating, source and room location of the source.

Panelboards serving NEC 700, 701 or 702 loads shall identify which branch they serve.

Both panels in a double tub application shall be labeled.

Circuit Breakers, Switches, and Motor Starters in Distribution Panelboards, Switchboards and Motor Control Centers: 1/2 inch (13 mm); identify circuit number and load served, including location.

Individual Disconnect Switches, Enclosed Circuit Breakers, and Motor Starters: ½ inch (13 mm); identify voltage, source and load served.

Transformers: 1 inch (25 mm); identify equipment designation. 1/2 inch (13 mm); identify primary and secondary voltages, primary source and location, and secondary load and location.

PANELBOARD DIRECTORIES

Typed directories for panelboards shall be covered with clear plastic and shall have a metal frame. Room number on directories shall be Owner's numbers, not Plan numbers unless Owner so specifies.

END OF SECTION

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SECTION 26 08 00
COMMISSIONING OF ELECTRICAL
BASED ON DFD MASTER SPECIFICATION DATED 03/01/21

PART 1 – GENERAL

SCOPE

This section includes commissioning forms for construction verification and functional performance testing. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Submittals

PART 2 - PRODUCTS
- (Not Used)

PART 3 – EXECUTION
- Commissioning Forms
  - CV-26 05 19 Low-Voltage Electrical Power Conductors and Cables
  - CV-26 05 26 Grounding and Bonding for Electrical Systems
  - CV-26 05 33 Raceways and Boxes for Electrical Systems
  - CV-26 05 43 Underground Ducts and Raceways for Electrical Systems
  - CV-26 09 19 Enclosed Contactors
  - CV-26 09 28 Lighting Control Panels
  - CV-26 28 16 Enclosed Switches and Circuit Breakers
  - CV-26 56 29 Site Lighting

RELATED WORK

Section 01 91 01 or 01 91 02 – Commissioning Process

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

SUBMITTALS

Reference the General Conditions of the Contract for submittal requirements.

Reference Section 01 91 01 or 01 91 02 Commissioning Process for Construction Verification Checklist and Functional Performance Test submittal requirements.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

COMMISSIONING FORMS

Commissioning forms are to be filled in as work progresses by the individuals responsible for installation and shall be completed for each installation phase.

Provide a description of the work completed since the last entry, the percentage of the total work completed for the system for that area and the step of installation or finalization.

Circle Yes or No for each commissioning form item. If the information requested for an item does not apply to the given stage of installation for the system, list it as “N/A”. Explain all discrepancies, negative responses or N/A responses in the negative responses section.
Once the work is 100% complete and the responses to each item are complete and resolved for a given commissioning forms group, mark as complete, initial and date in the spaces provided.

Provide copies of the commissioning forms to the commissioning agent 2 days prior to construction progress meetings.

CV-26 05 19 – Low-Voltage Electrical Power Conductor and Cables

Equipment Identification/Tag: _______
Location: _________________________

A) CONDUCTOR AND CABLING PULLING CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)						
				1)	2)	3)	4)	5)	6)	7)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:		______________			DATE:	______________

Question Details

1) Conductor and cabling sized to maintain less than a 3% voltage drop for rated length and ampacity of circuit.
2) Conductors and cabling coloring match specification requirements for given voltage, wire gauge, and leg of circuit.
3) Conduits swabbed to remove foreign material prior to pulling cables.

4) All cables pulled though conduit at the same time, with pulling lubricant used to ease pulling tensions.
5) Excess cable provided at each termination and splice point for purpose of multiple terminations or splices to be performed.
6) Emergency power conductors and cabling pulled in separate conduits from normal power systems.
7) Outdoor cables not to be terminated within 8 hours to be properly sealed and protected from moisture intrusion until termination.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

B) CONDUCTOR AND CABLE TERMINATIONS & SPLICES CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)							
				1)	2)	3)	4)	5)	6)	7)	8)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:	_______________			DATE:	_______________		

Question Details

1) Installed lugs match the pads on the equipment to which the cable will be mounted.
2) All lug terminations are connected per connection torque valve as recommended by the manufacturer.
3) Splices made only in accessible junction boxes.
4) All conductors and cables cleaned prior to termination.
5) All splices made so that the electrical resistance of the splice does not exceed the equivalent resistance of 2’ of conductor.
6) Solderless spring type pressure connectors with insulating covers used for all wires splices and taps of conductors and cabling 10AWG and smaller.
7) Mechanical or compression connectors used for all wire splices and taps of conductors and cabling 8 AWG and larger.
8) Uninsulated conductors and connectors taped with electrical tape equivalent to 150% of the insulation value of the conductor.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

C) TESTING & FINALIZATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)					
				1)	2)	3)	4)	5)	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
❑ CHECKLIST GROUP COMPLETE				INITIALS:				DATE:	

Question Details

1) All exposed conductors and cabling has been visually inspected for physical damage and any damaged conductors and cabling has been replaced.
2) Conductors and cabling jacket and insulation are in good condition.
3) All cable terminations have been checked for proper tightness and clearances per specification and manufacturer recommendations and any adjustments necessary have been made.
4) For aluminum conductors and cabling all specified acceptance tests have been performed on all cables, terminations, and splices and are approved prior to energizing.
5) All splices and terminations are to be tagged within 2” to 4” of splice or termination and in accordance with specification requirements.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

CV-26 05 33 – Raceway and Boxes for Electrical Systems

Equipment Identification/Tag: _____
Location: _____

A) CONDUIT & FITTINGS PRE-INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below) 1)	2)
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
				YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS: _____	DATE: _____

Question Details

1) Conduit type and material in accordance with specification requirements for given application and location.
2) Conduit sufficiently sized to accommodate cabling and fill requirements of contract document.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

B) CONDUIT & FITTINGS INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)									
				1)	**2)**	**3)**	**4)**	**5)**	**6)**	**7)**	**8)**	**9)**	**10)**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
				YES NO	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**	**YES NO**
❑ **CHECKLIST GROUP COMPLETE**				**INITIALS:**	______________				**DATE:**	______________			

Question Details

1) Conduit support spacing complies with specification requirements.
2) All conduit supported independently of piping, ductwork, equipment, cable tray or other conduit.
3) Bends in conduit minimized with required bends conforming to specification requirements and no more than an equivalent of three 90 degree bends between boxes.
4) Moisture traps are avoided as much as possible. When unavoidable, a junction box is provided with drain fitting at conduit low point.
5) All equipment requiring maintenance is accessible.
6) Minimum 6” clearance between conduit and piping, and 12” clearance between conduit and heat sources such as flues, steam pipes, and heating appliances is provided.
7) No continuous conduit run exceeds 100’ without a junction box.
8) Expansion-deflection joints installed where conduit crosses building expansion joints.
9) Where conduit passes between areas of differing temperatures, listed conduit seals are provided.
10) At end of work day suitable conduit caps or other approved seals provided for incomplete work to protect installed conduit against entrance of dirt and moisture.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

C) RACEWAY & GUTTER INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below) 1)	2)	3)	4)	5)	6)	7)	8)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:	_______________				DATE:	_______________	

Question Details

1) Raceway and gutter support spacing and methods comply with specification requirements.
2) All raceways supported independently of piping, ductwork, equipment, cable tray or other conduit.
3) Suitable insulating bushings and inserts provided at connections to outlets and corner fittings.
4) All equipment requiring maintenance is accessible.
5) Expansion-deflection joints installed where conduit crosses building expansion joints.
6) Oil tight gutters included gaskets at each joint.
7) Rain-tight gutters are installed in horizontal position only.
8) At end of work day suitable caps or other approved seals provided for incomplete work to protect installed raceways and gutters against entrance of dirt and moisture.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

D) JUNCTION, PULL AND OUTLET BOXES INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)								
				1)	2)	3)	4)	5)	6)	7)	8)	9)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:		_______________			DATE:		_______________	

Question Details

1) Boxes provided in locations as per contract documents, Engineer's direction or as necessary for splicing and terminations.
2) Box type and material in accordance with specification requirements for given application and location.
3) No outlet box located where it will be obstructed by other equipment, piping, lockers, benches, counters, etc.
4) All boxes supported independently of conduit, piping, ductwork, equipment, or cable tray.
5) No outlet boxes installed back-to-back in walls, and minimum 6" separation between all boxes, except for installations in acoustic walls where a minimum 24" separation between boxes is provided.
6) All boxes are accessible, and where installation is inaccessible, 18" by 24" access door has been provided.
7) Mounting heights for outlet boxes corresponds with contract document requirements.
8) All recessed outlet boxes in finished areas are mounted to the correct depth to accommodate and be flush to final surface finish.
9) Knockout closures provided for unused openings.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

E) FINALIZATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below) 1)	2)	3)	4)	5)	6)	7)	8)	9)	10)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:		______________			DATE:		______________		

Question Details

1) All penetrations through fire rated wall assemblies have been sealed per specification requirements.
2) All penetrations through non-rated wall assemblies have been sealed per specification requirements for given space type.
3) Conduits that penetrate the building envelope are sealed to prevent intrusion of air and moisture and are accessible.
4) All conduit junction boxes are painted and tagged in accordance with specification requirements.
5) All splices and terminations are to be tagged within 2” to 4” of splice or termination and in accordance with specification requirements.
6) 1/8” nylon pull string provided in all empty conduits, except sleeves and nipples.
7) Grounding and bonding of conduits and raceways conform to specification requirements.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

CV-26 09 19 – Enclosed Contactors

Equipment Identification/Tag: _____
Location: _____

Group/Item	Group/Task Description			Submitted	Delivered
A	*MODEL VERIFICATION*				
1	Manufacturer				
2	Model				
3	Serial Number				
4	Voltage (V)				
5	Ampere Ratings (A)				
6	Short Circuit Current Rating (kA)				
7	# of Poles				
8	Enclosure Type				
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____

Group/Item	Group/Task Description			Response	
B	*PHYSICAL CHECKS*				
1	Unit is free from physical damage.			YES	NO
2	All components/accessories present.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
C	*INSTALLATION*				
1	Unit secured as required by manufacturer and specification requirements.			YES	NO
2	Adequate clearance around unit for service.			YES	NO
3	Unit is level, plumb, and square.			YES	NO
4	Identification labels provided per specification requirements.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
D	*WIRING*				
1	Unit is grounded per project requirements.			YES	NO
2	All connections are terminated properly.			YES	NO
3	All electrical connections are tightened to the proper torque values.			YES	NO
4	All cables are permanently labeled relative to use.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
E	*CONTROLS INSTALLATION*				
1	Remote start and stop wiring installed and communication verified.			YES	NO
2	Photocell wiring installed and communication verified (if applicable).			YES	NO
3	Time-clock wiring installed and communication verified (if applicable).			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
F	*STARTUP*				
1	All protective coverings removed.			YES	NO
2	Unit has been cleaned of all debris and dirt on interior of unit.			YES	NO
3	All wiring connections verified for proper torques values and are acceptable.			YES	NO
4	Voltage verified to be zero across line and load terminals of each relay.			YES	NO
5	Unit energized by authorized personnel.			YES	NO
6	All relays tested via H-O-A switch and are operational.			YES	NO
7	All damage to unit finish is repaired.			YES	NO

Group/Item	Group/Task Description			Response	
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
G	*CONTROLS STARTUP*				
1	Unit programmed in accordance with contract documents and manufacturer instructions.			YES	NO
2	Communication with building automation system verified (if applicable).			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____

Negative Responses

Group/ Item	Date Found	Found By	Reason for Negative Response	Resolved	Date Resolved	Resolution
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		

CV-26 09 28 – Lighting Control Panels

Equipment Identification/Tag: _____
Location: _____

Group/Item	Group/Task Description			Submitted	Delivered
A	*MODEL VERIFICATION*				
1	Manufacturer				
2	Model				
3	Serial Number				
4	Voltage (V)				
5	Amperage Rating (A)				
6	KAIC rating (kA)				
7	Max / Installed Relays			/	/
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____

Group/Item	Group/Task Description			Response	
B	*PHYSICAL CHECKS*				
1	Unit is free from physical damage.			YES	NO
2	All components/accessories present.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
C	*INSTALLATION*				
1	Unit secured as required by manufacturer and specification requirements.			YES	NO
2	Adequate clearance around unit for service.			YES	NO
3	Unit is level, plumb, and square.			YES	NO
4	Identification labels provided per specification requirements.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
D	*WIRING*				
1	Unit is grounded per project requirements.			YES	NO
2	All connections are terminated properly.			YES	NO
3	All electrical connections are tightened to the proper torque values.			YES	NO
4	All cables are permanently labeled relative to use.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
E	*CONTROLS INSTALLATION*				
1	Remote low-voltage switch wiring installed and communication verified.			YES	NO
2	Photocell wiring installed and communication verified (if applicable).			YES	NO
3	Time-clock wiring installed and communication verified (if applicable).			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
F	*STARTUP*				
1	All protective coverings removed.			YES	NO
2	Unit has been cleaned of all debris and dirt on interior of unit.			YES	NO
3	All wiring connections verified for proper torques values and are acceptable.			YES	NO
4	Voltage verified to be zero across line and load terminals of each relay.			YES	NO
5	Unit energized by authorized personnel.			YES	NO
6	All relays tested via override switch and are operational.			YES	NO
7	All damage to unit finish is repaired.			YES	NO
❑ **CHECKLIST GROUP COMPLETE**		**INITIALS:**	_____	**DATE:**	_____
G	*CONTROLS STARTUP*				

Group/Item	Group/Task Description		Response	
1	Unit programmed in accordance with contract documents and manufacturer instructions.		YES	NO
2	Communication with building automation system verified (if applicable).		YES	NO
❑ **CHECKLIST GROUP COMPLETE**	**INITIALS:**	_____	**DATE:**	_____

Negative Responses

Group/ Item	Date Found	Found By	Reason for Negative Response	Resolved	Date Resolved	Resolution
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		
				YES / NO		

CV-26 56 29 – Site Lighting

Equipment Identification/Tag: _______
Location: _________________________

A) INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)								
				1)	2)	3)	4)	5)	6)	7)	8)	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	
❑ CHECKLIST GROUP COMPLETE				INITIALS:	_______________				DATE:	_______________		

Question Details

1) Fixtures, ballasts, and lamps are free from damage.
2) Identical ballasts provided for each fixture type.
3) Base with conduit stubs provided in location and per contract documents for all pole mounted fixtures.
4) Pole anchors extend a minimum of 2” above base.
5) All fixtures installed in locations specified in contract documents.
6) All wall mounted fixtures are mounted at heights specified in contract documents.
7) Fixture poles are plumb.
8) All penetrations of facility envelope have been filled and sealed per specification requirements.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

B) WIRING INSTALLATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)					
				1)	2)	3)	4)	5)	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
				YES NO	YES NO	YES NO	YES NO	YES NO	
❑ CHECKLIST GROUP COMPLETE				INITIALS:				DATE:	

Question Details

1) Fixture, accessories, pole, and pole base grounding are bonded to branch circuit grounding conductor.
2) All electrical connections are tight.
3) All conductors are labeled per specification requirements.
4) Ensure all ungrounded conductors for individual poles are protected with in-line fuses.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

C) TESTING & FINALIZATION CHECKS

Date	Description of Work Performed	% Complete	Initials	Questions (See details below)							
				1)	2)	3)	4)	5)	6)	7)	8)
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
				YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
❑ CHECKLIST GROUP COMPLETE				INITIALS:	_______________			DATE:	_______________		

Question Details

1) Emergency lighting operation verified (if applicable).
2) Lighting control schedules programmed and operation verified for all associated fixtures (if applicable).
3) Protective covering removed.
4) Lens and other accessories installed.
5) Number and type of lamps specified for each fixture installed and operational.
6) Fixture adjusted and aimed for specific task or effect per contract documents and/or Architect’s directions.
7) All damages to fixture finish repaired.
8) Fixtures, lenses, and photometric surfaces are clean.

Negative Responses

Group/ Item	Date Found	Found By	Location	Reason for Negative Response	Resolved	Date Resolved	Resolution
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		
					YES / NO		

FPT-26 09 28 – Lighting Control Panels

Equipment Identification/Tag: _____
Location: _____

Test Duration

Date: _____ Start Time: _____ End Time _____

Estimated Duration: _____
Cx Provider(s): _____
_____
_____
_____

Applicable Equipment: _____
_____

Objectives

This test is performed to investigate the functionality of the low voltage lighting controls.

Instrumentation

Instrument	Accuracy	Measurement
N/A	N/A	N/A

Stated Sequence

To be defined by A/E and commissioning provider.

Sampling Set

All sequences for a minimum of 20% of the total areas present. However, ensure at least one area representing each lighting control method is tested.

Procedure

1. Manual Control (if applicable)
    a. Using the final as-built documentation, systematically check the lighting circuitry by manually operating the low-voltage light switches designated for each area.
2. Scheduled Control (if applicable)
    a. Verify lighting system is in occupied mode. If not override system into occupied mode.
    b. Verify all fixtures are energized.
    c. Override system to unoccupied mode.
    d. Verify all fixtures are de-energized, except those noted as “night lights”.
    e. Return system to normal operation.
3. Occupancy Control (if applicable)
    a. Verify occupancy sensor calls luminaries “On” upon entry to room.
    b. Manually operate override switch to “Off” position and then back to “On” position. Verify switch is operational and that fixtures respond to “On” position.
    c. Record occupancy sensor time-out setting.
    d. After predetermined time-out setting re-check space to verify lighting has been de-energized.
4. Daylighting Control (if applicable)
    a. Verify lighting system is in occupied mode. If not override system into occupied mode.
    b. Take reading of current lighting levels in room.
    c. Cover daylight sensor in room.
    d. Verify lamps are raised to highest output level, and take reading of light levels in room.

Results

Manual Control (if applicable):

SECTION 26 09 19
ENCLOSED CONTACTORS/LIGHTING CONTACTOR PANEL
BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/21

PART 1 – GENERAL

SCOPE
The work under this section includes enclosed contactors. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- References
- Submittals
- Project Record Documents
- Operation and Maintenance Data
- Regulatory Requirements

PART 2 - PRODUCTS
- Contactors
- Accessories

PART 3 - EXECUTION
- Installation
- Schedule

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.
Refer to Drawings and LCP-1 (Lighting Contactor Panel)

Section 01 91 01 or 01 91 02 – Commissioning Process

REFERENCES
NEMA ICS 2 – Controllers, Contactors and Overload Relays Rated 600 V
NEMA ICS 5 – Industrial Control and Systems, Control Circuit and Pilot Devices
ANSI/NEMA ICS 6 – Industrial Control and Systems: Enclosures

SUBMITTALS
Product Data: Include dimensions, size, voltage ratings, current ratings, enclosure type and NEMA sizes.

PROJECT RECORD DOCUMENTS
Accurately record actual locations of each contactor and indicate circuits controlled.

OPERATION AND MAINTENANCE DATA
All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

REGULATORY REQUIREMENTS
Furnish products listed and classified by Underwriters Laboratories Inc., or ETL as suitable for purpose specified and shown.

PART 2 – PRODUCTS

CONTACTORS
Description: NEMA ICS 2, magnetic contactor, 100% rated.

Configuration: Mechanically held with 2-wire control. Provide with 2-wire interface for mechanically held contactors.

Coil Voltage: 120-volts, 60-Hertz, or as indicated on the plans.

Poles: Three, or as indicated on the plans.

Contact Rating: 208 volts, 30-amperes, or as indicated on the plans.

Provide flanged disconnect for input circuits.

ACCESSORIES
Enclosure: ANSI/NEMA ICS 6, Type 1, or as indicated on the plans.

Selector Switch: NEMA ICS 5, general duty type HAND-OFF-AUTOMATIC (H-O-A).

Indicating Light: NEMA ICS 2, red LED push-to-test type.

Auxiliary Contacts: NEMA ICS 5, Class A600 one (1) set of field convertible contacts.

Two-wire interface: provide with two-wire interface for mechanically held contactors

Special Purpose Control Relay/Contact: 208-240V AC, Non-reversing, 120-208-240V. Dayton 6GNVO

PART 3 – EXECUTION

INSTALLATION
Install in accordance with manufacturer's instructions.

The installation must be accessible. The preferred location shall be in the electrical or the mechanical rooms or as shown on the drawings.

DETAIL
See Drawings (Sheet E401).

END OF SECTION

SECTION 26 27 26
WIRING DEVICES
BASED ON DFD MASTER ELECTRICAL SPEC DATED 09/03/24

PART 1 – GENERAL

SCOPE
This section describes the products and execution requirements relating to furnishing and installing wiring devices and related systems for the project. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals
- Operation and Maintenance Data

PART 2 - PRODUCTS
- Time Clocks

PART 3 - EXECUTION
- Installation
- Field Quality Control
- Adjusting

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process

SUBMITTALS
Provide product data showing model numbers, configurations, finishes, dimensions, and manufacturer's instructions.

For motion sensor shop drawings, the manufacturer’s actual layout of motion sensors and the wiring diagrams shall be provided.

OPERATION AND MAINTENANCE DATA
All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

PHOTOCELLS

Salvage existing photocell. Re-route existing wiring to new lighting control panel.

TIME CLOCKS
Unit shall be a multi-purpose, 7-day, 365-day advance single and skip a day, combination 2-channel electronic time clock with a SPDT switching configuration and astronomic dial.

The contacts shall be rated 30 amp resistive at 120/250 VAC, 7.5 amps inductive at 120/250 VAC, 5 amps inductive at 30 VDC and up to 1/2 HP at 250 VAC. The unit shall be rate for 30 VDC, 120 VAC, 250 VAC and 277 VAC.

The controller shall be capable of programming in the AM/PM or 24-hour format by jumper selection, in one minute resolution, using 2 buttons only for all basic settings.

Display shall be LED type.

The unit shall have 365 day and or holiday selection capabilities, with 16 single date and 5 holiday selection options and user selectable daylight savings/standard time functions.

The unit shall have 72-hour memory backup with rechargeable battery and charger.

The unit shall be capable of manual override, ON and OFF to the next scheduled event, using 1 button for each channel.

The enclosure shall be rated for indoor installation.

Basis of Design: Intermatic Model ET2125C

- Features:
- 24 hour/365 day
- 2 circuit electronic control
- 2-SPST/DPST

Mounting: Timeclock shall be mounted inside custom Lighting Control Panel (LCP-1) enclosure, NEMA 1.

Sequence of Operations: Confirm with Owner.

- Basis of Design: Power "ON" from 16:00 until 08:00, 365 days.
- Confirm desired sequence of operations with Agency prior to commissioning.

PART 3 – EXECUTION

INSTALLATION

Device installations shall be per ADA requirements.

See plans for device mounting heights.

Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

Install devices and wall plates flush and level.

FIELD QUALITY CONTROL

Inspect each wiring device for defects.

Verify that each receptacle device is energized.

The user agency and DFD personnel reserve the right to be present at all tests.

ADJUSTING

Adjust devices and wall plates to be flush and level.

Mark all conductors with the panel and circuit number serving the device with a machine generated label, at the device, and on the back of the device cover.

END OF SECTION

SECTION 26 56 29
SITE LIGHTING
BASED ON DFD MASTER ELECTRICAL SPEC DATED 09/03/24

PART 1 – GENERAL

SCOPE

The work under this section includes exterior luminaires and accessories, poles, and foundations. Also included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Definitions
- Submittals
- Project Record Documents
- Operation and Maintenance Data
- Coordination
- Extra Materials

PART 2 - PRODUCTS
- Luminaires
- LED Luminaires
- LED Drivers
- Bi-Level Switching
- Fuses
- Wiring Connectors
- Poles
- Foundations

PART 3 - EXECUTION
- Installation
- Field Quality Control
- Adjusting
- Cleaning
- Construction Verification Items
- Agency Training

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 01 91 01 or 01 91 02 – Commissioning Process
Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
Section 26 08 00 – Commissioning of Electrical

REFERENCE STANDARDS

Wisconsin Administrative Code SPS 362.1807 Shallow Post Foundations.
International Building Code IBC 1807.3 Embedded Posts and Poles.
IEEE 1789 – Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers.
RoHS – Restriction of Hazardous Substances. Council of the European Union (EC) Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
LM-79-08 (or latest) – IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
LM-80-08 (or latest) – IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
TM-21-11 (or latest) – IES Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources.
NEMA SSL 1-2010 (or latest) – Electronic Drivers for LED Devices, Arrays, or Systems.

DEFINITIONS

Driver: The power supply used to power LED luminaires, modules, or arrays.

L70, $L_{70,}$ or $L_{70\%}$: The reported life of an LED component or system to reach 70% lumen maintenance, or 70% of the LEDs original light output.

LEDs: Broadly defined as complete luminaire with light emitting diode (LED) packages, modules, light bars, or arrays, complete with driver.

LED luminaire failure: Negligible light output from more than 10 percent of the LEDs, or less than 70 percent of the listed lumen output constitutes luminaire failure.

SUBMITTALS

Shop Drawings: Indicate dimensions and components for each luminaire, pole, and base.

Product Data:

For each luminaire type, submit luminaire information including catalog cuts with highlighted catalog numbers, and required accessories:

- Luminaire:
  - Manufacturer and catalog number,
  - Type (identification) as indicated on the plans and schedule,
  - Delivered lumens,
  - Input watts,
  - Efficacy,
  - Color rendering index,
  - Performance data, and
  - Effective Projected Area (EPA).
- Driver:
  - Manufacturer and catalog number,
  - Type (Non-Dimming, Step-dimming, Continuous dimming, etc.),
  - Power Factor, Crest Factor, THD, etc.
- Pole (if applicable):
  - Diameter
  - Height
  - Pole thickness
  - Weight

Manufacturer's Instructions:

Indicate application conditions and limitations of use stipulated by product testing agency specified under "Regulatory Requirements".

Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

Light Layout: Provide a computer-generated factory point-by-point foot-candle layout of the project for each area involved.

Post Installation Report: Provide to the Engineer and DFD the results of the measured foot-candle level for each area involved. Use a measuring device pre-approved by DFD.

PROJECT RECORD DOCUMENTS

Accurately record actual locations of each luminaire, pole, and underground circuit.

Provide record drawings of the final, as installed and measured, point-by-point foot-candle layout for each area involved.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

COORDINATION

Use bolt templates and pole mounting accessories to install anchor bolts in pole base.

EXTRA MATERIALS

Provide one (1) of each type of LED module, light bar, or array (if applicable). If the LEDs are integrated into the luminaire and are not separate components, then provide one (1) of each of these types of luminaires.

Provide one (1) LED driver of each type.

Provide five (5) percent of total fuses provided for each size, but not less than one (1) of each size.

PART 2 - PRODUCTS

LUMINAIRES

See the Luminaire Schedule on the drawings for type of luminaires and catalog numbers. Catalog numbers are shown on the drawings for quality and performance requirements only. Luminaires manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated luminaires and meet the intent of the design.

Luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, or IEC).

Provide luminaires with quick-connect disconnecting means, similar to Thomas & Betts Sta-Kon.

LED LUMINAIRES

- LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
    - Minimum Light Output.
    - Zonal Lumen Requirements.
    - Minimum Luminaire Efficacy.
    - Minimum CRI.
    - L70 Lumen Maintenance.
    - Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.

Additional requirements:

- The color temperature of exterior LED luminaires should not exceed 4100K (nominal).
- Glare Control: Exterior luminaires shall meet DesignLights Consortium's® criteria for Zonal Lumen Distribution requirements or Backlight-Uplight-Glare (BUG) standards for exterior luminaires.
- Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- Luminaire and driver shall be furnished from a single manufacturer to ensure compatibility.
- Luminaire Color Rendering Index (CRI) shall be a minimum of 70 for exterior luminaires.
- LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -40°F to 104°F (-40°C to 40°C).
- Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- Luminaire shall have a maximum Total Harmonic Distortion (THD) of $\leq$20% at full input power and across specified voltage range.
- All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- All luminaires shall be provided with knockouts for conduit connections.
- The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
- Provide all of the following data on submittals:
    - Delivered lumens
    - Input watts
    - Efficacy
    - Color rendering index.

LED DRIVERS

General:

- Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated on the luminaire schedule on the drawings.
- Minimum Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
- Driver shall have a rated life of 50,000 hours, minimum.
- Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- Driver shall modulate current at high frequencies.
- Driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- Driver shall have a maximum Total Harmonic Distortion (THD) of $\leq$20% at full input power and across specified voltage range.
- Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
- Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing.
- Provide all of the following data on submittals:
    - Input watts
    - Power Factor (pf)
    - Crest Factor (cf) at full input power
    - Total Harmonic Distortion (THD).

FUSES

Furnish and install a fuse holder and fuse in each ungrounded leg of the electrical circuit supplying the outdoor luminaire. If the voltage is 208, 240, or 480 volts, then the fuse holder needs to be a 2-pole fuse holder which simultaneously disconnects both ungrounded conductors. Every luminaire (including bollards) shall be separately fused with a water-resistant fuse holder. Size the fuse for the amperage of the luminaire. Tap the circuit conductors with a minimum #10 AWG conductor to serve the luminaire. The fuse and holder shall be accessible through the handhole. Provide sufficient wire to bring fuse holder outside of handhole.

WIRING CONNECTORS

Wiring Connectors shall meet the requirements of Section 26 05 19 Low-Voltage Electrical Power Conductors and Cables.

Twist-On Wire Connectors: Solderless twist-on spring connectors (wire-nuts) with insulating covers for copper wire splices and taps. All wire connectors used in site lighting applications shall be silicone gel-filled twist connectors or connectors designed for damp and wet locations. Gel-filled twist-on connectors may be used for copper conductor sizes 6 AWG and smaller for site lighting applications. The manufacturer's wire fill capacity must be followed.

POLES

Furnish products as specified in schedule on Drawings.

Handhole: With removable weatherproof cover.

Anchor Bolts: As recommended by pole manufacturer. Provide template, flat washers, lock washers, and hex nuts for each pole.

Pole Base Cover: Shall be pre-finished metal to match pole. Plastic base covers will not be accepted.

FOUNDATIONS

Provide foundations for pole mounted lighting. Construct from reinforced concrete in sizes as shown on drawings and to meet the minimum structural requirements of SPS 362.1807 Shallow Post Foundations, and IBC 1807.3 Embedded Posts and Poles.

Place the anchor bolts in pole bases so that the luminaire will be oriented perpendicular to the curb/street/sidewalk/parking lot or as indicated on the plan.

Provide a concrete-encased electrode (UFER) grounding system for grounding the foundation, luminaire, and pole:

1. Provide twenty-five (25) feet of #4 bare stranded copper grounding electrode conductor.

2. Extend three (3) feet of the grounding electrode conductor out the top of the foundation for connection to the luminaire/pole.
3. Clamp the grounding electrode conductor to the top of the rebar cage. Use a clamp rated for such use such as an Erico EK16 or similar.
4. Spiral a minimum of ten (10) feet of the grounding electrode conductor around the outside of the rebar cage.
5. Loop the remaining conductor around the rebar cage at the bottom of the foundation in direct contact with earth.

The exposed surface area of the foundation shall have the forms removed and the concrete rubbed out to a smooth finish.

Pole Base J-Boxes
For pole bases with multiple conduits to other poles/locations, the contractor may provide a non-metallic j-box with a curved cover mounted in the side of the exposed part of the base to accommodate the multiple conduits. Boxes shall be NEMA 3R Carlon Nonmetallic Curved Lid J-Boxes or equal. Mount j-box centered at 20" above grade. Use only in poles 18" in diameter and larger. Locate boxes 90-degrees or 180-degrees from traffic. Install boxes per manufacturer's recommendations.

POLE PROTECTORS (GUARDS)
Provide prefabricated pole protectors/guard for all new light pole foundations. Pole guards shall be manufactured from 100% polypropylene, of modular construction, and require no external fasteners for installation. Pole guards shall be a minimum of 41" above finished grade.

The contractor shall verify guard diameter based on foundation diameter. Contractor shall order custom openings to match proposed pole cross section.

Basis of Design: Post Guard Poletector 360
Color: Yellow, shall be confirmed with Owner during submittal review.

PART 3 – EXECUTION

INSTALLATION
Install in accordance with manufacturers' instructions.

Minimum underground conduit size is 1 inch.

Underground and exterior wire shall be minimum #10 AWG conductors, type XHHW-2 or USE-2, or as indicated on the drawings. Number 10 AWG conductors shall be utilized for vertical wire installed within pole.

Protect anchor bolts 2 inches (50 mm) minimum above base.

Install all anchor bolts and handhole fasteners with anti-seize compound.

Install poles plumb. Provide shims or double nuts to adjust plumb.

Use belt slings or non-chafing ropes to raise and set pre-finished luminaire poles.

Bond each luminaire, each metal accessory, the UFER ground conductor and the pole to the branch circuit equipment ground conductor with a separate ground wire sized per NEC or as shown on the drawings.

Install pole protectors/guards per manufacturer's specifications.

FIELD QUALITY CONTROL
Operate each luminaire after installation and connection. Inspect for improper connections and operation.

ADJUSTING
Aim and adjust luminaires as indicated on Drawings or as directed by the A/E.

All new luminaires shall be operational at the Substantial Completion of the project.

CLEANING

Clean photometric control surfaces.

Clean finishes and touch up damage.

CONSTRUCTION VERIFICATION

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 26 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

AGENCY TRAINING

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

END OF SECTION

SECTION 30 05 00
COMMON WORK RESULTS FOR ALL EXTERIOR WORK
BASED ON DFD MASTER SPECIFICATION DATED 09/01/2015

PART 1 – 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 work included as part of Division 26, Division 31, Division 32, and Division 33. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Referenced Organizations
- Referenced Documents
- Quality Assurance
- Safety
- Permits
- Construction Limits
- Equipment & Materials Furnished by Others
- Provisions for Future Work
- Work by Others
- Submittals
- Off Site Storage
- Codes
- Certificates and Inspections
- As-Built Drawings

PART 2 - MATERIALS
- Barricades, Signs, and Warning Devices

PART 3 - EXECUTION
- Maintenance of Site and Building Access/Egress
- Continuity of Existing Traffic/Parking and Traffic Control
- Survey and Staking
- Utility Locates
- Protection and Continuity of Existing Utilities
- Protection of Existing Work and Facilities
- Stormwater/Excavation Water Management

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

31 20 00 – Earthmoving
31 22 16.15 – Roadway Subgrade Preparation
31 23 16.14 – Trenching
31 25 00 – Erosion Control
32 11 23.33 – Dense Graded Base
32 12 16.13 – Hot Mix Asphalt Paving
32 17 23 – Pavement Markings
32 31 13 – Chain Link Fences and Gates
32 92 19 – Seeding
33 40 00 – Storm Drainage Utilities

REFERENCED ORGANIZATIONS
Abbreviations of organizations referenced in these specifications are as follows:

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
EPA	Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
WDNR	State of Wisconsin Department of Natural Resources
WISDOT	State of Wisconsin Department of Transportation

REFERENCED DOCUMENTS

Where reference is made to WisDOT or SSHSC in this specification it shall mean the pertinent sections of the Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction (SSHSC), current edition, and all supplemental and interim supplemental and interim specifications.

Where reference is made to the SSSWC, it shall mean pertinent sections of the Standard Specifications for Sewer and Water Construction (SSSWC) in Wisconsin, current edition.

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.

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.

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 DFD Project Representative. In no case shall construction activities extend beyond state property lines or construction easements.

The Contractor shall 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 DFD Project Representative.

WORK BY OTHERS

Coordinate work under this project with work by Owner and other contractors on the site.

SUBMITTALS

Refer also to the General Conditions and Division 1.

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, provide 6 copies of each submittal. Submit to project architect/engineer (A/E) unless otherwise directed by DFD Project Representative at the Pre-Construction Meeting.

OFF SITE STORAGE
Refer to Division 1.

In general, the 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 the DFD Project Representative, 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 A/E or other third party in the Contract Documents. Deliver originals of certificates and documents to the DFD Project Representative within 3 days; provide copies to the A/E. Include copies of the certifications and documents in the O&M Manual.

AS-BUILT DRAWINGS
DFD will provide the Contractor with a suitable set of Contract Documents on which daily records of changes and deviations from contract shall be recorded.

At completion of the project, the Contractor shall submit the marked-up as-built drawings to the A/E prior to final payment.

PART 2 – MATERIALS

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 3 - EXECUTION

MAINTENANCE OF SITE AND BUILDING ACCESS/EGRESS

Unless otherwise shown or directed, maintain existing access and egress to the 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 the DFD Project Representative.

CONTINUITY OF EXISTING TRAFFIC/PARKING AND TRAFFIC CONTROL
Refer also to Section GR - General Requirements.

Do not interrupt or change existing traffic, delivery, or parking without prior written approval from the DFD Project Representative. 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 and WISDOT.

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.

SURVEY AND STAKING

A/E will provide benchmarks and control points for the project as requested by the Contractor if information is available and not already shown on the plans.

Contractor shall be responsible for transferring benchmarks, control points, lines and grades to the project site as necessary to complete work.

UTILITY LOCATES

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

Contractor shall include the costs for ***ALL*** underground utility locates in their bid. Locates shall include excavation, backfill, survey and pictures of existing utilities within the construction limits. Survey information shall include size, elevation, GPS location, materials and height and width of utility. Locates shall be authorized by DFD Project Representative.

PROTECTION AND CONTINUITY OF EXISTING UTILITIES

Verify the locations of any water, drainage, gas, storm sewer, sanitary sewer, electric, telephone/communication, fuel, steam lines, chilled water or other utilities and site features which may be encountered in any excavations or other sitework. All lines shall be properly underpinned and supported to avoid disruption of service.

Do not interrupt or change existing utilities without prior written approval from the DFD Project Representative, affected utilities and users. Notify all users impacted by outages a minimum of 48 hours in advance of outage. Notification shall be provided in writing and describe the nature and duration of outages and provide the name and number of Contractor's foreman or other contact.

Any service connections encountered that are to be removed shall be cut off at the limits of the excavation and capped 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 the DFD Project Representative immediately. Correct all damages at no cost to Owner.

STORMWATER/EXCAVATION WATER MANAGEMENT

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

Pits, trenches within building lines and other excavations shall be maintained free of water.

Provide trenching, pumping, other facilities as needed to control stormwater runoff and excavation water.

Notify Architect/Engineer if springs or running water are encountered in excavation; provide discharge by trenches, drains, pumping to point outside of excavation. Provide information to Architect/Engineer of points and areas that water will be discharged.

Implement stormwater runoff and drainage control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas during construction.

END OF SECTION

SECTION 31 20 00
EARTHMOVING
BASED ON DFD MASTER SPECIFICATION DATED 09/01/2015

PART 1 - 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 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quantities

PART 2 - MATERIALS
- Earth Fill
- Granular Fill

PART 3 - EXECUTION
- General
- Topsoil Removal
- Excavation
- Placing and Compacting Material
- Grading
- Clean Up

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:
Section 30 05 00 – Common Work Results For All Exterior Improvements
Section 31 22 16.15 – Roadway Subgrade Preparation
Section 31 23 16.13 – Trenching
Section 31 25 00 – Erosion Control
Section 32 91 13 – Soil Preparation

REFERENCE STANDARDS

American Society for Testing and Materials (ASTM):

D1557	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
D2922	Standard Test Methods for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
D3017	Standard Test Method for Water Content of Soil and Rock In-Place by Nuclear Methods (Shallow Depth)
D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

QUANTITIES
Finished topsoil depth shall be as specified in Section 32 91 13 – Soil Preparation or 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.

If onsite grading, 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.

Contractor shall notify the DFD Project Representative immediately if geotechnical information, existing grades, or proposed grades shown on the drawings appears to be inaccurate.

PART 2 - MATERIALS

EARTH FILL

Use clean material consisting of inorganic soil or a mixture of inorganic soil and rock, stone or gravel. The material shall be free of topsoil, sod, stumps, wood, asphalt, concrete, debris, and other deleterious material. The maximum dimension of any material shall not exceed 2' in any direction.

GRANULAR FILL

Clean material meeting the requirements of "Grade 1" or "Grade 2" granular backfill as defined in WisDOT Section 209.2.1.

PART 3 - EXECUTION

GENERAL

Complete earthwork excavation for elevation changes, utility trenches, minor structures and building foundations 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 and as shown on the plan relative topsoil removal and storage.

Coordinate topsoil stockpile locations with Owner and other contractors working onsite.

Remove all topsoil from proposed locations of buildings, structures, roads, walks and other paved areas. Also, remove topsoil from proposed lawn or turf areas where the proposed elevation exceeds the existing elevation by 1' or greater, or where fill will be placed.

Stockpile reusable topsoil for use in restoration. Salvaged topsoil shall not be removed from the site without prior approval of the DFD Project Representative.

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 the drawings. Allow for placement of fill, base course, pavements, and topsoil as required by the drawings and other Contract Documents.

Transfer lines and grades as shown on the drawings.

Excavate areas to provide positive drainage. Contractor shall notify the DFD Project Representative immediately if the final proposed elevations shown on the drawings do not provide drainage away from buildings, structures, roads, walks and other paved areas.

Remove excess and spoil material from the site in a timely fashion.

Do not excavate below design grades without prior authorization by the DFD Project Representative.

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 the drawings and other Contract Documents.

Fill type shall be as indicated on Table 31 20 00 -2, or as shown on the drawings.

Do not place fill on areas consisting of organic soil, debris or soft and yielding material.

Do not place fill on frozen or muddy areas.

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.

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 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.

Table 31 20 00 -2

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density [(a)]
Areas within 10’ of Existing or Proposed Building or Structure Footing or Slab	Granular Fill	12”	90% Modified	60%
Turf Areas	Earth Fill	12”	85 % Modified	50%

(a) Minimum relative density as determined by ASTM D-4253 for coarse-grained soils with less than 15% by mass passing the No. 200 (75-μm) sieve. Applicable only when minimum proctor compaction cannot be achieved.

GRADING

Grading shall include areas necessary to establish new grades as required, additional areas disturbed by construction activities, storage, equipment including all trenching, where excess fill is deposited and where cutting is required.

New grades are designed to produce desired configuration of site and do not represent a balance between cut and fill.

Excavated materials shall be disposed of by contractor at a suitable off-site location. Contractor shall be responsible for securing suitable disposal site(s) and for all off-site disposal costs.

Grades not indicated shall be uniform levels or slopes between point elevations as shown. Adjust all grades as necessary to provide positive drainage away from structures.

Grades for earthwork shall not deviate from established elevations, as shown in excess of 1 inch unless otherwise directed by DFD Project Representative.

Do all cutting, filling, compacting fill, rough grading required to bring entire project to within respective base course elevations or 6 inches below finished topsoil elevations.

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.

END OF SECTION

SECTION 31 22 16.15
ROADWAY SUBGRADE PREPARATION
BASED ON DFD MASTER SPECIFICATION DATED 12/30/2022

PART 1 - GENERAL

SCOPE
The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete pavement subgrade preparation and provide a surface ready for constructing and supporting the Dense Graded Base, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work. Included are the following topics:

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:
Section 30 05 00 – Common Work Results For All Exterior Work
Section 03 30 00 – Cast-In-Place Concrete
Section 31 20 00 – Earthmoving
Section 31 23 16.13 – Trenching
Section 31 25 00 – Erosion Control
Section 32 11 23.33 – Dense Graded Base
Section 31 11 26.17 – Pulverized and Re-Laid Pavement

REFERENCE DOCUMENTS
Where these specifications do not cover portions of the work to be undertaken, the SSHSC in Wisconsin, current edition, shall govern the work.

SUBMITTALS
Submit product information for the following: geotextile fabric and geogrid.

QUALITY ASSURANCE
The Contractor shall conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents either by retaining the services of an independent construction materials testing consultant or with internal certified testers. The materials testing consultant shall meet the requirements of ASTM E329.

The A/E and Contactor's construction materials testing personnel shall observe all proof-rolling operations. The DFD Project Representative shall also be informed of all proof-rolling operations. Provide minimum of 48 hours confirmed notice for all parties.

PART 2 - MATERIALS

BREAKER RUN AGGREGATE

Crushed stone, rock or gravel meeting the requirements of either 3-inch Dense Graded Base material as defined in WisDOT Section 305 with no greater than 5% of the material passing the No. 40 sieve.

RECYCLED AGGREGATE AND PAVEMENT

Recycled or salvaged aggregate and pavement products shall be free of organics, clay, rocks greater than 3-inches in least dimension and all other deleterious materials. The successful Bidder may submit specifications for these materials for consideration by the A/E for use on the project as part of the submittal process following contract award.

GEOGRID

Geogrid shall meet or exceed the physical properties of WisDOT Type SR as specified in WisDOT SSHSC Section 645. Contractor shall include 600 square yards of geogrid in the lump sum base bid to be placed at the discretion of the DFD representative. Geogrid shall be placed on a skimmed layer of 1 ¼" base aggregate dense, above the 3" breaker run; then topped with the remaining 1 ¼" base aggregate dense. Additional quantity of geogrid, if required, will be paid at the unit price included in the base bid. Similarly, if less geogrid is required, the lump sum bid shall be adjusted accordingly utilizing the provided unit price.

GEOTEXTILE FABRIC

Fabric shall be insect, rodent, mildew, and rot resistant woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. All fabric shall have the minimum strength values in the weakest primary direction. Fabric shall conform to WisDOT Section 645.2.8.

PART 3 - EXECUTION

PREPARATION

Review drawings and prepare work plan and schedule. Coordinate any necessary interruptions in site access with DFD Project Representative, in accordance with other specification sections.

Remove topsoil from work area. Sawcut and remove pavement from work area as indicated on the drawings. Sawcuts shall be made for the full depth of pavement.

Grade roadways and parking areas to drain water away from buildings.

EXCAVATION

Excavate to elevations and dimensions as shown on the drawings and as necessary to complete construction. Excavations shall be sufficiently deep to provide for depth of base course and pavement.

Stones over 6-inches in size shall be removed from the loosened portion of the subgrade.

Notify DFD Project Representative if correction of unauthorized excavation or over-excavation is necessary. Said excavations will be corrected by placement of Breaker Run Aggregate. Contractor will be responsible for all costs associated with correcting these excavations.
Segregate the various materials excavated. Excavated material that does not meet the requirements of backfill and excess excavated material, shall be removed from the site and disposed by the Contractor, unless directed otherwise by other specification sections or the DFD Project Representative.
Locate spoil piles so they do not interfere with public travel, adjacent landowners or other construction activities.

PREPARING THE FOUNDATION

The subgrade shall be constructed to have a uniform stability throughout. Use of recycled and salvaged aggregate and pavements shall be fully incorporated into subgrade soil. Construct the foundation to the required elevation with equipment and methods adapted for the purpose. Shape and compact to provide a smooth foundation, at required density, and at the proper elevation to receive the Dense Grade Base (See Section 32 11 23.33).

Compact material to minimize settlement and avoid damage to structures, pipes, utility lines and other features. Hand-place and compact material as necessary.

It is the responsibility of the Contractor to provide all necessary compaction equipment and other grading equipment that may be required to obtain a subgrade that satisfies the conditions of a satisfactory subgrade as defined below. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

The prepared foundation shall be tested for compaction as defined in the paragraph entitled 'Subgrade Approval / Proof Rolling'.

SUBGRADE APPROVAL / PROOF ROLLING

Prior to undercutting or excavating below subgrade (EBS) or placing any Dense Grade Base (See Section 32 11 23.33), contact the DFD Project Representative to schedule inspection of the subgrade and proof rolling of the subgrade. All proof rolling shall be completed in accordance with the requirements of the paragraph entitled 'Quality Assurance' and shall meet the criteria as defined below.

To complete proof rolling, entire pavement 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.

Proof rolling shall be accomplished in a series of traverses parallel to the centerline of the driveway, street, or parking area. The truck shall traverse the length of the street or parking area once for each 12' of width at speeds less than 5 mph. Additional passes along the traverse shall be completed as directed by the DFD Project Representative 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.

UNDERCUTTING/EXCAVATION BELOW SUBGRADE (EBS)

Undercutting/EBS shall be completed only when directed by the DFD Project Representative or if unsatisfactory subgrade, as defined above, is observed. The Contractor shall not be compensated for any unauthorized undercutting/EBS. Measure and document undercut areas and depths in consultation with DFD Project Representative.

Contractor shall include 200 Cubic Yard of Undercutting/EBS in the lump sum base bid. Areas of Undercutting/EBS shall be filled to subgrade with compacted Breaker Run Aggregate as specified above. Additional quantity of Undercutting/EBS, if required, will be paid at the unit price included in the base bid. Similarly, if less Undercutting/EBS is required, the lump sum bid shall be adjusted accordingly utilizing the provided unit price.

Excavate undercut areas to the depth specified by A/E or DFD Project Representative using equipment with smooth cutting edge. Excavated undercut material that does not meet the specifications for fill needed elsewhere on site shall be removed from the site and legally disposed.

Undercut areas shall be backfilled with Breaker Run (or with a combination of Breaker Run and Geotextile Fabric or Geogrid) in maximum of 9 inch thick lifts (compacted). Breaker Run shall be compacted to 90% Modified Proctor dry density. If geotextile fabric or geogrid is used, install per the requirements of WisDOT SSHSC Section 645.

Following installation and compaction of place Breaker Run material, the area shall be subject to the work defined in the paragraph entitled 'Subgrade Approval / Proof – Rolling'.

Undercutting/Excavation Below Subgrade (EBS) work shall include all materials, labor, equipment and supervision necessary to remove the soils from the Project Site considered to be poor from the proof roll and backfill and compact with Breaker Run material brought to the Project Site. EBS shall be measured in its original position. The cost of the compacted Breaker Run material is incidental to the unit price item for Undercutting/Excavation Below Subgrade (EBS). If Geogrid is required and is used in combination with the Breaker Run, the unit price for Geogrid shall include all materials, labor and equipment for installation.

RESTORATION

Roll all pavement subgrade surfaces using a smooth drum roller to promote an impervious surface and minimize percolation of water into the subgrade.

END OF SECTION

SECTION 31 23 16.13
TRENCHING
BASED ON DFD MASTER SPECIFICATION DATED 5/19/2025

PART 1 - 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:

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:
Section 02 32 00 – Geo Technical Investigation
Section 30 05 00 – Common Work Results for All Exterior Improvements
Section 31 20 00 – Earthmoving
Section 31 25 00 – Erosion Control
Section 33 40 00 – Storm Drainage Utilities

REFERENCE STANDARDS
American Society for Testing and Materials (ASTM):

D422	Standard Test Method for Particle Size Analysis of Soils

D4318	Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
D1557	Standard 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
D3017	Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods
E329	Standard Specifications for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

QUALITY ASSURANCE

The Contractor shall conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents either by retaining the services of an independent construction materials testing consultant or with internal certified testers. The materials testing personnel shall meet the requirements of ASTM E329.

The Contractor's construction materials testing personnel shall complete material testing as outlined in Table 31 23 16.13-1:

Table 31 23 16.13-1

Material	Test Required	Test/Sample Frequency
Bedding/Initial Cover	D2922 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test / 500 lf trench
Backfill Material	D2922 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test / 500 lf trench

SUBMITTALS

Provide grainsize analysis for bedding and backfill materials.

Provide copies of all material field testing reports completed for the project to the DFD Project Representative and the AE within 48 hours of completing the individual tests. Along with each individual test result, provide a running spreadsheet of all individual test results.

PERMITS/FEES

Contractor shall be responsible for obtaining all permits necessary to complete trenching work. Contractor shall pay all fees associated with obtaining permits. These include, but are not limited to permits to work within right-of-way.

PART 2 – MATERIALS

CRUSHED STONE CHIPS

Pipe 18" Diameter or Less:

Clean material meeting the requirements of "3/8" Crushed Stone Chips" as defined in Section 8.43.2(a)1 of the SSSWC, except that the gradation shall be as shown herein. If used for pipe bedding, Crushed Stone Chips shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1/2 inch	100%
3/8 inch	85 – 100%
No. 4	10 – 30%
No. 8	0 – 10%
No. 16	0 – 5%

Pipe Over 18" Diameter:

Clean material meeting the requirements of "3/4" Crushed Stone Chips" as defined in Section 8.43.2(a)2 of the SSSWC, except that the gradation shall be as shown herein. If used for pipe bedding, Crushed Stone Chips shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1 inch	100%
3/4 inch	90 – 100%
3/8 inch	20 – 55%
No. 4	0 – 10%
No. 8	0 – 5%

CRUSHED STONE SCREENINGS

Crushed stone shall be 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 the SSSWC. If used for pipe bedding, Crushed Stone Screenings shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1/2 inch	100%
No. 4	75 – 100%
No. 100	10 – 25%

BEDDING SAND

Sand shall meet the requirements of "Bedding Sand" as defined in Section 8.43.2(c) of the SSSWC. If used for pipe bedding, Bedding Sand shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1 inch	100%
No. 16	45 – 80%
Material finer Than No. 200	2 – 10%

CRUSHED STONE

When crushed stone is required to affect soil stability or drainage it shall meet the gradation requirement below.

Sieve Sizes	Percent Passing by Weight
2-1/2 inch	100%
2-inch	90-100%
1-1/2 inch	35-70%
1-inch	0 – 15%
½ inch	0 – 5%

UTILITY COVER MATERIAL

Material that is to be used around and over the pipe and above the pipe bedding shall be termed utility cover material. The utility cover material for pipe shall be the same as the bedding material.

PART 3 – EXECUTION

PREPARATION

General Contractor shall excavate and backfill the following utilities in accordance with this section:

-Storm sewer piping.

Review drawings and prepare work plan and schedule. Coordinate any necessary interruptions in utility service with DFD Project Representative, in accordance with other specification sections.

Test pits, potholes or other means used to verify the location of existing underground facilities that are shown on the plans are considered incidental to utility installation.

Remove topsoil from work area. Saw cut and remove pavement from the work area. Remove excavated materials throughout the day. Deliver imported materials as needed throughout the day. Locate bedding, backfill and spoil piles in accordance with all governing safety requirements, and do not interfere with public travel, adjacent landowners or other construction activities.

The same trench may not obstruct more than one street at one time without an approved traffic control plan and posted detour in accordance with Section 30 05 00 Common Work Results for All Exterior Work.

DRAINAGE PROTECTION

Prevent surface drainage from entering utility excavations and trenches. Shape area to direct water away from excavation or trench with diversions such as berms, or ditches. If drainage must cross the excavation or trench, use culverts or other structure to minimize water entering the excavation or trench.

EXCAVATION

Excavate to elevations and dimensions necessary to complete construction. Excavations shall be sufficiently deep to provide for bedding beneath pipes and structures and as otherwise required to complete the work as shown. Excavations shall be sufficiently wide to provide for compaction equipment along the side of the pipe and the sidewall of trench or inside wall of trench box, shield or shoring.

The Contractor shall provide all trench soil retention, trench boxes, sheeting and/or bracing needed to protect the work, existing property, utilities, pavement, and existing improvements, and to provide safe working conditions in the trench. Removal of any trench soil retention, sheeting and/or bracing from the trench shall not disturb pipe bedding and cover on new or existing utilities. Sheeting and bracing shall be removed unless specific permission to leave it in place is given by the DFD Project Representative.

The Contractor shall not excavate soil or impact the area of influence for structure foundations or footings. Notify DFD Project Representative and A/E immediately if foundations or footings are undermined, cracked, damaged or appear unstable.

Unless noted on the drawings, the Contractor shall remove all vegetation along the full width of the trench before beginning excavation. Vegetation and soil containing organic material, rock or boulders larger than 6 inches in diameter shall not be used for trench backfill. Unless otherwise specified, surplus material shall be the property of the Contractor and shall be disposed of at Contractor's cost.

Trench excavation shall be backfilled when the Contractor is not working in the trench. If trench cannot be backfilled due to progression of work, fence shall be installed and extend the full length of open trench on all sides. Fence shall be 4-foot high orange snow fence securely fastened to supports.

UNSTABLE TRENCH BOTTOM

Notify DFD Project Representative if trench bottom consists of unstable soil, organic material, debris or other undesirable material. When this condition arises, the excavation shall be carried to such depth as directed by the A/E. Undercut backfill shall be installed and mechanically compacted to replace the excavated materials to trench bottom subgrade.

BEDDING AND UTILITY COVER MATERIAL

Excavate trench to depth and alignment of proposed utility lines and grades, allowing for required amount of bedding material. Excavation shall be reasonably free of water prior to placement of bedding material. Bedding material shall be shaped to conform to bell of pipe, fittings and structures.

If unstable soils are adjacent to bedding and cover material in trench wrap bedding and utility cover material in geotextile fabric. Where sheet piling/shoring is abandoned between unstable soil and trench wall geotextile fabric may be omitted.

Bed pipes and place utility cover material for the utility and pipe type being installed in accordance with detail drawings and the depth and compaction requirements specified in table 31 23 16.13-2 . After placing pipe, support during placement and compaction of initial utility cover material.

Compaction of utility cover material for pipe and fittings shall be accomplished using hand tools and vibratory plate or tamping type walk behind compactors.

BACKFILL AND COMPACTION

Backfilling shall not begin until excavation is cleaned of trash and debris.

After initial cover material is placed and compacted, backfill and compact trenches using the material specified in Table 31 23 16.13 – 2. Take care to minimize settlement and avoid damage to new and existing structures, pipes, utility lines and other features during backfill placement and compaction. Place backfill simultaneously on all sides of structures. Moisture condition backfill material as necessary to achieve density required for given use. Do not place material on frozen surfaces or use frozen material.

Backfill trenches from the top of utility cover material to subgrade below pavements, base course, and topsoil as required by the drawings. Where final restoration will be delayed backfill trench to match existing grade and maintain surface drainage patterns. Wedge around structures that extend above existing grade with compacted soil or pavement to match the existing surface.

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.

Table 31 23 16.13-2

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density [(a)]
Bedding Materials Beneath Utilities	Crushed Stone Chips, Crushed Stone Screenings, or Bedding Sand (as required in Division 33)	6”	95% Modified	70%
Utility Cover – Areas Over Bedding Materials to 12” Over Utilities	Crushed Stone Chips, Crushed Stone Screenings, or Bedding Sand	6”	95% Modified	70%

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density [a]
	(as required in Division 33)			
Areas Between Topsoil and Utility Cover	Earth Backfill	12”	90% Modified	50%
Areas Between Utility Cover and Crushed Aggregate Base Course Beneath Existing or Proposed Pavement (Roads, Drives, Walks)	Controlled Backfill	12”	95% Modified	60%
Turf Areas	Earth Backfill	12”	88 % Modified	50%

(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.

GRADING

Grade areas disturbed during trench excavation and backfilling and adjacent areas as necessary to establish new grades shown on plans as soon as practicable after backfilling. If new grades are not shown on plans, grade areas to tie into the surrounding area without abrupt changes in elevations or slopes and provide drainage away from structures.

New grades are designed to produce desired configuration of site and do not represent a balance between cut and fill.

Grades for earthwork shall not deviate more than 1 inch from plan elevations unless otherwise directed by DFD Project Representative.

CLEAN UP

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 of all debris and mud.

END OF SECTION

SECTION 31 25 00
EROSION CONTROL
BASED ON DFD MASTER SPECIFICATION DATED 02/17/2016

PART 1 - 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:

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:
Section 02 41 13 – Demolition
Section 30 05 00 – Common Work Results For All Exterior Improvements
Section 31 20 00 – Earthmoving
Section 31 22 16.15 – Roadway Subgrade Preparation
Section 31 23 16.13 – Trenching

Provide erosion control in accordance with the following references:

- Erosion Control Product Acceptability List (“PAL”), current version as published by the WisDOT.
- Construction Site Erosion & Sediment Control Technical Standards, current version as published by the Wisconsin Department of Natural Resources WDNR.
- Storm Water Post-Construction Technical Standards, current version as published by the WDNR.

Method of measurement and basis of payment sections in any referenced erosion control documents shall not apply to this contract.

REFERENCE DOCUMENTS
Wherever PAL appears in this specification, it shall mean the Wisconsin Department of Transportation, Erosion Control Product Acceptability List (PAL), current edition.

SUBMITTALS

Submit shop drawings for the following erosion control features: geotextile fabric, erosion mat/blanket and staples,

EROSION CONTROL PLAN

The A/E has prepared an erosion control plan for the project. The Contractor will provide the A/E with any modifications to the erosion control plan that are necessary due to the Contractor's means and methods of construction.

Contractor shall comply with all the requirements of the erosion control plan.

Contractor shall provide all erosion control measures necessary as noted in the drawings and defined in the specifications to protect property and the environment

PART 2 – MATERIALS

GENERAL

Erosion mats, soil stabilizers, and tackifiers shall be listed on the Wisconsin Erosion Control Product Acceptability List (PAL) as published by the Wisconsin Department of Transportation.

When the design or contract includes permanent erosion control or stormwater control features, the contractor may employ these items in his control of erosion and stormwater during his construction activities. However, these items shall be fully cleaned, restored, and in every way fully functioning for its intended permanent use prior to acceptance of the work.

GEOTEXTILE FABRIC

Type FF geotextile fabric meeting the requirement of the PAL shall be used for inlet protection.

Type HR geotextile fabric as specified in WisDOT Section 645.2.2.7 shall be used beneath all rip rap installation.

TEMPORARY DITCH BARRIERS

Rectangular bales of hay or straw, tightly bound with twine, not wire. Anchor stakes shall be "T" or "U" steel posts, or hardwood, 2-inches by 2-inches nominal. Rebar shall not be used for anchor bales.

Temporary ditch checks meeting the requirements of the PAL and installed per the manufacturer's instructions may be used in lieu of bales. Temporary ditch checks may also be classified as silt logs, silt logs, or wattles. Temporary ditch checks shall be American Excelsior, Erosion Tech, Western Excelsior, or approved equal.

SILT FENCE

Fence fabric shall comply with the requirements of Standard Specifications for Highway and Structure Construction 628.2.6, in 3 foot tall rolls, with 4' tall 2" x 2" nominal cross section hardwood posts spaced a maximum of 10' o.c. Silt fence shall be Mirafi, Trevira, Amoco, CFM, or approved equal.

EROSION MAT

A light duty, organic mat encased in a light weight photodegradable or biodegradable netting on both the bottom and top sides. Erosion mat shall comply with the requirements of Class I; Type A erosion mat as defined by Standard Specifications for Highway and Structure Construction and the PAL. Erosion mat shall be American Excelsior, Erosion Control Systems, North American Green, or approved equal.

STAPLES

Use biodegradable staples in accordance with manufacturer's recommendations for anchoring urban erosion mats. Acceptable anchoring devices are listed in the PAL. Wood and metal staples are not allowed for use with urban erosion mats.

RIPRAP
Riprap shall be the class specified in the plan and shall conform to Standard Specifications for Highway and Structure Construction 606.2. If a class is not specified in the plan, medium riprap shall be used.

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.

PART 3 - EXECUTION

GENERAL
Install erosion control measures as required by the 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 DFD Project Representative of additional erosion control features that are provided, but not shown on the plan.

Contractor shall provide all erosion control measures necessary to protect property and the environment. Perform all work in accordance with manufacturer's instruction where these specifications do not specify a higher requirement.

GRADING AND EARTHWORK
Install all temporary or permanent erosion control measures prior to any onsite grading or land disturbances.

Clear only those areas designated for the placement of improvements or earthwork before placement of the 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 the year when erosion hazards are minimal.

Do not clear the site of topsoil, trees, and other natural ground covers before the commencement of construction. Retain natural vegetation and protect until the 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) for the protection of disturbed areas and soil piles which will remain unfinished 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.
For permanent riprap installations as indicated in the plans, install riprap and geotextile fabric in accordance with WisDOT Section 606.3 of the SSHSC.

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 A/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 the 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 the site or receiving facility.

TRACKING CONTROL

Provide each entrance to the site with a stone tracking pad. Tracking pad shall be constructed 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. Untreated wash water shall not be discharged to storm sewers or surface water bodies.

MAINTENANCE

Inspect all erosion control measures within 24 hours of the end of each rainfall event that exceeds 0.25" 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 records of all inspections and any remedial actions taken.

Maintain stockpile stabilization measures as necessary after rainfall events and heavy winds. Replace tarps, re-seed, and reapply mulch, tackifiers 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 they become ineffective.

Remove 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.

END OF SECTION

SECTION 32 11 23.33
DENSE GRADED BASE
BASED ON DFD MASTER SPECIFICATION DATED 12/30/2022

PART 1 - GENERAL

SCOPE
The work under this section consists of constructing a dense graded base using crushed stone or crushed gravel. The Contractor may also use crushed concrete, reclaimed asphaltic pavement, reprocessed material, or blended material. The work under this section shall provide a surface ready for constructing and supporting the Concrete or Asphalt Pavement.

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:
Section 03 30 10 – Cast In Place Concrete for Site Work
Section 30 05 00 – Common Work Results For Exterior Work
Section 31 22 16.15 – Roadway Subgrade Preparation
Section 32 12 16.13 -- Hot Mix Asphalt Paving

REFERENCE STANDARDS
American Society for Testing and Materials (ASTM):

D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods
E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

QUALITY ASSURANCE

Provide coarse aggregates from WisDOT approve sources as specified in WisDOT Section 106.3.4.2 of the SSHSC for department approved aggregate sources. List of current sources can be found on the department's website at:

https://wisconsindot.gov/pages/doing-bus/eng-consultants/cnslt-rsrces/tools/appr-prod/default.aspx

Sources not on the approved list can submit contractor quality test results to the engineer for review and acceptance. All testing must conform with WisDOT specifications, and be within 5 years for pits and 3 years for quarries.

The Contractor shall conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents either by retaining the services of an independent construction materials testing consultant or with internal certified testers. The materials testing personnel shall meet the requirements of ASTM E329.

The Contractor's construction materials testing personnel shall complete material testing as outlined in Table 32 11 23.33-1.

Table 32 11 23.33 -1

Material	Test Required	Test/Sample Frequency
1¼-inch Base Aggregate Dense	D6913 Standard Test Methods for Particle-Sized Distribution (Gradation) of Soils Using Sieve Analysis	1 test/3,000 TONS placed
Breaker Run (Less than 5% by weight passing No. 40 Sieve)	D6913 Standard Test Methods for Particle-Sized Distribution (Gradation) of Soils Using Sieve Analysis	1 test/3,000 TONS placed

SUBMITTALS

Provide copies of all material testing reports completed for the project within 48 hours of completing the individual tests. Along with each individual test result, provide a running spreadsheet of all individual test results.

PART 2 - MATERIALS

DENSE GRADED BASE

Use dense graded base 1 1/4-inch. Provide aggregate conforming to WisDOT Section 301.2 of the SSHSC for crushed stone, crushed gravel, crushed concrete, reclaimed asphaltic pavement, reprocessed material or blended material. Material gradations shall conform to WisDOT Section 305.2.2 of the SSHSC unless specified elsewhere in the contract documents.

BREAKER RUN

Use breaker run 3-inch. Provide aggregate conforming to WisDOT Section 301.2 of the SSHSC for crushed stone, crushed gravel, crushed concrete, reclaimed asphaltic pavement, reprocessed material or blended material. Material gradations shall conform to WisDOT Section 305.2.2 of the SSHSC unless specified elsewhere in the contract documents.

PART 3 - EXECUTION

CONSTRUCTION

Preparing the Foundation

Refer to Section 31 22 16.15 – Roadway Subgrade Preparation.

Placing Aggregate

Construct base as specified in WisDOT Section 305.3 of the SSHSC. Compact each base layer, including shoulder foreslopes, with equipment specified in WisDOT Section 301.3.1 of the SSHSC.

Use standard compaction conforming to WisDOT Section 301.3.4.2 of the SSHSC, unless otherwise specified herein. Final shaping of shoulder foreslopes does not require compaction.

Construct the base to the width and section the drawings show. Shape, and compact the base surface to within 0.04 feet of the drawing elevation.
Ensure there is adequate moisture in the aggregate during placing, shaping, and compacting to prevent segregation and achieve adequate compaction. Moisture condition base as necessary to achieve required density as determined by ASTM D1557.

Excavation shall be reasonably free of water prior to placement of base. Do not place dense graded base on frozen surfaces or use frozen material.

Maintain the base until paving over it, or until the DFD Project Representative accepts the work, if paving is not part of the contract.

COMPACTION
Compacting Aggregate

If using a pneumatic roller, do not exceed a compacted thickness of 6 inches per layer. For the first layer placed over a loose sandy subgrade, the Contractor may, with A/E approval, increase the compacted layer thickness to 8 inches. If using a vibratory roller, do not exceed a compacted thickness of 8 inches per layer.

Compact the base until there is no appreciable displacement, either laterally or longitudinally, under the compaction equipment. Route hauling equipment uniformly over previously placed base. Compact each layer before placing a subsequent layer. If the material is too dry to readily attain the required compaction, add water as necessary to achieve compaction.

CLEANUP
After the project is completed, thoroughly clean up all debris which may have accumulated during the placement of dense graded base and breaker run, if placed. All storm sewer manholes, inlets, and trench drains within the project area shall be inspected in the presence of the DFD Project Representation, the Owner Agency, and the A/E to confirm there is no accumulated debris. The Contractor shall ensure the manholes, inlets, and trench drains are free of water and debris prior to inspection by the parties noted above. Any accumulated debris in the manholes, inlets, and trench drains shall be removed and properly disposed of by the Contractor.

Replace or repair as required, all surfaces and/or landscape features damaged or disturbed under this item of work.

END OF SECTION

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SECTION 32 12 16.13
HOT MIX ASPHALT PAVING
BASED ON DFD MASTER SPECIFICATION DATED 12/30/2022

PART 1 - 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 1 - GENERAL
- Scope
- Related Work
- Reference Documents
- Quality Assurance
- Submittals

PART 2 - MATERIALS
- Recycled Products and Materials
- Hot Mix Asphalt (HMA) Pavement
- Tack Coat

PART 3 - EXECUTION
- Preparation
- Hot Mix Asphalt (HMA) Pavement

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.

Related Work Specified Elsewhere:
Section 30 05 00 – Common Work Results for all Exterior Work
Section 31 22 16.15 – Roadway Subgrade Preparation
Section 32 11 23.33 – Dense Graded Base

REFERENCE DOCUMENTS
Where reference is made to WisDOT or SSHSC in this specification it shall mean the pertinent sections of the Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction (SSHSC), current edition, and all supplemental and interim supplemental and interim specifications.

QUALITY ASSURANCE
The Contractor is to conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents by retaining the services of an independent construction materials testing firm acceptable to DFD. Contractor must maintain a quality control program in accordance with WisDOT SSHSC Section 701 General QMP Requirements and Section 460.2.8 Quality Management Program to ensure that the asphalt produced meets the specified mix design and plan requirements.

The Contractor’s construction materials testing personnel must complete non-destructive nuclear density testing as outlined in Table 32 12 16.13-1. Test results shall be provided to A/E and DFD Construction Representative within 24 hours of being completed. All densities shall meet the requirements outlined in WisDOT SSHSC Subsection 460.3.3

Table 32 12 16.13 - 1

Layer	Test/Sample Frequency
Lower	*1 random tests/5000 SF placed*
Upper	*1 random test/5000 SF placed*

If density is below specified amount, submit proposed corrective action to DFD Project Representative. Corrective action may consist of removal and replacement of deficient pavement or reduced payment, as agreed to by the DFD Project Representative.

SUBMITTALS

Provide HMA pavement mix design reports for all mix designs to be used on the project. All mix designs shall meet the requirements outlined in WisDOT SSHSC Sections 450 and 460, and shall be listed on the current WisDOT Approved Mix Design List.

Provide copies of all material field testing reports completed for the project to the DFD Project Representative and the AE within 48 hours of completing the individual test. Along with each individual test result, provide a running spreadsheet of all test results.

PART 2 – MATERIALS

RECYCLED PRODUCTS AND MATERIALS

The Wisconsin Department of Administration, Division of Facilities Development (DFD) strongly encourages the use of recycled materials and products containing recycled materials. Bidders and Contractors may submit specifications for recycled materials and products containing recycled materials for consideration by the DFD for use on the project as part of the submittal process following the contract award.

HOT MIX ASPHALTIC (HMA) PAVEMENT

Provide HMA pavement thickness and type as indicated on the plan and conforming to the requirements of WisDOT SSHSC Section 450 and Section 460. Utilize the same material type throughout the paving operation unless noted elsewhere on the drawings. Ensure all asphaltic materials provided under this section conform to the requirements of WisDOT SSHSC Section 455 and as revised in any current Supplemental Specifications. Mixtures shall be as follows:

- Binder Course: Mixture 3 MT 58-28 S
- Surface Course: Mixture 4 HT 58-28 H

TACK COAT

Apply tack coat at a minimum rate of 0.05 gallons per square yard to the lower layer(s) of HMA pavement surface prior to placing upper layer(s) of HMA pavement, unless otherwise noted. Apply at rate of 0.07 gallons per square yard where tack coat is being applied to a milled surface or other hard rigid surface. The surface shall be clean and dry prior to tack coat application. Tack coat shall require a minimum asphalt content of 50% and meet all other requirements of the WisDOT SSHSC Section 455.

PART 3 – EXECUTION

PREPERATION

All existing asphaltic concrete pavement removals, including driveway removals, shall be saw cut to the limits designated as pavement removal on the contract drawings or to the limits staked by the Engineer in

the field. Typically, all pavement sawcuts shall be parallel or perpendicular to the centerline of the roadway

HOT MIX ASPHALT (HMA) PAVEMENT

Complete all work under this section to WisDOT SSHSC Section 450 and Section 460. Provide HMA layer thicknesses as shown on the drawings. If the drawings do not indicate HMA layer thicknesses, the minimum thickness of the HMA lower layer shall not be less than 1-3/4 inches (12.5 mm nominal aggregate size) and the minimum thickness of the HMA upper layer shall not be less than 1-1/2 inches (9.5 mm nominal aggregate size).

END OF SECTION

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SECTION 32 17 23
PAVEMENT MARKINGS
BASED ON DFD MASTER SPECIFICATION DATED 09/01/2015

PART 1 – GENERAL

SCOPE
The work under this section consists of providing all work, materials, labor, equipment, and supervision necessary to provide and install pavement markings as provided for in these specifications and on the drawings. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Submittals

PART 2 - MATERIALS
- Pavement Markings

PART 3 - EXECUTION
- Pavement Markings

RELATED WORK
Applicable provisions of Division 01 govern work under this Section.

Related Work Specified Elsewhere:
Section 30 05 00 – Common Work Results For All Exterior Improvements

SUBMITTALS
Submit the manufacturer specifications for each pavement marking. The submittal for each material shall include the following at a minimum:

- Pavement Marking Material and Manufacturer
- Color and Batch Number
- Date Manufactured (Material more than one year old will not be accepted)
- Manufacturer Name and Address.

PART 2 – MATERIALS

PAVEMENT MARKINGS

Furnish **paint** pavement markings conforming to WisDOT Section 646.2 as specified in the drawings.

PART 3 – EXECUTION

PAVEMENT MARKINGS
Prepare surface to receive markings and install them in accordance with WisDOT Section 646.3.

Apply pavement markings at the locations and to the dimensions and colors as shown on the drawings. If not otherwise specified, marking lines shall be yellow and have a minimum width of 4 inches.

Apply pavement markings at a rate per the manufacturers recommended application rate based on the temperature and surface material.

END OF SECTION

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SECTION 32 31 13
CHAIN LINK FENCING AND GATES
BASED ON DFD MASTER SPECIFIATION DATED 10/01/12

PART 1 - GENERAL

SCOPE
The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide a fully functioning fence and gate installation as provided for in these specifications and on the drawings.
Included are the following topics:

RELATED WORK
Applicable provisions of Division 1 govern work under this Section.
30 05 00 – Common Work Results for All Exterior Work

REFERENCE

Unless otherwise specified in these specifications or otherwise shown on the drawings, conform all work under this section to Section 616.2.3 of the Wisconsin Department of Transportation, Standard Specifications for Road and Bridge Construction, current edition.

SUBMITTALS

Manufacturer's product literature and catalog cuts of materials:

- Chain link fencing
- Coating specifications and test certifications
- Gate (each size)
- Accessories

Shop Drawings (for fence and each gate size)

- Dimensions
- Elevations/heights
- Footings
- Attachments

Provide manufacturer's installation instructions and warranties, where applicable.

Warranty

CONTINUITY OF EXISTING SECURITY FENCING

Do not interrupt or change existing security fencing without prior written approval from the engineer. When interruption is required coordinate the 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, drainage, gas, sewer, electric, drainage, gas, sewer, electric, telephone or steam lines 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 to the Owner and Engineer.

PART 2 – MATERIALS

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 plans or specified. The designated height of the fence shall be the fabric height.

LINE POSTS

Line posts may not be driven posts.

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

All steel items used shall be galvanized, aluminum or zinc aluminum alloy coated.

FABRIC

Provide 9 gauge aluminum coated, two (2) inch mesh fabric, with barbed (twist) selvage on the top and on the 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

Furnish materials in accordance with the following schedules for the fence height specified:

SCHEDULE OF FENCING MATERIALS

TYPE AND HEIGHT	POST TYPE	SIZE O.D. (IN)	MIN. WALL THICK (IN)	MIN. SECT MODUL (IN^3)	MIN. YIELD STRENGTH (PSI)	MIN. WGT (LBS/ FT.)	MAX. POST SPACE (FT.)
Line Posts	SCH 40 Pipe-Steel	1.90	0.145	0.326	25,800	2.72	8
SEVEN	Sch 40 Pipe-Steel	2.375	0.154	0.560	25,800	3.65	10
FEET	SCH 40 Pipe-Alum.	1.90	0.145	0.326	25,000	0.93	8
	Sch 40 Pipe-Alum.	2.375	0.154	0.560	25,000	1.26	10
	Pipe-Steel	1.90	0.110	0.260	45,000	1.94	10
	Square-Steel	2.0x2.0	0.102	0.466	42,000	2.72	10
	Square-Aluminum	2.0x2.0	0.110	0.470	29,000	0.94	10
Corner and	SCH 40 Pipe-Steel	2.375	0.154	0.560	25,800	3.65	--
Brace Posts	SCH 40 Pipe-Alum.	2.375	0.154	0.560	25,000	1.26	--
SEVEN	Pipe-Steel	2.375	0.095	0.373	45,000	2.31	--
FEET	Pipe-Steel	1.90	0.120	0.281	45,000	2.28	--
OR LESS	Square-Steel	2.0x2.0	0.102	0.466	42,000	2.72	--
	Square-Aluminum	2.0x2.0	0.110	0.470	29,000	0.94	--
	Formed-Steel	3.5x3.5	0.134	0.932	35,000	5.14	--
Rails and	SCH 40 Pipe-Steel	1.66	0.140	0.235	25,800	2.27	--
Braces	SCH 40 Pipe-Alum.	1.66	0.140	0.235	25,000	0.78	--
	Pipe-Steel	1.66	0.085	0.156	45,000	1.43	--
	"C" Section Steel	1.625x1.25	0.074	0.165	35,000	1.35	--

Gate Posts shall conform to manufacturer's specifications for various width gates. Minimum sizes shall be as follows:

SCHEDULE OF GATE MATERIALS

TYPE AND HEIGHT	POST TYPE	SIZE O.D. (IN)	MIN. WALL THICK (IN)	MIN. SECT MODUL (IN3)	MIN. YIELD STRENGTH (PSI)	MIN. WGT (LBS/ FT.)
GATE POSTS	SCH 40 Pipe-Steel	4.0	0.226	2.386	25,800	9.10
	Pipe-Steel	2.875	0.160	0.878	45,000	4.64
	Square-Steel	2.5x2.5	0.188	1.244	42,000	5.88
	Square-Aluminum	2.5x2.5	0.175	1.606	29,000	2.90
	Square-Aluminum	3.0x3.0	0.155	1.513	29,000	2.00
GATE FRAMES	SCH 40 Pipe-Steel	1.90	0.145	0.326	25,800	2.72
(VERTICAL/	SCH 40 Pipe-Alum.	1.90	0.145	0.326	25,000	0.93
INTERNAL)	Pipe-Steel	1.90	0.090	0.221	45,000	1.74
	Pipe-Steel	1.66	0.111	0.196	45,000	1.83
	Square-Steel	2.0x2.0	0.102	0.466	42,000	2.75
	Square-Aluminum	2.0x2.0	0.110	0.470	29,000	0.94
GATE FRAMES	SCH 40 Pipe-Steel	2.375	0.154	0.561	25,800	3.65
(TOP/BOTTOM)	SCH 40 Pipe-Alum.	2.375	0.154	0.561	25,000	1.6

GATES

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-eight inch diameter truss rods on non-welded 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, non-lift-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 ornamental tops on all posts except 3.5" x 3.5" roll formed sections. Tops shall have an opening for the top rail to pass through.

Post tops shall be fitted with a 45 degree extension arm for supporting three strands of barbed wire and with an opening for the top rail or tension wire. Extension arms shall be capable of supporting a 200 pound downward pull at the outermost end of the arm.

BARBED WIRE

Provide two (2) strand 12 1/2 gauge minimum barbed wire with 14 gauge minimum four (4) point barbs.

Galvanized wire shall conform to ASTM A-121, Class III.

Aluminum coated wire shall conform to ASTM A-585, Class II.

Aluminum alloy wire shall be 6061 conforming to ASTM B-211. Minimum tensile strength shall be 50,000 psi.

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.

GROUND RODS

Provide a one-half inch diameter six (6) foot long copper clad rod to provide a ground. Provide one (1) for each 1,000' of fence and one for each separated fence section.

CONCRETE

All concrete for post base construction shall be a five (5) bag mix and shall be mixed to obtain a low slump. Maximum aggregate size shall be one (1) inch. Two (2) percent to four (4) percent entrained air is allowed.

PART 3 - 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.

CONCRETE FOOTINGS

Excavate holes for footings to neat dimensions in firm ground to ensure the post will be centered. Remove rock or other obstructions encountered to the required depth. Use forms in unstable soil and allow them to remain in place for at least twenty-four (24) hours after concrete is poured. Backfill, after forms are removed, with suitable material thoroughly compacted in place in layers to prevent settlement.

Line footings shall be 48” deep and 10” minimum diameter.

Corner and end post footings shall be 48” deep and 18” minimum diameter.

Gate footings shall be 48” deep and 18” minimum diameter. Increase bottom diameters by 6-inches creating a bell shaped hole to prevent the gate from working the post out of the ground.

The bottom of the posts shall be six (6) inches above the bottom of the hole. Concrete bases shall be domed at the post (for drainage away from the post) and have a smooth troweled finish. Concrete footings shall cure for seven (7) days before placing tension wires.

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 Engineer.

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 nine (9) percent occurs.

Place an intermediate braced post at 660' intervals for fence with a top rail and at 1,000' 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' but more than 660' for fence with top rail, or less than 2,000' but more than 1,000' for fence with top tension wire.

POST BRACING ASSEMBLY

Post bracing assemblies consist of one (1) or more brace rails and a three-eighths (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 (1) 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 (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. Attach to posts with heavy duty pressed steel or malleable iron bands spaced at fifteen (15) inches o.c.

GROUND RODS

Connect at least three (3) fence wires to the ground rod by clamping, bolting or brazing. Ground rod shall be installed on line with fence.

Install ground rods as specified for each run of fence and install additional rods for each 1,000' on long runs of fence.

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.

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 fourteen (14) inches o.c. and on rails

and bottom tension wires at not more than twenty-four (24) inches o.c. Where a top tension wire is installed, fasten to the fabric at not more than eighteen (18) inches o.c.

Repeat stretching operations at approximately every 100' 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 Engineers approval.

GRADE CLEARANCE

For security fence installations, install the fence with 1 inch minimum and 2 inch maximum clearance.

GATES

Install gates plumb and level and adjust for smooth operation as intended, without binding or hanging up.

BARBED WIRE

Install barbed wire properly fastened to the rampart arms.

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

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SECTION 32 92 19
SEEDING

Based On DFD Master Specification Dated 09/09/2025

PART 1 - GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete lawn seeding, mulching, and lawn maintenance operations. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Submittals
- Quality Assurance
- Soil Testing
- Delivery, Storage, and Handling
- Installation Schedule
- Job Conditions
- Warranty

PART 2 - PRODUCTS
- Lawn Seed
- Water
- Topsoil
- Sand
- Fertilizer
- Mulch
- Erosion Control Measures
- Amended Topsoil

PART 3 - EXECUTION
- Site Preparation
- Soil Preparation
- Placing Topsoil
- Soil Amendments and pH Adjustment
- Fertilizer Amendments
- Seeding
- Mulching
- Cleaning and Repair
- Maintenance
- Seeding Acceptance

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 31 25 00 - Erosion Control
Section 32 91 19 – Soil Preparation

REFERENCE STANDARDS

Association of Official Seed Analysts (AOSA)

SUBMITTALS

Provide copies of all quality assurance testing reports:

Soil-testing: For native topsoil, stockpiled/stored topsoil, and imported topsoil

Topsoil Description: Contractor to provide a written description and quantity of topsoil required; as native or imported, or a breakdown of each, prior to performing landscape work on the site.

Provide product data, including applicable analytical data, for required topsoil amendments including:

Organic Compost

Fertilizer

Proposed Fertilizer to be submitted prior to purchase

Fertilizer Label: Contractor to provide tag from product packaging

Proposed Seed Mix to be submitted prior to purchase

Seed Mix Label: Contractor to provide seed analysis tag from product packaging

Request for Inspection

Seeding Maintenance Log

SOIL TESTING

The Contractor shall retain the services of an independent soil-testing laboratory to conduct testing and analysis of existing, salvaged/stockpiled, and imported topsoil. The selection of the soil-testing laboratory shall be subject to approval by the Architect/Engineer.

Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated, and that specializes in types of tests to be performed.

The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be approved by the Architect/Engineer. A minimum of three representative samples shall be taken, per-acre. Samples shall be taken from varied locations to test topsoil for all landscape planting types proposed in the Contract Documents.

The Contractor shall be responsible for scheduling soil tests and shall take into account the time period needed by the soil testing laboratory to conduct tests, to process the samples, and to publish the results and recommendations, and the time needed by the Architect/Engineer to approve submittals and amendments recommended. This is typically at least a two-month process. Contractor is responsible for coordinating all testing and reporting tasks without adversely affecting the project schedule.

Contractor is responsible for paying for all costs related to testing of soil samples.

Soil Analysis: For each un-amended topsoil sample, submit for approval by the Architect/Engineer a soil analysis and a written report by a qualified soil-testing laboratory, stating existing percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; harmful material; pH; and mineral and plant-nutrient content of the soil.

Topsoil testing methods shall comply with ASTM D5268, Standard Specification for Topsoil Used for Landscaping Purposes.

Report suitability of tested soil to support turf and plant growth.

Based on the test results, provide written recommendations for soil treatments and amendments to be incorporated to support turf and plant growth. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients; and soil amendments to be added to topsoil. Report presence of harmful salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such harmful materials are present, provide recommendations for corrective action.

The DFD Construction Representative, in consultation with the Architect/Engineer, reserves the right to reject improperly amended native topsoil or imported topsoil that does not meet the quality assurance

specifications. If rejected, Contractor is responsible for costs of replacement, and/or amendment, and re-testing of topsoil to provide topsoil that will support turf and plant growth.

DELIVERY, STORAGE, AND HANDLING

Seed shall be delivered to the site in its original, unopened container, labeled as to weight, analysis and manufacturer. Store any seed delivered in a manner safe from damage from heat, moisture, rodents, or other causes. Any seed damaged after acceptance shall be replaced by the Contractor at his / her expense.

INSTALLATION SCHEDULE

Seed during one of the following periods:

Spring Installation: May 1 to Mid-July
Fall Installation: September 1 to Mid-October
Dormant Seeding: only permitted upon written approval by DFD Construction Representative and Architect/Engineer

Coordinate installation periods with on-going maintenance requirements throughout sodding operations.

Weather Limitations: Proceed with seed installation only when existing and forecasted weather conditions permit. No seeding shall occur on frozen ground or at air temperatures lower than 32^{o} F. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

JOB CONDITIONS

During construction, protect all structures, utilities, sidewalks, pavements, and other facilities and existing and newly installed vegetated areas from damage at all times. All vegetation damaged during construction shall be treated, repaired or replaced with new material as necessary, to restore to the original condition.

Work areas shall be kept clean and orderly during the installation period. Under no condition shall debris from planting activities result in a safety hazard on-site or to adjacent off-site property.

WARRANTY

Contractor shall warranty the establishment of a satisfactory seeded lawn for a minimum of one growing season after date of Seeding Acceptance. This assumes the Owner performs required maintenance (i.e. regular watering) after the Contractor's maintenance period is completed. Contractor shall inform Owner when required maintenance has concluded.

Satisfactory seeded lawn: At end of the warranty period, a healthy, uniform, and dense stand of grass has been established per Lawn Seeding Acceptance below.

Contractor shall re-seed and maintain lawn areas that do not comply with requirements until lawns are satisfactory at the Contractor's expense.

Contractor shall provide an additional period of lawn maintenance following any actions needed to re-seed per the warranty requirements at the Contractor's expense.

Damage to vegetated and lawn areas incurred as a result of warranty replacement operations shall be repaired by Contractor at no cost to Owner.

During the Warranty Period, damage to lawn areas not caused by Contractor shall be excluded from Warranty. Such damage shall include ruts caused by driving vehicles over lawns, excavation and backfill work in lawn areas, damage from animals, or acts of vandalism or extreme weather conditions. Where evidence of such damage exists, advise Owner in writing, stating location, cause and extent of damage. Owner, upon receipt of such notice may order Contractor to correct damage at Owner's expense to exclude damaged area from Warranty provisions and correct damage by any arrangement deemed by Owner in his/her best interest.

PART 2 - PRODUCTS

LAWN SEED

Fresh, clean, dry, new seed that meets or exceeds the minimum requirements of purity and germination stated on an independent certificate of seed analysis document according to the Association of Official Seed Analysts (AOSA) rules.

Do not use wet seed or seed that is moldy or otherwise damaged. All seed packaging shall include a seed tag that contains: the name of the seller, the lot number, seed varieties with purity and germination percentages, as well as percentage of other crop seed, weed seed, noxious weeds and inert material. Variety Not Stated (VNS) seed is not permitted.
Seed shall have been test within the last 9 months and contain the following properties:

Purity	>90%
Germination	>85%
Other Crop	<0.5%
Weed Seed	<0.5%
Noxious Weeds	None
Inert Matter	<8%

Annual ryegrass shall not be permitted in lawn seed mixtures, except as a temporary cover for erosion control.

Select a high-quality lawn seed mixture that is adapted to the local site conditions and intended use of the turf, that is contains seed types fitting within one of the following percentages:

For Sunny areas (higher levels of maintenance), proportioned by weight as follows:

Kentucky Bluegrass / Fine Fescue / Perennial Ryegrass Blend

- 60 percent Kentucky bluegrass (at least three varieties)
- 20 percent fine fescue including Chewings fescue, creeping red fescue, or hard fescue
- 20 percent perennial ryegrass

For Sun and Partial Shade areas, proportioned by weight as follows:

Kentucky Bluegrass / Fine Fescue / Perennial Ryegrass Blend

- 40 percent Kentucky bluegrass (at least two varieties)
- 40 percent fine fescue including Chewings fescue, creeping red fescue, or hard fescue
- No more than 20 percent perennial ryegrass

WATER

Water to be free of wastewater effluent or other hazardous chemicals. Contractor shall be responsible for watering of seeded areas until a uniform and substantial stand of grass is achieved.

TOPSOIL

Naturally fertile, agricultural soil, classified as sandy loam to silty loam, capable of supporting turf and plant growth; of uniform composition throughout, without admixtures of subsoil, free of clay lumps, stones larger than 1” diameter, roots, trash and debris of any kind.

Soil-testing results shall indicate that topsoil falls within the following acceptable ranges, or can be amended to conform to the following requirements:

- pH between 5.5 -7.0
- USDA classification loam, sandy loam, clay loam
- Phosphorous (P) between 6-10 ppm
- Potassium (K) between 51-100 ppm
- Organic Matter between 5-8%
- C:N Ratio between 12:1 to 15:1
- Soluble Salts in the range of 0-2 dS/m
- Moisture Capacity of greater than 15%

SAND

Particles of natural or manufactured rock that will pass through a No. 4 sieve, and be retained on a No. 200 sieve; clean, washed, and free of toxic materials.

FERTILIZER

Fertilizer: Granular product composed of not less than fifty (50) percent slow-acting, guaranteed analysis fertilizer. All fertilizers shall be delivered fully labeled according to applicable regulations, bearing name and trade name or trademark of producer.

Starter Fertilizer: shall be composed of nitrogen, phosphorus and potassium with higher phosphorus ratio than found in maintenance fertilizers.

Maintenance Fertilizer: shall have nutrient ratios of nitrogen, phosphorus, and potassium to support any deficiencies indicated by soil-testing analysis.

All fertilizers shall be delivered fully labeled according to applicable regulations, bearing name, trade name or trademark of producer, along with producer's warranty.

MULCH

Straw Mulch: Provide air-dry, clean, mildew and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

Hydro Mulch: wood fiber mulch with or without tackifier.

EROSION CONTROL BLANKET

100% biodegradable weed free wood excelsior, straw, or coconut-fiber mat enclosed in a biodegradable netting stitched with biodegradable thread/yarn, (biodegradable within 12 months of installation) or net free. Include manufacturer's recommended steel wire staples, 6" long or biodegradable anchoring staples, T shaped with barbed head and shoulders, 6 inches. Wisconsin DOT approved Class 1 Type B Urban erosion mat or similar are acceptable. Biodegradable materials are intended to avoid entrapment of animals. Erosion mat shall be American Excelsior-Curlex Net-Free, Erosion Control Blanket-S32BD, Western Excelsior-Excel SS-2 All Natural, Ero-Guard EG-25 (NN), Erosion Tech ETRS2BN or approved equal.

EROSION CONTROL FIBER MESH

100% biodegradable twisted jute mesh. Include manufacturer's recommended steel wire staples, 6 inches long or biodegradable anchoring staples, T shaped with barbed head and shoulders, 6 inches.

AMENDED TOPSOIL

Topsoil amended in accordance with recommendations from the soil testing analysis.

PART 3 - EXECUTION

SITE PREPARATION

During construction, protect all structures, utilities, sidewalks, pavements, and other facilities and existing and newly installed vegetated areas from damage at all times.

Delay grading and spreading topsoil if unfavorable weather conditions may result in washouts or loss of material.

SOIL PREPARATION

Newly graded subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

Existing vegetated areas: If seeding occurs in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:

Remove existing vegetation. Do not mix vegetation into surface soil. Loosen existing topsoil to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

Rough grade areas to within 1 inch of subgrade elevations. Areas shall be graded to a smooth uniform surface plane with loose, uniformly fine texture. Areas shall be restored if eroded or otherwise disturbed after rough grading is complete.

PLACING TOPSOIL

Areas to be seeded shall have a minimum of 4 inches of topsoil of existing, amended or imported topsoil, but not less than required to meet finish grades after light rolling and natural settlement. Do not spread topsoil if subgrade is frozen, muddy, or excessively wet.

If required topsoil depth is greater than 6 inches, topsoil shall be installed in lifts. Moisten the topsoil surface between lifts. Allow water to thoroughly percolate through and settle and dry before rolling and placing the next lift.

Limit fine grading to areas that can be seeded in the immediate future. After finish grading, restore any eroded or otherwise disturbed areas before sodding.

Do not place topsoil on top of saturated or frozen subgrade soil.

SOIL AMENDMENTS AND pH ADJUSTMENT

Provide lime, sand, or other soil amendments as recommended by soil-testing analysis. If topsoil has been determined acceptable by a soil test, no amendments are needed.

Uniformly apply recommended soil amendments and incorporate into the top 4 to 6 inches of soil by tilling or disking.

FERTILIZER AMENDMENTS

Provide fertilizer amendments as recommended by soil-testing analysis. If topsoil has been determined acceptable by soil-testing, no fertilizer amendments are needed except in the case of lawn seeding where starter fertilizer is required.

Apply starter fertilizer to surface of finely graded topsoil.

SEEDING

Methods of seed installation may vary at the discretion of the Contractor in order to establish and guarantee a smooth, uniform quality lawn. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

Install seed mixes at manufacturer’s recommended rates.

Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

Alternative methods of seeding or hydroseeding may be proposed in writing by Contractor and must be approved by the A/E.

Dormant seeding may be proposed in writing by Contractor and must be approved by the A/E.

MULCHING

Protect seeded areas by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

Provide seed stabilization measures erosion blanket to prevent erosion or displacement of soils and seed on steep slopes. The use of plastic netting is prohibited.

Alternative methods of mulching or hydromulching may be proposed in writing by Contractor and must be approved by the A/E.

CLEANING AND REPAIR

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 landscape areas shall be repaired.

MAINTENANCE

Contractor to provide regular watering, weeding, pest management, and trash removal services for all newly seeded areas for a period of 60 (sixty) days after the date of seeding acceptance, at which time maintenance duties will be taken over by the Owner.

Contractor shall provide a temporary irrigation system or import water via watering truck as often as necessary to maintain moist soil to a depth of at least 2 inches. Seed installation shall be watered unless natural rainfall precludes the need for specific visits. During periods of hot weather (higher than 80º-85ºF), the seed installation may need additional irrigation.

Contractor to replace any mulch and/or seed that has been blown or washed away.

Fertilizing: Apply maintenance fertilizer with a mechanical rotary or drop-type distributor approximately thirty (30) days after seed installation, at manufacturer's recommended rate, and thoroughly water into the soil.

Contractor shall remove all weeds by the roots on a bi-weekly basis. Use of herbicide for weed-control shall be requested by Contractor and allowed only with approval by Owner in writing.

Chemical applications of fertilizer or herbicides 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.

Mowing: The first mowing shall not be performed until the lawn has grown to a height of approximately 3 to 4 inches. Lawn shall be mown as often as necessary to maintain a height of 2-1/2 to 4 inches. No more than one third of the height of grass leaf shall be removed during any single mowing operation. The mowing operation is to include trimming around obstacles and the removal of excess grass clippings.

Line trimmers shall not be used around tree trunks.

Seeding Maintenance Log: Contractor shall submit a written record to the DFD Construction Representative that documents regular maintenance visits and actions performed. Failure of Contractor to provide documentation of regular required landscape maintenance duties, and resultant unsuccessful lawn establishment, will result in lawn re-seeding at full cost to Contractor per the seeding Warranty.

Contractor shall inform Owner when required maintenance period has concluded.

SEEDING ACCEPTANCE

The DFD Construction Representative and the Architect/Engineer shall perform inspections with the Contractor at the conclusion of the installation operations to verify that seeded lawn areas have been satisfactorily established.

A satisfactory installation shall meet the following requirements:

- An established root system (leaf blades break before seedlings can be pulled from the soil by hand)
- Uniform coverage throughout all turf areas with no bare spots larger than 5 inches by 5 inches
- No bare areas comprising more than 1% of any given 1,000 square foot area
- No deformation of the turf areas caused by mowing or other Contractor equipment
- Shall be free of weeds, disease and harmful pests

Request for Inspection: Contractor shall submit a request for inspection to the DFD Construction Representative and Architect/Engineer. The request shall be received at least 7 (seven) days before the anticipated date of inspection.

Contractor shall re-seed lawn areas that do not comply with requirements and continue required maintenance until lawns are satisfactory.

Any defects or imperfections appearing in whole or any part of the work caused by or due to any fault or negligence on the part of the Contractor shall be corrected before the work is accepted.

Seeding work may be accepted in stages when the Contractor and Owner deem that practice to be in their mutual interest. Approval must be given in writing by Owner to the Contractor verifying that work may be completed in stages.

Acceptance of seeding work shall not waive any provisions of the Warranty.

END OF SECTION

SECTION 33 40 00
STORM DRAINAGE UTILITIES
BASED ON DFD MASTER SPECIFICATION DATED 11/23/2021

PART 1 - GENERAL

SCOPE
The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide for the storm drainage work required in these specifications and on the drawings. The limits of the work, including the responsible party for testing purposes, shall be clearly defined on the Drawings. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Documents
- Reference Standards
- Submittals
- Provisions for Future Work
- As-Built Drawings

PART 2 - MATERIALS
- Corrugated Steel Aluminum Coated Pipe
- Apron Endwalls

PART 3 - EXECUTION
- General
- Laying Pipe
- Bedding/Utility Cover
- Apron Endwalls
- Leakage Testing

RELATED WORK
Applicable provisions of Division 1 govern work under this section.

Related work specified elsewhere:
Section 30 05 00 – Common Work Results for All Exterior Work
Section 31 23 16.13 – Trenching
Section 31 25 00 – Erosion Control

REFERENCE DOCUMENTS
Wherever WisDOT or SSHSC appears in this specification it shall be construed to mean the pertinent sections of the Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction (SSHSC), current edition, and all supplemental and interim supplemental specifications, as they may pertain, except this contract shall be a lump sum contract and measurement and basis of payment methods shall not apply.

Where these specifications do not cover portions of the work to be undertaken, the Standard Specifications for Sewer and Water Construction in Wisconsin, current edition, shall govern the work.

REFERENCE STANDARDS

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

SUBMITTALS

Provide manufacturer's product information (cut sheets), shop drawings and O&M information for storm drainage materials including:

- Pipe
- Fittings
- Outfalls

Provide reports documenting all required testing and televising.

PROVISIONS FOR FUTURE WORK

Construct storm drainage system in a manner that will facilitate future extension or connection.

AS-BUILT DRAWINGS

Show the actual locations of storm drainage facilities and service lines and structures on drawings. Show changes to proposed storm drainage facilities, alignment, or grades. Show the actual locations, sizes and types of underground utilities and other features encountered during construction.

PART 2 – MATERIALS

CORRUGATED STEEL ALUMINUM COATED PIPE

Aluminum coated pipe meeting the requirements of AASHTO M36. Minimum wall thickness shall be 16 Ga. for 12"-24" diameter pipe, 14 Ga. for 30" and 36" pipe, and 12 Ga. for 42"-54" diameter pipe.

Provide galvanized corrugated coupling bands with angle connectors having a minimum of 2 bolts. Coupling bands shall provide a joint that is soil tight.

APRON ENDWALLS

General

Provide apron endwalls where shown on the drawings and at the following locations:

- Where storm sewers outfall into ditches, swales or other surface water body
- On both ends of a culvert pipe (pipe that crosses under a road, sidewalk, trail or other surface feature)

Unless otherwise indicated, apron endwalls shall be constructed of the same material, same sidewall thickness and to the same design standards as the pipe they are connected to. Apron endwalls shall be the same diameter as the pipe that they are connected to.

Pipe ties shall be constructed using galvanized ¾" diameter steel rod and hardware, or other approved materials.

PART 3 – EXECUTION

GENERAL

Complete exploratory excavations at utility crossings as shown on the drawings and as necessary to complete the work.

Maintain clearances between existing or proposed storm drainage lines and watermains as follows:

- 8' horizontal separation (measured center to center) between existing or proposed sanitary or storm drainage lines and watermains.
- 12" vertical separation (measured from outsides of pipes) where watermains cross over sanitary or storm drainage lines.

- 18” vertical separation (measured from outsides of pipes) where watermains cross under sanitary or storm drainage lines.

Notify the A/E and DFD Project Representative of utility conflicts as soon as they are encountered.

Store and handle pipe in accordance with manufacturers’ recommendations. Keep pipes clean of soil, debris and animals.

LAYING PIPE

Install pipe in accordance with the SSSWC and ASTM specifications that 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 outside 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 drainage pipes to horizontal alignment and grade shown on the drawings with bell ends up hill. Establish and maintain horizontal alignment using total station, transit or theodolite. Discrepancies from the required horizontal alignment or grade at any location shall not be greater than 0.10’ or 0.05’, respectively.

BEDDING/UTILITY COVER

Provide bedding and utility cover in accordance with the applicable requirements of Section 31 23 16.13 – Trenching.

Where excavation extends below the bottom of the trench, bring the excavation to the required elevation by the use of compacted Crushed Stone Bedding.

A minimum of 8” of compacted Crushed Stone Bedding shall be placed below the bottom of the apron endwall.

A minimum of 6” of compacted Crushed Stone Bedding shall be placed below the storm drainage pipe and 12” of cover material shall be placed over the storm drainage pipe (both measured at the bell of the pipe).

APRON ENDWALLS

Limit the excavation for apron endwalls so as to provide only the necessary amount of space to sufficiently prepare the subgrade, set the apron endwall, and lay pipe. Provide adequate clearance for compaction equipment and operator between apron endwall and trench soil retention for adequate backfilling and compaction.

Where excavation occurs below the bottom elevation of the apron endwall bottom, bring the excavation to the required elevation by the use of compacted crushed stone bedding.

Set apron endwall in accordance with elevation and location as indicated on the drawings. Install base plumb and level.

Apron endwalls for pipe greater than 18” in diameter shall be restrained using a minimum of two pipe ties per section. Pipe ties shall also be used to restrain the first two pipes located immediately upstream of the apron endwall. Pipe ties shall be bolted through the sidewall of the pipe.

Provide riprap downstream of apron endwalls at all storm drainage outfalls and at other locations as indicated on the drawings.

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 the DFD Project Representative.

END OF SECTION