Exhibit D Specifications

DAS TH Carriage House Exterior Stair Replacement
Terrace Hill
Request for Quote RFQ940700-01

Due Thursday, October 3rd, 2024, at 2:00 PM (CT)

PROJECT MANUAL FOR:

DAS TH CARRIAGE HOUSE EXTERIOR STAIR REPLACEMENT
PROJECT # 9407.00
DES MOINES, IOWA

CONSTRUCTION DOCUMENTS
VOLUME 1 OF 1
DIVISIONS 00 – 32`
27 AUGUST 2024

MA Architecture
CERTIFIED TARGETED SMALL BUSINESS
1201 Keosauqua Way, Suite 101
Des Moines, IA 50309

Project No. 073.24
Set Number: _____

SECTION 00 01 07

SEALS AND SIGNATURES

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Licensed Professional Architect under the laws of the State of Iowa.

Name: Melinda Aust

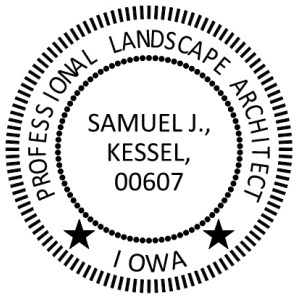
08-27-2024

Signature Date

Registration Expires: 6-30-2026 Iowa Reg No. 05898

Pages or sheets covered by this seal: G & A Series

Divisions or Sections: Division 01, 02-14 unless noted below



I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Professional Landscape Architect under the laws of the State of Iowa.

Name: Samuel J. Kessel

Signature Date 08-27-2024

Registration Expires: 06-30-2025 Iowa Reg No. 00607

Pages or sheets covered by this seal: C Series

Sections: Division 31 and 32

END OF SECTION

SECTION 00 01 10
VOLUME 1 TABLE OF CONTENTS

END OF SECTION

SECTION 00 31 32
GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 DESCRIPTION

A. Subsurface Geotechnical Evaluation Report:

1. Soil test borings were conducted at the project site by an independent soil testing company employed by the Owner. The logs of these borings and related subsurface geotechnical evaluation report are included within the Project Manual for the Contractor's reference.

B. Qualifications:

1. Soil investigation data and logs are for informational purposes only. Neither the Engineer nor Owner assume responsibility for its accuracy. Because borings cover a relatively small area of each construction site, this information is not necessarily typical of entire site.
2. Recommendations included in the subsurface geotechnical evaluation report are non-binding to the Contract. Requirements of the Contract related to soils and other materials are found in the technical specifications, divisions 31 and 32, of this Project Manual.

(a) Should differences arise between the recommendations found in the subsurface geotechnical evaluation report and the specifications, the specification shall be followed.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 00 31 32

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ALLENDER BUTZKE ENGINEERS INC.
GEOTECHNICAL • ENVIRONMENTAL • CONSTRUCTION Q. C.

June 20, 2024

Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, IA 50319

Attn: Mr. James Trower

RE: Geotechnical Exploration
DAS Terrace Hill
Carriage House Stair Replacement
2300 Grand Avenue
Des Moines, IA 50312
PN 241221

Dear Mr. Trower:

Allender Butzke Engineers Inc. (ABE) has completed the geotechnical exploration for the DAS Terrace Hill Carriage House Stair Replacement project. The geotechnical exploration was conducted to evaluate physical characteristics of subsurface conditions with respect to design and construction of this project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the borings and laboratory tests, discusses the observed subsurface conditions, and provides geotechnical engineering recommendations for this project.

PROJECT INFORMATION

DCI Group is preparing plans for replacement of an existing staircase south of the carriage house at Terrace Hill in Des Moines, Iowa. We understand the existing brick and railroad tie staircase will be replaced with a new concrete staircase possibly with a footing. An existing brick tunnel is present below the existing staircase; however, details of the tunnel were not available at the time of this report. Past site plans from 2003 showing approximate tunnel location indicate the tunnel may be 8 to 10 feet wide. We assume the bottom of the tunnel may be near the finish floor elevation of the existing carriage house which is reported to be at elevation 164.0 feet.

FIELD EXPLORATION

Two borings were conducted with hand operated equipment near the existing staircase to depths of 7 feet below existing grades on June 5, 2024. Approximate locations of the borings are shown on the enclosed Site Plan and were measured in the field from existing landmarks. The boring surface elevations, indicated on the enclosed Boring Logs, were interpolated between Light Detection and Ranging elevation contours (LiDAR). Methods of drilling, sampling, standard laboratory testing, and classifying of subsurface materials are discussed in the Boring Log Description/Legend pages of the Appendix.

SUBSURFACE CONDITIONS

Soil Profile

Detailed descriptions of soils encountered by this exploration are provided on the Boring Logs enclosed in the Appendix. The Profile of Borings (Plate A-1) presented in the Appendix depicts the relative deposit elevations in the borings. Following is a discussion of the subsurface materials encountered in the borings. Unless otherwise indicated, the depths of soil stratum and groundwater levels are referenced from below existing grade at the individual boring locations at the time of drilling.

Very dark brown sandy lean clay (CL) topsoil was present at the ground surface. The moist topsoil extended to depths of about 3 inches. Very dark brown sandy lean clay (CL) with brick fragments was present below the topsoil in Boring Nos. 1 and 2. Dark brown clayey fine to medium sand (SC) with trace amounts of gravel was present below a depth of 0.8 feet in Boring No. 2. Natural Wisconsinan glacial till soils consisting of brown lean clay (CL) with sand underlaid the fill in both borings. Below a depth of 5 feet in Boring No. 1 the Wisconsinan glacial till became very moist with trace amounts of sand. Borings terminated in medium stiff Wisconsinan glacial till near depths of 7 feet.

Groundwater Level Observations

The borings were monitored during and shortly after drilling operations to detect moisture seepage and groundwater accumulation. The results of our groundwater level observations are noted on the Boring Logs enclosed in the Appendix.

No moisture seepage or groundwater accumulation was observed These short-term water levels are not necessarily a true indication of the groundwater table. Long-term observations would be necessary to accurately define the groundwater variations at this site.

Brown-gray coloring of the Wisconsinan glacial till is an indication of past fluctuations of the groundwater in this zone. Therefore, we interpret that past seasonal high groundwater tables have been several feet below existing grades. Fluctuation of groundwater levels can occur due to seasonal variations in the amount of rainfall, surface drainage, subsurface drainage, site topography, irrigation practices, and ground cover (pavement or vegetation).

ANALYSIS AND RECOMMENDATIONS

Foundation Design

Hand probing encountered shallow (less than 4 feet deep) refusal at various locations along the entire staircase. Consistent refusal with hand operated equipment was encountered within 2 to 3 feet of the ground surface along an approximately 10 feet wide portion adjacent to the existing stair case which we assume is the existing tunnel (see following Figure No. 1 highlighting the existing tunnel). Other areas outside of the tunnel refusal was also met intermittently and may

indicate the presence of larger materials such as gravel, rubble, or other debris. Areas where hand probing encountered intermittent refusal within 4 feet are shown in the following Figure No. 1. Brick fragments and gravel were encountered in the upper 2 feet in both borings. Based on these shallower refusal depths frost-depth footings in this area may be obstructed by the existing tunnel and may encounter debris in other areas that requires removal prior to footing construction. Although not indicated by the test probing loose backfill could also be encountered surrounding the existing brick tunnel.

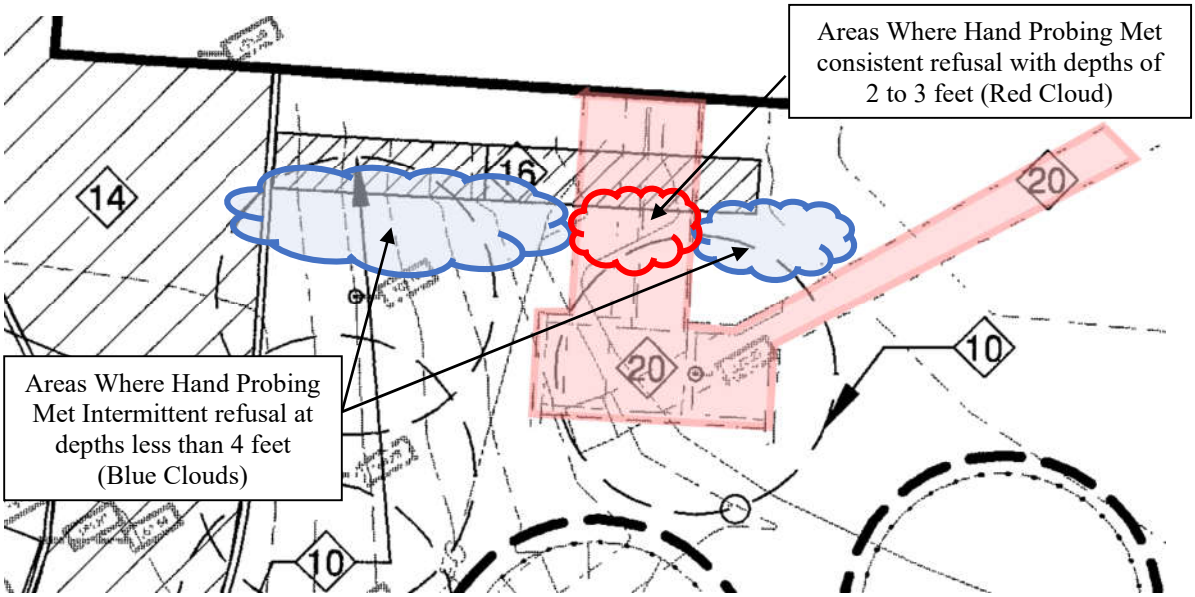


Figure No. 1 – Indicates Existing Below Grade Tunnel (Red Shaded Area), Areas where Hand Probing Met Intermittent Refusal (Blue Clouded Areas), and Areas Where Hand Probing Met consistent refusal (Red Clouded Area)

Hand probing near the tunnel encountered refusal with depths of 2 to 3 feet which we assume is the top of the tunnel (indicated by red clouded area in Figure No. 1). Therefore, frost-depth footings over the tunnel will not likely be possible. A slab-on-grade staircase or thickened slab could be considered over the existing tunnel. If loose tunnel wall backfill is present below the staircase, the stairs could experience differential settlement. The current stairs don't appear to show significant differential settlement, however, the current railroad tie and brick construction would be more flexible that a concrete slab. One option to provide more reliable support may include structurally supporting the staircase to span over the tunnel with spread footings bearing in natural soils. Care should be taken during construction so the existing tunnel is not disturbed. Due to the age of tunnel, removal and compaction of tunnel backfill may not be possible.

In our opinion, newly placed engineered compacted fill and suitable natural soils can provide adequate support for the proposed staircase. Continuous foundations bearing on suitable soils be proportioned for maximum net allowable soil bearing pressures of 1,500 pounds per square foot. We estimate long-term total settlement due to structural loads will be less than 1 inch and differential settlement may be on the order of ½ of the total settlement when foundations bear on newly placed engineered compacted fill and suitable natural soils.

Continuous foundations should be adequately reinforced to limit deflections caused by non-uniform soil support characteristics. All exterior foundations and foundations in unheated areas should be placed a minimum of 3.5 feet below final grade to provide protection against frost penetration and reduce movements associated with changes in soil moisture content although this will not be possible in areas directly above the tunnel which we understand is 2 to 3 feet below existing grade. The predominately cohesive soils and newly placed cohesive fill would be suitable for trench foundations however the granular fill encountered in Boring No.1 should be expected to cave. Footing excavations should be kept free of water accumulation to prevent softening of subgrade soils.

Observations and test probing of the foundation subgrade soils should be conducted by an ABE geotechnical engineer to determine that the soils are compatible with the design criteria. If zones of soft or otherwise unsuitable soils are encountered at foundation level, we recommend that footings be extended to bear on firmer soils or an over-excavation and compacted backfill procedure be implemented. Over-excavations should extend 9 inches laterally in each direction beyond the foundation edges for each foot of over-excavation depth.

Excavation Stability and Backfill

Boring information indicates that excavations for the proposed structures will encounter primarily cohesive soils. Granular soils could be present as backfill behind the walls of the existing tunnel and foundation walls and could also be present as sand seams within the cohesive lean clay (CL) Wisconsinan glacial till. If excavations encounter only cohesive soils with no wet sand seams or layers, it is expected that water seepage, if encountered, can be controlled by permitting it to drain into temporary construction sumps and be pumped outside the perimeter of the excavations.

The extent of bracing or sloping of open cut excavations will be dependent upon depth of cut, groundwater conditions, soils encountered, length of time the excavation will be open, area available for excavation and local governing regulations. Predominately cohesive soils may appear to stand nearly vertical in shallow excavations for short periods of time. However, soil creep, surcharge loads, precipitation, subsurface moisture seepage, construction activity vibrations and other factors may cause these soils to cave within an unpredictable period of time. Excavations encountering sand and/or loose fill may tend to cave rapidly, especially if water is flowing through them. Unstable granular excavation walls may also cause surrounding cohesive soils to become unstable. Temporary shoring, flattening of the excavation slopes or use of trench boxes may be required to maintain a safe condition. Determining the appropriate OSHA classifications of the soil types encountered and implementing the required provisions for sloping, shoring, and bracing of excavations throughout the project during construction are the responsibility of the contractor per OSHA.

The recommended degrees of compaction guidelines for backfill, depending upon anticipated future use over the area, are provided in the following Table A. For cohesive soils, moisture contents within a range of -1 to +4 percent of the material's optimum moisture content are necessary to achieve the desired fill qualities.

The on-site soils can be excavated utilizing conventional excavation equipment. Granular soils can generally be suitably compacted with vibratory compaction equipment whereas cohesive soils are more suitable for compaction with sheepsfoot or pneumatic type compactors. Care should be exercised in properly backfilling and compacting all trenches, especially utility trenches under or adjacent to the pavement. Loosely compacted or sand backfilled trenches can collect surface water and inadvertently direct it to the pavement subgrade and cause softening of the soil as well as increasing frost heave potential.

TABLE A
RECOMMENDED DEGREE OF COMPACTION GUIDELINES

Construction Application	Standard Proctor (ASTM D698) Cohesive Soil	Standard Proctor (ASTM D698) Cohesionless Soil	*Relative Density (D4253 & D4254) Cohesionless Soil
Class 1	95%	98%	70%
Class 2	90%	93%	45%
Class 3	85%	88%	20%

Class 1 - Subgrade for building foundations, slabs-on-grade, pavements and other critical backfill areas.
Class 2 - Backfill adjacent to structures not supporting other structures - Minor subsidence possible.
Class 3 - Backfill in non-critical areas - Moderate subsidence possible.

*Use Relative Density technique (ASTM D4253 & D4254) where Standard Proctor technique (ASTM D698) does not result in a definable maximum dry density and optimum moisture content.

At the time of this geotechnical exploration, moisture contents of the on-site lean clay (CL) Wisconsinan glacial till were generally near to slightly above the recommended moisture content range for compaction. Depending upon precipitation levels prior to and during construction, adjustment of soil moisture content may be required in order to lower or raise the moisture to within the recommended moisture content range. Discing and aeration is generally the most economical method to lower soil moisture content, if climatic conditions allow. Chemical modification of very moist soils with quicklime or Class C fly ash can be accomplished if construction scheduling does not permit field drying. However, since these chemicals are very fine (powder) and subject to dusting, chemical stabilization methods may not be preferred at this hospital site. Common chemical modification methods may not be reactive when temperatures are near or below 40° Fahrenheit.

Frost Heave

Key elements contributing to frost heave including freezing temperatures, available water, and fine-grained frost susceptible soils are generally present at sites in Iowa. As a result, frost heave problems are generally common (and most noticeable) in pavements or sidewalks adjacent

to non-frost susceptible elements such as manholes, light poles, and exterior doors or frost protected stoops. Frost heave can cause pavement cracks to develop parallel to and several feet from curbs. This generally occurs where cleared paved areas exposed to freezing temperatures heave more than adjoining paved areas insulated by piled snow. Areas cleared of snow not exposed to periodic sunshine during the winter, such as under canopies, on the north shaded side of buildings and other shaded areas may experience more frost heave than other sunshine exposed areas. Sometimes it is not readily apparent why frost heave problems occur at one location and not at another seemingly similar location.

While it is appropriate to implement measures to reduce frost heave such as insulation, replacing frost susceptible soils with less frost susceptible soils, void forms, sealing cracks/joints to reduce surface water infiltration, or drainage improvements (surface and subsurface), these measures may simply move the frost heave problem to a different location where preventative measures have not been implemented. Having a smooth transition between heaved and non-heaved areas is desirable, but may be difficult and/or costly to accomplish. We are available to consult with you to discuss options for your consideration to reduce frost heave potential on this project.

GENERAL

The analyses and recommendations in this report are based in part upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

It is recommended that the geotechnical engineer be provided the opportunity to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observation during earthwork and foundation construction phases to help determine that the design requirements are fulfilled.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, expressed or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions of this report modified or verified in writing by the geotechnical engineer.

The scope of our service was not intended to include any environmental assessment or exploration for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air on, below or adjacent to this site.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience.

Respectfully submitted,
ALLENDER BUTZKE ENGINEERS INC.

Seth Hansen, P.E.
Project Engineer

Matt Drummond, P.E.
Principal Engineer

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

6-20-24

Seth A. Hansen, P.E. License Number 26401 Date

My license renewal date is December 31, 2025.

Pages covered by this seal: All Pages.

1 Email Above
1 Email Terrace Hill; Attn: Molly Thompson

APPENDIX

BORING LOG DESCRIPTION/LEGEND

The material types encountered during the drilling operations were recorded on field logs. The profile represented on the Boring Log is based on final classification performed by a geotechnical engineer using the field logs, laboratory observation and testing. The material stratigraphy demarcation lines shown on the Boring Logs indicate changes in soil characteristics, however, actual soil changes or variations may occur as a gradual transition. Soil profile discussion, Log Boring information, water levels and recommendations presented in this report are based upon measured depths below ground levels existing at time of the field exploration, unless otherwise specified.

DRILLING AND SAMPLING

The borings were conducted with either a truck or all-terrain rotary drill rig using the drilling methods indicated on each Boring Log. Soil sampling and/or in-situ testing such as Shelby Tube (ST), split-spoon (SS), drive cone (DC), or core (C) was conducted at depth intervals which were selected in consideration of the characteristics of the proposed construction. Generally undisturbed soil samples are taken at 5 foot depth intervals or change in soil types. Disturbed soil samples from the auger, either jar size or bulk size samples, may be taken at intermediate intervals for the purpose of soil classification or laboratory testing. Borings conducted for soil classification only, will show no designation of sampling although disturbed sampling is performed. Soil samples obtained in the field were identified and sealed for transportation to the laboratory for performance of pertinent physical testing and engineering classification.

Drilling Methods

CFA - Continuous Flight Auger: 4, 6, or 8-inch diameter (ASTM D1452).
RD - Rotary Drilling: Using drilling fluid in cased or uncased boring (ASTM D2113).
HSA - Hollow Stem Auger: 6 or 8-inch diameter, continuous flight auger remains in boring with soil removed from the hollow stem through which undisturbed sampling is conducted.
HA - Hand Auger: 4-inch or less diameter.

Sample Types

ST - Shelby Tube: Thin-walled tube samples of cohesive soils (ASTM D1587).
SS - Split Spoon with 140 lb. manual hammer: Standard penetration test and split-barrel samples (ASTM D1586).
SSA - Split Spoon with 140 lb. automatic hammer: Standard penetration test and split-barrel samples (ASTM D1586).
DC - Drive Cone: Dynamic in-place testing of soil using a 2-inch diameter cone with a 60 degree point driven into the soil for continuous 1-foot intervals in the same manner as Split Spoon, no sample is obtained.
C - Core: Sampling hard soil or bedrock with a diamond core barrel in a rotary drill boring (ASTM D2113).
SPT - Standard Penetration Test: Number of blows required to drive sampler (split spoon or drive cone) into the soil with a 140-pound weight dropping a distance of 30-inches (ASTM D1586), number of blows recorded for each 6-inch interval in an 18-inch (or more) penetration depth, values shown are for each 6-inch interval (if series of number sets are shown) or a total of the last two 6-inch intervals (if only one number is shown) which is commonly referred to as "N" in blows per foot. High resistance is indicated by a high number of blows for a lesser penetration depth listed in inches.
BS - Bulk Sample: Disturbed.
CPT - Cone Penetration Test: Quasi-static in-place testing of soils using a 60 degree cone and friction sleeve which are steadily pushed into the soil and measure skin friction and end bearing (ASTM D3441).

STANDARD LABORATORY TESTING

Representative undisturbed soil samples obtained by the Shelby Tube sampler were tested for moisture content (ASTM D2216), density (dry) and unconfined compressive strength (ASTM D2166) in the laboratory. Results of these tests appear on the respective Boring Logs. Additional soil testing including particle size analysis (ASTM D422) and Atterberg Limits (ASTM D4318) may be conducted, if necessary, to define in more detail pertinent soil characteristics for classification in accordance with the Unified Soil Classification System. Specialized laboratory tests (if conducted) to determine pertinent soil characteristics are discussed in the "Laboratory Testing" section of the report.

WATER LEVEL MEASUREMENT

Water levels indicated on the Boring Logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with short term observations.

BORING LOG DESCRIPTION/LEGEND

DESCRIPTIVE SOIL CLASSIFICATION

Soil description is based on the Unified Classification System as outlined in ASTM Designations D-2487 and D-2488. This classification is primarily based upon visual and apparent physical soil characteristics, comparison with other soil samples, and our experience with the soil. Additional laboratory testing may be conducted, if necessary to define in more detail pertinent soil characteristics. The Unified Soil Classification group symbol shown on the boring logs corresponds with the group names listed below. The description includes soil constituents, moisture conditions, color and any other appropriate descriptive terms.

Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name	Group Symbol	Group Name
GW	Well-Graded Gravel	SW	Well-Graded Sand	CL	Lean Clay	CH	Fat Clay
GP	Poorly-Graded Gravel	SP	Poorly-Graded Sand	ML	Silt	MH	Elastic Silt
GM	Silty Gravel	SM	Silty Sand	OL	Organic Clay Organic Silt	OH	Organic Clay Organic Silt
GC	Clayey Gravel	SC	Clayey Sand			PT	Peat

RELATIVE PROPORTIONS			GRAIN SIZE TERMINOLOGY	
Descriptive Term(s) (Of components also present in sample)	Sand and Gravel % of Dry Weight	Fines % of Dry Weight	Major Component of Sample	Size Range
Trace	<15	<5	Cobbles	12 in. to 3 in. (300mm to 75mm)
With	15-30	5-12	Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Modifier	>30	>12	Sand	#4 to #200 sieve (4.75mm to 0.074mm)
			Silt or Clay	Passing #200 sieve (.074 mm)

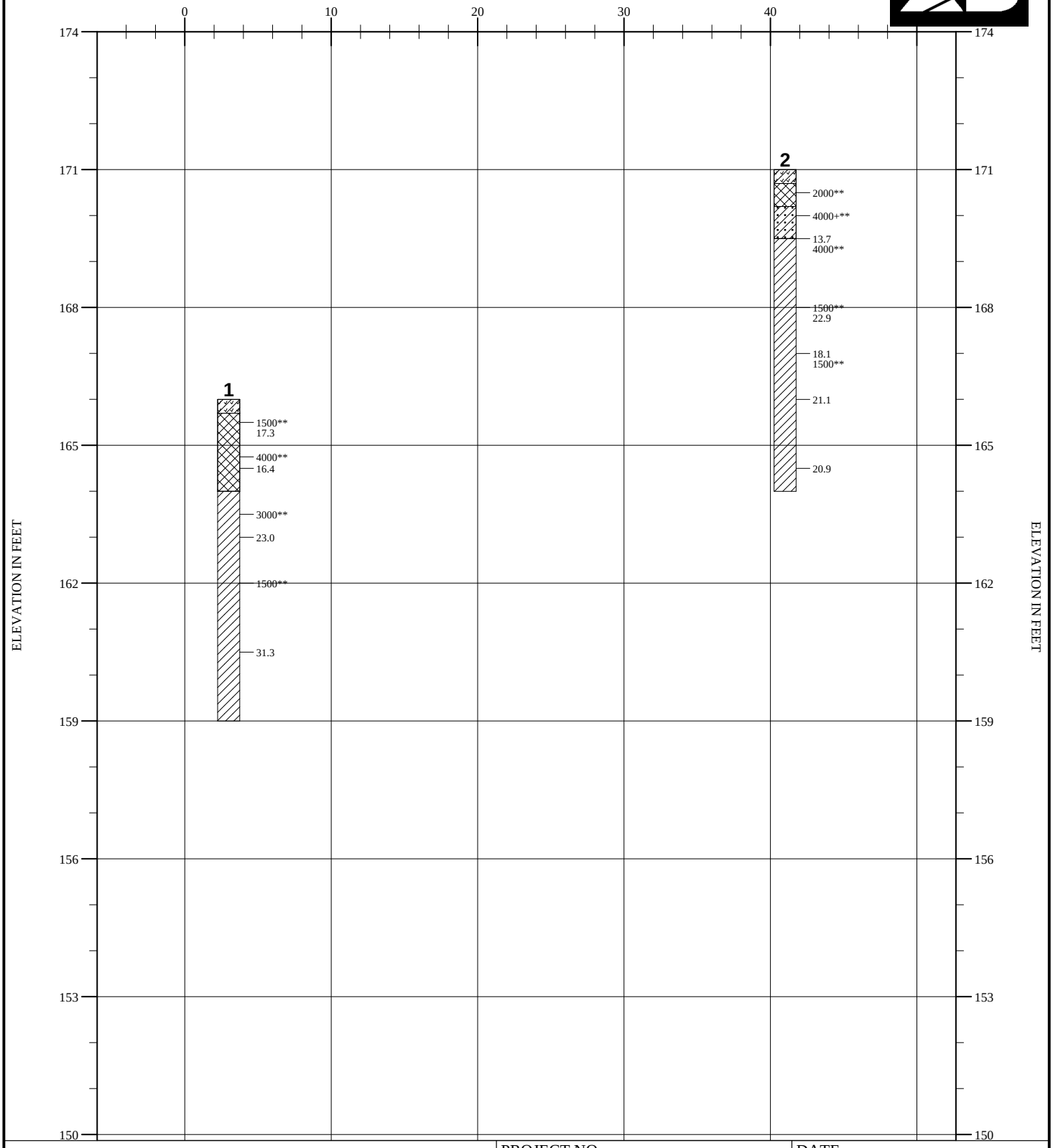
CONSISTENCY OF FINE-GRAINED SOILS			RELATIVE DENSITY OF COARSE-GRAINED SOILS	
Unconfined Compressive Strength, Qu, psf	Consistency	SPT, bpf	SPT, bpf	Relative Density
< 500	Very Soft	0-2	0-4	Very Loose
500-1,000	Soft	2-4	4-10	Loose
1,000-2,000	Medium Stiff	4-8	10-30	Medium Dense
2,000-4,000	Stiff	8-15	30-50	Dense
4,000-8,000	Very Stiff	15-30	50-80	Very Dense
8,000-16,000	Hard	30-100	80+	Extremely Dense
> 16,000	Very Hard	>100		

BORING LOG DESCRIPTION/LEGEND

ABBREVIATIONS

COMMONLY USED ABBREVIATIONS	
ft. or ' - feet	elev. - Elevation
in. or " - inches	% - Percent
psf - pounds per square foot	No. - Number
plf - pound per lineal foot	TB - Test Boring
pcf - pounds per cubic feet	N - blow count (SPT, bpf)
kip - 1000 pounds	USCS - Unified Soil Classification System
ksf - 1000 pounds per square foot	LL - Liquid Limit
klf - 1000 pounds per lineal foot	PL - Plastic Limit
tsf - tons per square foot	PI - Plasticity Index
bpf - blows per foot (SPT, N)	

PROFILE OF BORINGS



Strata symbols

- Lean Clay Topsoil
- Lean Clay Fill
- Lean Clay
- Clayey Sand

PROJECT NO.: 241221	DATE: 6/10/2024
PROJECT: DAS Terrace Hill Carriage House Stair Replacement 2300 Grand Avenue Des Moines, IA 50312	
PLATE: A-1	SCALE: 3 feet/in.

ALLENDER BUTZKE ENGINEERS, INC.

BORING LOG NO. 1

Project No.: **241221**

Project: **DAS Terrace Hill Carriage House Stair**
2300 Grand Avenue
Des Moines, IA 50312

Client: **DAS c/o DCI Group**
220 SE 6th Street, Suite 200
Des Moines, IA 50309

Surface Elevation: **166'+/-**
Datum: **Site Datum**

Date Drilled: **6-5-2024**
Drilling Depth, ft.: **7**

Drilling Method: **Hand Equipment**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Static Cone Reading Qc, tsf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
166	0				17.3		1500**	Very dark brown sandy lean clay, trace organics, moist		CL		0.3
								TOPSOIL		CL		165.7
165					16.4		4000**	Very dark brown sandy lean clay with brick fragments, moist				2
	3				23.0		3000**	**FILL**		CL		164
162							1500**	Brown lean clay, moist				
								WISCONSINAN GLACIAL TILL				
	6				31.3			Very moist after 5'				7
159								End of Boring				159
	9											
156												
	12											
153												
	15											
150												
	18											
147												
	21											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation
Time: at completion _____ hrs. _____ days
Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.
Geotechnical | Environmental | Construction Q.C.

BORING LOG NO. 2

Project No.: **241221**

Project: **DAS Terrace Hill Carriage House Stair**
2300 Grand Avenue
Des Moines, IA 50312

Client: **DAS c/o DCI Group**
220 SE 6th Street, Suite 200
Des Moines, IA 50309

Surface Elevation: **171'+/-**
Datum: **Topographic Site Plan**

Date Drilled: **6-5-2024**
Drilling Depth, ft.: **7**

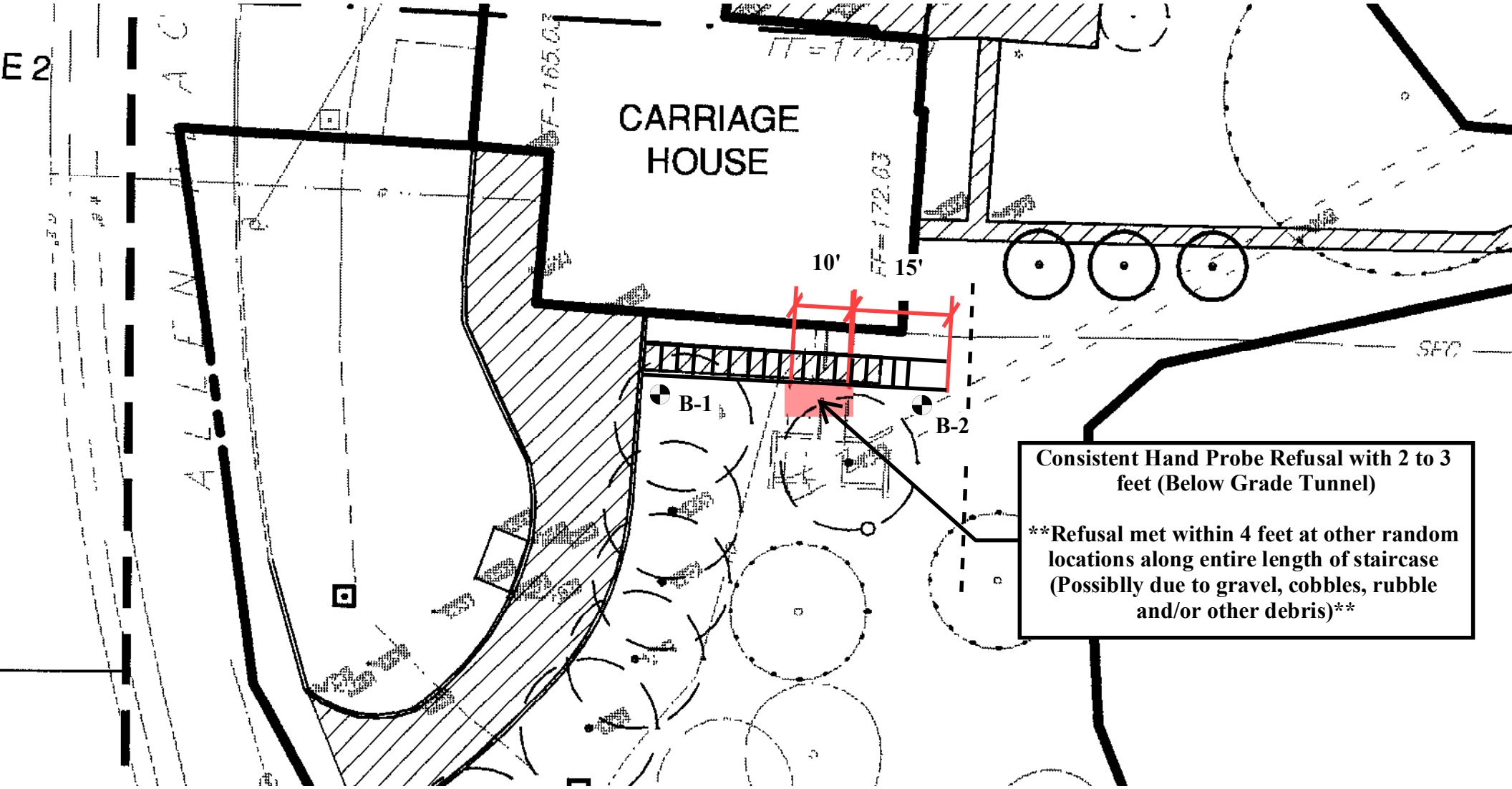
Drilling Method: **Hand Equipment**
Page: **1** of **1**

Elevation ft.	Depth ft.	Sample No.	Type	SPT bpf	Moisture Content, %	Dry Density pcf	Static Cone Reading Qc, tsf	Material Description*	Graphic Log	USCS	Water Level	Depth / Elevation ft.
171	0						2000**	Very dark brown sandy lean clay, trace organics, moist		CL		0.3
							4000+**	**TOPSOIL**		CL		170.7
										SC		1.5
					13.7		4000**	Very dark brown sandy lean clay with brick fragments, moist		CL		169.5
168	3				22.9		1500**	Dark brown clayey fine to medium sand, trace gravel, after 0.8'				
								FILL				
					18.1		1500**	Brown lean clay, moist Moist to very moist after 3'				
					21.1			**WISCONSINAN GLACIAL TILL**				
165	6											
					20.9							7
								End of Boring				164
162	9											
159	12											
156	15											
153	18											
150	21											

*The stratification lines represent the approximate boundary lines between material types: in-situ, the transition may be gradual.

Water Level Observation
Time: at completion _____ hrs. _____ days
Depth to water: **Dry** ft. _____ ft. _____ ft.

ALLENDER BUTZKE ENGINEERS, INC.
Geotechnical | Environmental | Construction Q.C.


CARRIAGE
HOUSE
10'
15'
B-1
B-2
Consistent Hand Probe Refusal with 2 to 3 feet (Below Grade Tunnel)
Refusal met within 4 feet at other random locations along entire length of staircase (Possiblly due to gravel, cobbles, rubble and/or other debris)

NOTES

SECTION 01 71 23
FIELD ENGINEERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Provide and pay for field engineering services including:

(a) Establish and continually maintain lines and levels, laid out by instrumentation, for all proposed site improvements, including:

(1) rough and finish grading
(2) pavements
(3) curbs and gutters
(4) sidewalks
(5) fencing
(6) other miscellaneous site improvements.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

1.3 QUALITY ASSURANCE

A. Entity retained by the Contractor to perform surveying or field engineering services shall be a Registered Professional of the discipline required for the specific service on the Project, licensed in the State of Iowa.

1.4 SITE CONDITIONS

A. Maintain benchmarks, monuments, and other reference points. If disturbed or destroyed, replace, or relocate by a registered land surveyor at the Contractor's expense.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01 71 23

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SECTION 02 01 10
EXISTING UTILITIES

PART 1 - GENERAL

1.1 NOTIFICATION

A. Notify public utility companies and municipalities as to which of their properties (such as pole lines, conduits, fiber optic lines, gas pipes, TV lines, cable lines, telephone lines, and sewers) must be removed or relocated to complete the work. This notice shall note the locations to where their properties could be relocated. However, no warranty is made or implied that the utility owners will remove or relocate their properties prior to commencement of construction operations or in sufficient time or manner to prevent interference with the Contractor's operations.

B. Give notice to the owners of all known utilities at least 48 hours before starting any operations affecting those properties. If during the course of his operations, the Contractor discovers utility property whose existence was not known, he shall immediately notify the owner thereof and the Engineer.

C. Construction operations adjacent to utility property shall not be commenced until arrangements satisfactory to the utility owner have been made for the protection of said property and continuation of service. Should any of the Contractor's equipment come in contact with or damage utility property in any way, even though there may be no apparent evidence of breakage or harm, promptly notify the proper authorities and cooperate with them in determining damage and restoring interrupted services as may be needed. Where contact is made with a utility, operations shall be suspended immediately, and the area vacated, until it has been determined by the utility owner that it is safe to resume operations.

1.2 COMPENSATION

A. It is understood and agreed that the Bidder has considered in the bid the relative locations of existing utilities, as shown on the Plans, and that no additional compensation will be allowed for any delays, inconveniences or damages sustained due to interference which may result from those utilities or the operations of moving them.

1.3 PRIVATE UTILITIES

A. Hire the services of a utility locator company to locate all privately owned utilities that may be disturbed by construction operations. Obtain any record information from the Owner related to existing utilities to aid in the location of all existing utilities.

1.4 CARE AND RESPONSIBILITY

A. Employ special equipment or construction methods (including hand labor, if necessary) to accomplish the work as planned adjacent to utility properties without damage thereto. At no time shall the Contractor interfere with any persons engaged in protecting or moving utility property or in the operation of the utility.

B. Assume full responsibility for reimbursing the utility owners for any damages caused to utility properties whose existence and approximate locations were made known to him before the damage was done. Nothing in this Section shall make the Contractor liable for damage to utility property located below the ground surface, in the absence of negligence, if the owner of the utility, after reasonable notice from the Contractor, fails to advise the Contractor of its location and approximate depth below the ground surface.

END OF SECTION 02 01 10

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SECTION 02 41 13
SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Provide removal of miscellaneous concrete curb and gutter, fencing (including footings and gates), brick, wood timber, stair system, shrubs, stumps and roots, vegetation, and other miscellaneous existing site features which are in the path of proposed improvements.

B. Employ a utility locating company to locate all privately owned utilities.
C. Work not included in this Section:

1.2 SITE CONDITIONS

A. Protection of Persons: Install barricades and post with warning lights.
B. Bench Marks and Monuments: Maintain bench marks and monuments.
C. Protection of Existing Property to Remain: Protect existing trees and vegetation, equipment, pavements, curbing, facilities, utilities, and structures which are in area where work will be performed and which are to remain. Repair or replace existing property which is to remain that is damaged by the work, to Owner's satisfaction, at no additional cost to the Owner.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 SITE REMOVALS

A. Site features that are to be removed or relocated are generally indicated on the Drawings. Remove and dispose of, off-site, all features and materials except for that which is permitted to remain upon determination being made by the Engineer, that their existence does not interfere with, endanger, or detract from the new construction in any way.
B. Visit the site prior to bidding; be familiar with actual conditions in the field. Extra compensation will not be allowed for conditions which could have been determined or anticipated by examination of the site, the Contract Documents, and the information available pertaining to existing soils, utilities, and other site characteristics.
C. All removal operations that may endanger new construction shall be completed prior to construction of affected work.
D. Comply with all instructions and ordinances of the State of Iowa, and all counties and municipalities regarding disposal operations, signs, traffic intersections, danger signals, barricades, fire protection, and all safety laws, ordinances, and rulings.
E. All debris resulting from the removal and demolition operations shall be disposed of, off-site, subject to any specific regulations imposed by laws, ordinances, orders, or decrees.
F. Removal of Existing Pavements and Curbing:

1. Where a portion of an existing pavement, curb, walk, or similar structure is to be retained for use, that portion shall not be damaged during removal operations.

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2. In removing pavements, curbs, and similar structures, where the cut will be exposed in the finished work, the structure shall, unless the removal is made to an existing joint and unless determining otherwise by the Engineer, be sawed along the removal lines with a concrete saw to a depth of not less than 1/3 the thickness of the pavement before breaking off the pavement. In such cases, the use of wedges, driven into the saw cut to break off the portion to be removed, will not be permitted. Elsewhere, the structure shall be cut and chipped to true lines and vertical faces.
3. All demo materials shall be removed from site unless noted otherwise.
4. Where removal of pavement will result in a finished edge or will be abut new pavement, sawcut the existing pavement edge immediately prior to paving, or at a time when damage to the sawcut edge will be minimized.
5. Pavement removals shall include underlying subbase and related materials.

G. Removal of fencing systemsand similar:

1. Removal shall include complete removal of system materials and components, including posts, footings, and other features. Unless noted otherwise, materials scheduled for removal shall not be reused.

3.2 PROTECTION OF TREES AND PLANT LIFE

A. Protection of plant life to remain within the construction limits and adjacent thereto shall include the following:

1. Orange snow fence or orange silt fence shall be placed at drip line of trees to protect against root compaction.
2. No equipment shall be allowed to move under drip line areas, nor shall any materials be stored within a drip line.
3. No toxic materials shall be dumped near trees.

3.3 CLEARING AND GRUBBING OF PLANT LIFE

A. Generally, clearing and grubbing shall be performed as necessary to construct the proposed improvements.
B. Clearing operations shall consist of cutting and removing vegetation.
C. Grubbing operations shall consist of removing and disposing of the roots and other remains. Root systems shall be completely removed.
D. Except in areas to be excavated, all depressions resulting from the grubbing operations shall be backfilled with soils as specified in Section 31 00 00 Earthwork.
E. All brush, roots and other debris or by-products resulting from the clearing and grubbing operations shall be removed from the site. If any wood is run through a chipping machine, the wood chips shall be recovered and disposed of off-site. Burying or burning of wood chips or other vegetation remnants on-site will not be permitted.

END OF SECTION 02 41 13

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SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Employ a utility locating company to locate all privately owned utilities.
2. Construction of temporary drainage piping and conveyance ways and removal and restoration following use of these temporary facilities.
3. Maintaining existing site, adjacent properties and public streets clean on a daily basis from construction caused dirt and debris.
4. Maintaining dust control during grading operations. Providing for watering of soils to control dust.
5. Provide stockpile management.
6. Stripping and stockpiling of topsoil and other soils to be reused.
7. Earthwork (cutting and filling).
8. Compacting fill and backfill.
9. Removal and replacement of unsuitable or unstable soils.
10. Dewatering of site and excavations to maintain workable conditions and to protect on-site soils from becoming unstable.
11. Excavating on-site soils or importing soils for construction of pavement subgrade, and in conjunction with dewatering operations, as needed.
12. Exporting excess, unsuitable, or waste soils from the site and importing suitable soils to the site to complete the work.
13. Pavement subgrade construction, maintenance, testing, and approval prior to placement of pavement subbase materials. Continue maintenance until pavement subbase materials are constructed.
14. Granular base or subbase under walks.
15. Spreading topsoil and importing specified topsoil as required.
16. Restoration and cleanup.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit samples of subgrade soils, proposed aggregates, sands, backfill, and fill materials to the testing laboratory at least three days prior to placement for evaluation of their suitability and determination of the optimum moisture content and maximum dry density.

1.3 DEFINITIONS

A. Backfill: Placing of approved site soil or borrow material in accordance with specified procedures and compaction to establish elevations shown for site improvements and general rough grading.

B. Borrow Material: Approved soil materials for fill, backfill, or rough grading required, from sources other than those made available by stripping of excavation of site.

C. Clearing: Removal of trees, vegetation, rubble and other unsuitable materials from the site or limits of work.

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D. Excavation: Cutting, digging and removing soil materials of every classification and of whatever substance encountered to dimensions, limits, elevation and contours shown on the Drawings.

E. Existing Site Material: Stripped and excavated material from work, of approved classification. Material must be approved by testing agency prior to placement.

F. Geotechnical Engineer: The Owner will employ and pay for the services of a soil testing and inspection service, the Geotechnical Engineer and Testing Laboratory representatives, for quality control testing of the earthwork operations. This individual or company is not the design engineer of record for the project.

G. Prepared Subgrade: Upper part of subgrade that is compacted to a greater density than lower portion of subgrade or subsoil. This material occurs beneath drives, roadways, and parking areas.

H. Pavement Area: The area within concrete or HMA pavement areas within a line one foot beyond the pavement limits and extending at a slope of 1:1 to the bottom of the excavation.

I. Rock: Rock excavation is defined to include all hard, solid rock in ledge formation, bedded deposits and unstratified masses; all-natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; and any boulder stone, masonry or concrete fragments exceeding one cubic yard in volume. Materials such a shale, hard pan, soft or disintegrated rock which can be dislodged with a power operated excavator will not be classified as rock excavation.

J. Soil Classification: Classification of soils for engineering purposes, ASTM D2487 Unified Soils Classification System (USCS) with divisions, group symbols, typical names and criteria referenced herein.

K. Stripping: Excavation and removal of topsoil, fill and any other upper layers of soils.

L. Subgrade: Subsoil in place, backfill or fill material upon which subbase, footings, or granular base are placed.

M. Subsoil: Natural soil in place on the site.

N. Topsoil: Fertile, friable, natural loam containing a liberal amount of humus and capable of sustaining vigorous plant growth. The pH value of the topsoil shall be between 5.5 and 7.5.

O. Unstable Materials: Materials which are not classified as unsuitable materials, but due to their condition of being too wet, too dry, over-compacted, are unacceptable.

P. Unsuitable Materials: Rock, loam, gumbo, mud, muck, silt, organic silty clay, peat, frozen soils, boulders, debris, rubbish, old foundations, pavements, slabs, vegetation, or highly organic soils.

1.4 JOB CONDITIONS

A. Site Information:

1. All information concerning property boundaries, ground elevations, present obstructions on or near the site, location of conduits, pipes, wires, etc., has been obtained from a source the Owner believes reliable. Present soil and subsurface conditions are documented by test boring logs included herein, however accuracy of this data is not guaranteed, and is furnished solely for the convenience of the Bidder. Use of this data is at Bidder's risk and no additional compensation will be granted because of the Bidder's lack of knowledge of the existing site.

2. Test borings and other exploratory operations may be conducted by a Bidder, at no cost to the Owner, provided the methods and operations are acceptable to the Owner.

3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult appropriate utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair any damaged utility(s) to satisfaction of utility owner.

4. Visit the site prior to bidding and be familiar with actual conditions in the field. Extra compensation will not be allowed for conditions which could have been determined or anticipated by examination of the site, the Contract Documents, and the information available pertaining to existing soils, utilities and other site characteristics.

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5. Maintain carefully, as established, temporary benchmarks, monuments, and other reference points and, if disturbed or destroyed by the Contractor, pay for replacement by a registered Engineer or Land Surveyor.

6. Locate existing underground public and private utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

1.5 QUALITY ASSURANCE

A. Employ and pay for the services of a Registered Land Surveyor to layout the Work and locate and mark associated benchmarks. Refer to Section 01 71 23 - Field Engineering.

B. The Owner will employ and pay for the services of a soil testing and inspection service (Geotechnical Engineer and Testing Laboratory) for quality control testing of the earthwork operations.

C. A Testing Laboratory representative must be present during stripping, excavation, backfilling, and compaction operations. Services which will be performed by the Testing Laboratory:

1. The Testing Laboratory will test and inspect excavations prior to any filling, to ensure that unsuitable soils have been completely removed and unstable soils have been stabilized or removed. Tests will be performed in the bottoms of the excavations to evaluate if the bearing capacity of the natural soils is at least 4,000 pounds per square foot (psf) for footings.

2. The Testing Laboratory will test and inspect excavations within paved areas, prior to any filling, to ensure that unsuitable soils have been completely removed within the upper three feet of subgrade, and unstable soils have been stabilized or removed.

3. The Testing Laboratory will test and inspect imported and on-site fill and aggregates prior to use. This will consist of sieve analyses to determine the suitability of the materials for the intended use. Once the source has been approved, the materials being delivered to the project will be tested on a regular basis to aid in evaluating their uniformity.

4. The Testing Laboratory will test and inspect fill and backfill materials, observe operations, will determine optimum use of various on-site soils, and will review and approve method of subcutting unsuitable soils.

5. The Testing Laboratory will take density tests as backfilling occurs to ensure that material is uniformly compacted to conform with the specifications. Compaction tests will be taken at an interval of at least one for every 400 cubic yards of fill placed in pavement areas. Tests will be taken at maximum vertical intervals of 2 feet of fill placed.

D. Contractor's Responsibilities:

1. Submit samples of proposed aggregates, sands, backfill, and fill materials to the Testing Laboratory at least three days prior to placement for evaluation of their suitability, and determination of the optimum moisture content and maximum dry density.

2. Inform the Testing Laboratory representative of proposed earthwork schedule at least 48 hours prior to commencing work. Do not perform earthwork operations which require inspection by the Testing Laboratory unless Testing Laboratory representative is present. Coordinate all earthwork activities with the Testing Laboratory. Allow the Testing Laboratory to test excavation bottoms prior to placing fill.

1.6

A.

PART 2 - PRODUCTS

2.1 EARTH MATERIALS

A. Pavement Area Subgrade:

1. Fill shall be free of rock, cobbles, boulders, stones larger than 2 inches, debris, rubble, lumps, wood, topsoil, organic material, fat clays, soft, frozen, or other unsuitable material.

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2. The fill may consist of on-site or imported soils.
3. Fill shall consist of organic free and debris free mineral soils, type SP, SP-SM, SM, SC, or CL with 100% passing the 2" sieve and not more than 25% passing the #200 sieve. ML, CL-ML, or CH soils shall not be used.
4. The cost of imported soils shall be included in the Bid. No additional costs will be allowed for soil import.

B. Granular Base:

1. Imported, free draining, clean sand with 100% passing the 1/2-inch sieve, with less than 50% passing the #40 sieve, and with less than 5% passing the #200 sieve.

C. Subbase

1. Subbase material shall meet Iowa DOT 4121.
   (a) Recycled HMA products shall not be used.

D. General Site Fill:

1. Fill for general areas outside the Pavement Areas be free of rock, boulders, debris, rubble, lumps, wood, topsoil, soft, or frozen material.
2. The fill may consist of on-site or imported soils.
3. Fill shall consist of debris free soils with 100% passing a 6 inch sieve. Soils shall have an organic content less than 10%.
4. The cost of imported soils shall be included in the Bid. No additional costs will be allowed for soil import.

E. Topsoil:

1. Uniform quality, free from hard clods, roots, sod, stiff clay, hard pan, stones larger than 1 inch, lime cement, ash, slag, concrete, tar residue, tarred paper, boards, chips, sticks, and any undesirable material.
2. On-site Topsoil:
   (a) Shall be screened through a 1 inch screen.
   (b) Shall be excavated from the top 12 inches of the site.
3. Compost-amended On-site Topsoil:
   (a) Amend low-quality on-site topsoil, not meeting the requirements specified for off-site topsoil, with a minimum of 1 inch of compost for every 3 inches of topsoil. Use compost meeting the requirements of mulch for pneumatic seeding in Iowa DOT Section 9010, 2.07.
4. Off-site Topsoil:
   (a) At least 3% organic matter according to ASTM D 2974,
   (b) A high degree of fertility,
   (c) Free of herbicides that prohibit plant growth,
   (d) A pH level between 6.0 and 8.0,
   (e) Meets the following mechanical analysis requirements:

Sieve	Percent Passing
1"	100
½"	95* to 97*

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¼"	40 to 60
No. 100	40 to 60
No. 200	10 to 30

* 100% for turfgrass

5. Do not use topsoil from ditch bottom surfaces, drained ponds, eroded areas, soils that are supporting growth of noxious weeds, or other undesirable vegetation.
6. Screen all topsoil, including on-site stockpiled topsoil and imported topsoil, through a 1 inch screen prior to placement.
7. The cost of imported soils shall be included in the Bid. No additional costs will be allowed for soil import.

PART 3 - EXECUTION

3.1 SPECIAL PRECAUTIONS

A. Dewatering

1. Prevent surface water and subsurface / ground water from flowing into excavations and from flooding the site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Draw down groundwater below the anticipated excavation bottom in advance of excavation. Locate sump pits outside of pavement areas and outside the building pad and its oversize area.
   (a) Remove sediment and suspended materials from water discharged from pumping, diversion, or similar operations before releasing to downstream water bodies or water conveyance ways. Conveyance ways include includes all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the site or any portion thereof. Conveyance ways also include storm sewer, curb and gutter, and pavements.
3. If soils are disturbed or become unstable, remove and replace with drier compacted fill. Alternatively, under favorable weather conditions, scarify, dry and recompact the disturbed or unstable soils back into place.
4. Convey rainwater runoff and water removed from excavations to temporary ponding areas. Establish and maintain temporary drainage ditches and other diversions outside structure and pavement excavation limits. Do not use trench excavations as temporary drainage ditches.
5. Do not place fill or compacted fill in standing water or over softened soils.
6. Include all dewatering costs in the Bid. No additional costs related to dewatering, including groundwater or precipitation, will be permitted.

B. Stability of Excavations

1. Sidewalls of all excavations shall comply with the most current OSHA regulations and applicable local codes and ordinances. Shore and brace where adequate sloping is not feasible because of space restrictions or stability of material being excavated.
2. Maintain slopes of excavations in safe condition until completion of backfilling.

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3. Soils on site are sensitive to moisture and may be easily disturbed by construction traffic. Provide stabilization materials (sand, aggregate, hydrated lime, fly ash, cement, etc.) to stabilize. Limit use of rubber-tired equipment on subgrade. Use smooth bucket backhoes or similar equipment without teeth for excavations. Provide measures to protect subgrade from becoming unstable and maintaining stability of subgrade soils. Pavement subgrade stabilization will be the responsibility of the Earthwork Contractor until the subbase is installed by the HMA or concrete contractor.

   (a) Include all costs associated with subgrade stabilization in the Bid.

C. Cold Weather Protection

1. If site grading and construction takes place during cold weather, implement good winter construction practices. Remove snow, ice, and frozen materials from cut and fill areas prior to additional grading. Do not place fill, footings, or slabs on soils which have frozen or contain frozen material. Do not use frozen soils as fill.

2. Protect excavation bottoms against freezing when atmospheric temperature is less than 35° F.

3.2 LAYOUT

A. Hire the services of a utility locator company to locate all privately owned utilities that may be disturbed by construction operations. Obtain any record information from the Owner related to existing utilities to aid in the location of all existing utilities.

B. Employ and pay for the services of a registered Engineer or Land Surveyor to stake and tape limits of construction, accurately locate the site boundaries, pavements, curbs, walks, and elevations, and establish temporary benchmarks for use during construction. Refer to Section 01 71 23 - Field Engineering.

C. Applicable portions of the walks, stairs, and paved areas shall be frequently staked, with horizontal and vertical reference points, during excavation and backfilling operations to facilitate orientation of the Testing Laboratory representative.

3.3 STOCKPILE MANAGEMENT

A. Provide stockpile management per the requirements of SUDAS Design Manual Chapter 7 - Erosion and Sediment Control, Section 7E-30 - Stockpile Management.

B. Stockpiles shall not be placed in surface conveyances such as curb and gutter, swales, or ditches.

C. Stabilize stockpiles immediately for areas that will not resume construction for a duration of 14 calendar days as specified for Stabilization Practices in Section 31 25 00 Erosion and Sedimentation Control.

D. Stockpile management is not required for clean aggregate stockpiles.

3.4 EXCAVATIONS

A. Excavate to the lines, grades and slopes shown on the Drawings.

B. Provide temporary drainage where construction interferes with existing drainage.

C. Excavations over 20 feet in depth require an Engineer to evaluate trench slope stability. An OSHA-approved qualified person, employed by the Contractor, shall review the soil classification in the field. Excavations shall comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” Costs for engineering evaluations and resulting excavation operations to comply with this requirement shall be included in the bid and no additional compensation will be permitted.

D. Excavate and remove all vegetation, topsoil, fill material, unsuitable soils, very soft to stiff clays, very loose to medium dense sands, and soils with organic content within the upper three (3) feet of final subgrade elevation of all proposed pavement areas, including pavement oversize areas. Remove all organic soils and vegetation under pavement areas. Remove any soft soils which are unsuitable for loads as directed by the Testing Laboratory representative.

E. Excavation shall extend a minimum of six inches below elevation of observed unsuitable soil. Extend excavations in wet or fine-grained soils to remove disturbed bottom soils.

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F. Oversize pavement area excavations one foot beyond the outside edges of the back of curb (or edge of pavement, where no curbing is proposed), plus 1 foot horizontally for each foot of excavation below the pavement (1:1 oversizing).

G. In Pavement Areas, following excavation to subgrade elevation, prepare the subgrade by scarifying subgrade soils to a minimum depth of 12", moisture conditioning soils to within the specified variance from optimum moisture content, and compacting to the specified density. Disc and dry soils as required to accomplish the specified moisture content. Remove and replace soils that cannot be stabilized, as determined by the Geotechnical Engineer or it's appointed Testing Laboratory representative, in accordance with Paragraph 3.8 of this Section. In pavement areas, following subgrade preparation and prior to placement of fill, proof roll the subgrade as specified herein for the Proof Roll.

3.5 COMPACTED FILL

A. Prior to placement of fill materials, the Testing Laboratory representative must test, inspect and approve the bottom of each excavation. Do not proceed with fill placement until the subgrade has been prepared, and the Testing Laboratory has approved the subgrade.

B. Before placing fill on a slope steeper than 4 horizontally to 1 vertically (4:1), perform one of the two following options:

1. Flatten the existing slope to the extent that it will not be steeper than 4 to 1; or

2. Construct steps in the slope, with the back surface being as nearly vertical as practicable and with the horizontal cuts being made as close together as the slope permits, but with no step being less than ten feet in width.

C. Do not place fill on frozen ground or continue filling operations when the fill material is at risk for freezing.

D. Do not place fill shall in standing water, in wet conditions, or over softened soils.

E. Break up or disc soil clumps or slabs to allow for proper compaction. Discing and compaction operations shall be approved by the Testing Laboratory representative.

F. Pavement Area Subgrade: Deposit approved fill in uniform layers not exceeding 8 inches loose thickness, dependent upon review by the Testing Laboratory representative. Compact each layer with approved methods and equipment that will densify the entire lift. Place fill within the specified moisture content range as approved by the Testing Laboratory representative.

G. General Site Fill: Deposit approved fill in uniform layers not exceeding 12 inches loose thickness, dependent upon review by the Testing Laboratory representative. Place fill within the specified moisture content range as approved by the Testing Laboratory representative.

H. The fill material, when being compacted, shall contain the moisture content necessary for the required compaction as designated by the Testing Laboratory representative. The moisture shall be uniform throughout each layer.

I. Use manually operated vibratory plate compactors within five feet from building foundation walls or retaining walls. Use self-propelled compactors outside of this five foot limit.

J. Spread, disc, farm, or otherwise dry wet soils as required to achieve a uniform moisture content throughout the soil. Moisten soils when too dry to achieve the required moisture content.

K. Scarify, remove, recompact or otherwise rectify all soft or yielding areas resulting from construction operations, precipitation, or other sources at no additional cost to the Owner.

L. If there are areas which cannot be compacted or stabilized, scarify the upper 24 inches to a moisture content not more than 1 percent above optimum, and compact to a minimum of 100% standard Proctor density (ASTM D 698). If after scarifying the areas still cannot be compacted or stabilized, the unstable materials shall be excavated to a depth of 36 inches and be replaced with materials which can be compacted.

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3.6 COMPACTION DENSITY REQUIREMENTS

A. Relative Compaction and Moisture Content Variance from Optimum for fill and backfill shall meet the following Table. Relative compaction values listed are minimum values. Do not exceed the listed variances for Optimal Moisture Content.

Earth Material	Relative Compaction, Minimum Percent, standard Proctor density (ASTM D 698)	Moisture Content Variance from Optimum, percentage
Pavement Area Subgrade – more than 3 feet below subgrade	95%	-3% to +3%
Pavement Area Subgrade –the upper 3 feet of subgrade	100%	-1% to +3%
General Site Fill	90%	-4% to +5%

B. In areas where tests do not meet the values listed in the Table above, provide additional compaction or preparation as needed, or remove and recompact soils to meet the specified values. Reworking of soils will be at the Contractor's expense. Each lift must be approved before commencing with the next succeeding lift.

3.7 ROUGH GRADING

A. The proposed contours and spot elevations shown on the Drawings indicate proposed finish grades. Grade to subgrade elevations, except for general landscape areas which shall be graded to finish grade with specified topsoil.

B. The Contractor will be solely responsible for determining quantities of cut, fill and waste materials to be handled, and for the amount of grading to be done in order to completely perform all work indicated on the Drawings.

C. Import suitable material and export unsuitable, excess, or waste material, as required. This work shall be included in the Bid. No additional costs will be allowed for importing or exporting soils.

D. Mining of soils for any purpose other than to construct the proposed improvements is prohibited. Trench borrowing, mining, or other over-excavations within Pavement Areas is prohibited.

E. Provide surfaces free of debris and building construction materials. Remove stones, rocks, debris, and similar undesirable material over 1" in diameter. Remove weeds, root masses, sod / vegetation clumps, branches, vegetation, and other deleterious materials.

F. Complete rough grading by blading to reasonably smooth contours with neat, uniform transitions and slopes. Ease new grades into surrounding existing grades without awkward or abrupt transitions.

G. Grade all surfaces such that they will not hold water. Grade all areas to drain.

H. Rough Grade Tolerances:

1. Unpaved areas outside buildings: Surfaces shall not vary by more than 0.15' above or below finish grade elevations.

2. Paved areas: Surfaces shall not vary by more than 0.10' above or below subgrade elevations.

I. Uniformly grade the subgrade to coincide with the proposed surface grades to ensure a consistent depth of topsoil, or pavement section.

J. In landscape areas, backfill all curbing with topsoil flush with the top of curb. Compact soils and subsoils behind curb backs to prevent settlement behind the curb.

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K. In landscape areas absent of curbing, grade topsoil flush with the walk or pavement surface on the up-gradient side, and hold down topsoil one inch below the walk or pavement surface on the down-gradient side.

L. Protect rough graded areas from construction traffic and erosion. Repair and re-establish grades and tolerances in settled, eroded or rutted areas to specified tolerances. No additional compensation will be permitted for protection or repairs.

3.8 SUBGRADE PREPARATION AND FINISH GRADING OF PAVEMENT AREAS

A. Grade and compact the subgrade for its entirety such that, at the time the granular base, or topsoil is placed, the specified density, moisture content, and stability in the subgrade are met.

B. Subgrade Preparation: Prepare the subgrade by scarifying subgrade soils to a minimum depth of 12", moisture conditioning soils to within the specified variance from optimum moisture content, and compacting to the specified density.

1. Spread, disc, farm, or otherwise dry wet soils as required to achieve a uniform moisture content throughout the soil. Moisten soils when too dry to achieve the required moisture content.

2. Scarify, remove, recompact, or otherwise rectify all soft, yielding, or unstable areas resulting from construction operations, rain, groundwater, or other sources at no additional cost to the Owner. Include all costs for moisture conditioning in the Bid. No additional costs for moisture conditioning will be permitted.

3. If there are areas which cannot be compacted or stabilized, scarify the upper 24 inches to a moisture content not more than 1 percent above optimum, and compact to a minimum of 100% standard Proctor density (ASTM D 698). If after scarifying the areas still cannot be compacted or stabilized, the unstable materials shall be excavated to a depth of 36 inches and be replaced with materials which can be compacted.

C. Uniformly grade the subgrade to coincide with the proposed surface grades. Blade subgrade to a smooth and uniform surface prior to proof roll.

D. Subgrade Finish Grade Tolerances:

1. Pavement Areas: Surfaces shall not vary by more than 0.06' (¾ inch) above or below subgrade elevations.

3.9 FINISH GRADING OF TOPSOIL

A. Spread topsoil to a uniform, minimum 6 inch depth after compaction, over all turfgrass and landscape areas within the grading limits. Spread topsoil after construction of pavements, curbing, fencing, and walks. Complete site grading and bring turfgrass and landscape areas to finish elevations.

B. General Topsoil Areas:

1. Blade smooth with light weight grading equipment with large, wide tires, to maintain grade uniformity without over-compacting the topsoil.

C. Compaction:

1. Do not perform direct compaction efforts on topsoil. Use light weight grading equipment with large, wide tires that will not over compact the topsoil.

2. If over compaction occurs, defined as more than 90% standard Proctor density (ASTM D 698), scarify the topsoil to full depth and regrade.

D. Finish Grade Tolerances:

1. General Topsoil Areas: Surfaces shall not vary by more than 0.08' (1 inch) above or below finish grade elevations.

3.10 RESTORATION AND CLEANUP

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A. Remove all construction materials and stockpiles from the site.

B. Provide final sweeping of all paved surface, existing and proposed, at project completion.

END OF SECTION 31 00 00

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SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Install and maintain all erosion and sedimentation control devices.
2. Additional erosion and sedimentation control devices as may be required by Local or State regulations.
3. Sweeping of paved areas.
4. Temporary stabilization of disturbed areas and stockpiles.
5. Removal of all erosion and sedimentation devices, and restoration from removal of these devices.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
B. Submit the following product information:

1. Wattles

C. Submit a proposed schedule for implementation of erosion and sedimentation control devices.
D. Submit maintenance Logs on a weekly basis.

1.3 QUALITY ASSURANCE

A. Construction activities shall not commence until all required permits are obtained.
B. Erosion and sedimentation control devices shall be inspected and approved by local authorities prior to commencement of construction operations.
C. Provide a knowledgeable and responsible person to implement and maintain inspection logs and provide inspections as required herein.
D. All erosion and sedimentation control devices shall remain in place until permanent stabilization has been accomplished including, but not limited to, 80% turf establishment and the first lift of pavement.

1.4 SITE CONDITIONS

A. Protect adjacent properties and water resources from erosion and sedimentation damage throughout Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wattles

1. SUDAS 9040 Erosion and Sediment Control, 2.06.

PART 3 - EXECUTION

3.1 PREPARATION

A. Review the Erosion and Sediment Control Plans.

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B. Notify the Engineer of deficiencies or changes in the Erosion and Sediment Control Plans required by current site conditions. Revisions to the plans will be made as determined by the Engineer.

3.2 PHASING OF THE WORK

A. Schedule and conduct operations so as to minimize erosion of soils and to prevent sedimentation of downstream water bodies or water conveyance ways. Conveyance ways include curb and gutter, pavements, storm sewer, swales, stormwater treatment areas, or other similar storm water conveyance means.
B. Construction of drainage facilities, turf establishment items, and other contract Work which will contribute to the control of erosion and sedimentation shall be carried out concurrently with earthwork operations or as soon thereafter as practicable.

3.3 LIMITATION OF WORK AREA

A. The Engineer will have authority to limit the surface area of erodible soil that can be exposed to possible erosion at any one time, without having the permanent erosion control features completed and operative.
B. Incorporate the erosion control features into the Work at the earliest practicable time and provide all additional temporary control measures as may be needed to correct conditions developing during construction.

3.4 INSTALLATION OF EROSION AND SEDIMENT CONTROL MEASURES

A. Wattles

1. Install per SUDAS 9040 Erosion and Sediment Control, 3.09.

3.5 STABILIZATION PRACTICES

A. Stabilize denuded areas and stockpiles within the following number of days of last construction activity in all areas:

1. All areas shall be stabilized within 14 days.
2. Temporary soil stockpiles shall be treated with appropriate erosion control measure, including silt fence and temporary seeding, when stockpiles are left inactive for periods longer than 14 days.

B. Temporary Stabilization:

1. Stockpiles and disturbed portions of the site where construction activity temporarily ceases for the time frames noted above shall be stabilized with a temporary seed and mulch according to the following:

(a) All areas of bare soil exposed to possible erosion shall be shaped to drain with minimum potential for erosion.
(b) The disturbed areas shall then be seeded with perennial ryegrass and annual wheat at a rate of 10 pounds per acre (0.25 lbs./1,000 sq. ft.) and 20 pounds per acre (0.50 lbs./1,000 sq. ft.) respectively, then and covered with hydromulch applied in accordance with SUDAS 9040 Erosion and Sediment Control, 3.21 B.

3.6 MAINTENANCE

A. Maintenance of erosion and sedimentation control devices shall meet the minimum requirements of this specification and SUDAS 9040.
B. Provide continual maintenance on all erosion and sedimentation control devices as identified herein. Repairs or replacements to all erosion and sedimentation control devices shall occur within 24 hours.
C. Maintain these devices throughout their temporary life and remove these devices when so approved by the Engineer.

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D. Maintenance and removal costs shall be included in the bid. No additional costs will be permitted.
E. Wattles

1. Maintain, clean, repair, and replace as specified in SUDAS 9040 Erosion and Sediment Control, 3.09.

F. Paved Areas

1. At a minimum, provide daily sweeping of all paved surfaces. Provide additional sweeping as needed to remove excess sediment from paved surfaces.

3.7 REMOVAL AND RESTORATION

A. Control of drainage and erosion shall include restoration work in preventing siltation of public waters, downstream water bodies and conveyance ways.
B. Restoration shall include cleanup, shaping, replacement of topsoil, and establishment of vegetative cover on all disturbed areas where water pollution potentials have been increased due to the construction operations.
C. Following final turf and vegetation establishment:

1. Remove all excess sediment from site prior to removal of devices.
2. All erosion and sedimentation control materials shall be completely removed and disposed of off-site.
3. All trenches and divots from anchors shall be backfilled and restored with vegetation.
4. Do not allow re-suspension of sediment or loss of trash or oil into the water during device removal.

3.8 COMPENSATION

A. All expenses related to complying with the provisions herein shall be borne by the Contractor with no additional compensation being permitted.

END OF SECTION 31 25 00

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SECTION 32 16 13
CURBS AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Cast-in-place concrete as follows:

(a) Curbs and Gutters

2. Expansion joint material.
3. Formwork for cast-in-place concrete.
4. Adequate measures to protect fresh concrete from traffic and damage/staining.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
B. Submit the following product information and shop drawings:

1. Mix Design
2. Curing Compounds
3. Admixtures
4. Expansion Joint Material

C. Submit the following plans (if applicable):

1. Cold Weather Placement Plan
2. Hot Weather Placement Plan
3. Plans shall include:

(a) Proposed Adjustments to Mix Design
(b) Proposed Method of Curing
(c) Detailed Schedule
(d) Plan for Additional Testing Procedures

1.3 QUALITY ASSURANCE

A. Employ and pay for the services of a registered Engineer or Land Surveyor to stake and tape limits of Work.
B. The Owner will provide testing services performed by a testing laboratory. Should a test fail, correct the failure and pay costs for retesting until approved by the testing laboratory and Owner.
C. Cold weather and hot weather placement shall be in accordance with ACI 306.1 and 305.1, respectively, and as stated herein.
D. Source Limitations

1. Each type or class of cementitious material shall be of the same brand from the same manufacturer's plant.
2. Obtain all aggregates from a single source.

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3. For all admixtures and curing compounds, one single product (each) shall be used to complete the entire project unless otherwise indicated.

E. Ready-mix concrete supplier shall comply with ASTM C94.

F. Field Quality Control

1. Testing

(a) Test the first three truck loads then every fifth truck load thereafter.
(b) Sampling shall be per ASTM C172.
(c) Testing shall include:

(1) Slump per ASTM C143
(2) Temperature per ASTM C1064
(3) Water Content per AASHTO T-318
(4) Air Content per ASTM C231
(5) Strength per ASTM C39
(6) Minimum five cylinders required for overall testing

(d) All test reports indicating non-compliance shall be emailed immediately to all parties on the test distribution list.
(e) Work that fails to meet requirements shall constitute consideration for rejection by the Engineer. Cost of measures to make work satisfactory shall be paid for by the Contractor.

2. Finish

(a) Finished concrete shall be uniform in color and texture.

(b) Finished surface shall be free of pits, pop-outs, spalling, blisters, delamination, cracks (other than at control and construction joints), curling, scaling, or discoloration.

(c) Finished concrete curbs and gutters that do not comply with this specification shall be removed and replaced in complete sections from joint to joint unless otherwise approved by the Engineer.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Mix Design Requirements

1. Strength

(a) In place minimum compressive strength at 28 days shall meet or exceed 4,500 psi.
(b) High-early strength concrete shall also have an in place minimum compressive strength at 3 days that meets or exceeds 3,000 psi.

2. Water-Cement Ratio

(a) Shall not be more than 0.42

3. Air Content

(a) Shall be 5 to 8.5% percent by volume.

4. Slump

(a) Shall be +/- 1.5” of the design slump on the reviewed mix designs.

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5. Workability

   (a) Concrete shall be of a consistency which will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

B. Materials

1. Cement shall meet or exceed ASTM C595, Type 1L.

   (a) Adding additional amounts of Type I Portland cement may be used to produce high-early strength concrete when approved.

2. Fly Ash shall meet or exceed ASTM C618, Class C or F.

   (a) Not more than 20% by weight.

3. Aggregates:

   (a) Fine Aggregate for Concrete:

      (1) Meet the requirements of Iowa DOT Section 4110 and Materials I.M. 409, Source Approvals for Aggregates.

      (2) Comply with the following gradation:

Sieve Size	Percent Passing
3/8”	100
No. 4	90 to 100
No. 8	70 to 100
No. 30	10 to 60
No. 200	0 to 1.5
Iowa DOT Article 4109.02, gradation No. 1	

   (b) Crushed stone particles with Class 2 durability complying with Iowa DOT Section 4115 and Materials I.M. 409, Source Approvals for Aggregates.

      (1) Comply with one of the following gradations:

Sieve Size	Gradation No. 3 Percent Passing	Gradation No. 4 Percent Passing	Gradation No. 5 Percent Passing
1 ½”	100	100	-
1”	95 to 100	50 to 100	100
¾”	-	30 to 100	90 to 100
½”	25 to 60	20 to 75	-
3/8”	-	5 to 55	20 to 55

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No. 4	0 to 10	0 to 10	0 to 10
No. 8	0 to 5	0 to 5	0 to 5
No. 200	0 to 1.5	0 to 1.5	0 to 1.5
Iowa DOT Article 4109.02, gradation No. 3, 4, and 5.			

4. Water shall meet or exceed ASTM C1602.
5. Admixtures

   (a) Provide admixtures certified by manufacturer to be compatible with other admixtures.
   (b) Shall be used in accordance with manufacturers recommendations.
   (c) Approved Manufacturers:

      (1) The Euclid Chemical Company
      (2) BASF Corporation
      (3) Sika Group
      (4) General Resource Technology
      (5) GCP Applied Technologies
      (6) Or Approved Equal

   (d) Use of the following admixtures are at the Contractor's discretion:

      (1) Air-Entraining Admixture shall meet or exceed ASTM C260.
      (2) Water Reducing Admixture shall meet or exceed ASTM C 494/C 494M, Type A.
      (3) Retarding Admixture shall meet or exceed ASTM C 494/C 494M, Type B.
      (4) Water Reducing and Retarding Admixture shall meet or exceed ASTM C 494/C 494M, Type D.
      (5) Viscosity Modifying Admixture (VMA) shall meet or exceed ASTM C 494/C 494M, Type S.
      (6) Non-Chloride, Non-Corrosive Accelerating Admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.

   (e) Use of the following admixtures is prohibited:

      (1) Calcium Chloride

2.2 EVAPORATION RETARDER:

A. Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
B. Approved Products

   1. Euclid Chemical Company (The); Eucobar
   2. BASF; MasterKure ER 50
   3. Or Approved Equal

2.3 CURING AND SEALING

A. Absorbent Covers

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1. AASHTO M 182, Class 2, new, never been used before burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
2. Material shall be free of harmful substances, such as sugar or fertilizer, or substances that may discolor the concrete. To remove soluble substances, burlap should be thoroughly rinsed in water before placing it on the concrete.

B. Moisture Retaining Covers

1. Plastic Film Curing Membrane: 4-10 mil thick polyethylene sheeting, complying with ASTM C171 and Product Standard PS17. Use white for exterior warm weather applications. Use either white or black for exterior cold weather applications.
2. White burlap polyethylene sheet meeting ASTM C 171.
3. Conforming to ASTM C171: A naturally colored, non-woven polypropylene fabric with a 4 mil non-perforated reflective (white) polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention.

   (a) Approved Products

      (1) PNA Construction Technologies, Inc.; Hydracure M15.
      (2) Reef Industries Incorporated; Transguard 4000.
      (3) Or Approved Equal

C. Curing Compounds

1. Shall meet ASTM C 1315, Type 1, Class A with Siloxane.
2. Do not use products with a manufacturing date older than 1 year from the date of application.
3. Shall be a clear, membrane forming curing compound.
4. Use one single product to complete the entire project unless otherwise noted.
5. Manufacturer's certification is required.
6. Approved Products

   (a) PROSOCO, Single Step
   (b) TK Products, TK-ONE STEP
   (c) Or Approved Equal

2.4 MISCELLANEOUS MATERIAL

A. Expansion Joints

1. Shall meet ASTM D1751 and Federal Specification HH-F-341F, Type 1.
2. Shall be composed with fibers of cellular nature bonded together with bituminous binder with sheets saturated in asphalt.
3. An expansion joint cap shall be used.
4. Approved Products

   (a) Fibre Expansion Joint with SNAP-CAP by W.R. Meadows Company
   (b) Or Approved Equal.

PART 3 - EXECUTION

3.1 PREPARATION BEFORE PLACING CONCRETE

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A. Examine conditions under which concrete work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Before concrete placement, complete formwork installation, secure reinforcement in place, and position all embedded items.
   1. Use standard metal forms. Wood forms will not be permitted.
   2. Construct forms in accordance with ACI 301, to the sizes, lines, and dimensions shown and as required to obtain accurate alignment, location, and grades.
   3. Design, support, brace, and maintain formwork to safely support loads that will be applied.
   4. Thoroughly clean and remove surface irregularities from forms and excavations including ice, water, wire, and other debris prior to pouring concrete.
   5. Fog spray forms, reinforcement, and base materials just before placing concrete.
   6. Level and plumb forms in finished structures.

C. Remove hardened concrete and foreign materials from inner surfaces of conveying equipment.

3.2 CONVEYING CONCRETE

A. Handle concrete from mixer to place of final deposit as rapidly as practical by methods which shall prevent segregation or loss of ingredients and in a manner which shall ensure that concrete quality is maintained.

3.3 PLACING CONCRETE

A. Do not allow concrete to drop freely more than 4 feet for conventional concrete and 10 feet for concrete containing the high range water reducing admixture.
B. Do not begin to place concrete while rain, sleet, or snow is falling unless adequate protection is provided and, when required, acceptance of protection is obtained. Do not allow rainwater to increase mixing water or to damage the surface of the concrete.
C. Cold Weather Placement
   1. Submit a plan prior to concrete installation in cold weather conditions.
   2. Comply with ACI 306.1 and as follows:
      (a) Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
      (b) When average high and low temperature is expected to fall below 40°F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
      (c) Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
      (d) Only approved admixtures shall be used.

D. Hot Weather Placement
   1. Submit a plan prior to concrete installation in hot weather conditions.
   2. Comply with ACI 305.1 and as follows:
      (a) Maintain concrete temperature below 80˚F at time of placement.

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E. Curbs and Gutters

1. Provide contraction joints 10 feet on center or as otherwise noted. Form joints by using oiled steel plates. Remove plates as soon as concrete has set. Rub edges of joints smooth with a jointing tool. Seal joints with hot poured concrete joint sealer.
2. Provide expansion joints at a maximum of 60 feet on center. Rub edges of joints smooth with a jointing tool. Fill joints with ½-inch joint filler material. Provide expansion joints between walks and curbing other concrete features. Remove joint cap once concrete has reached a minimum of 3000 psi.
3. Construct on subbase material specified for beneath paving.
4. Mechanical curb machines may be used to place curb and gutter using an approved extrusion machine that will produce a finished curb meeting the standards, workmanship, and appearance that would be achieved using metal forms. The same tolerances which apply using metal forms shall apply to work done with curb machines.

3.4 CONSOLIDATING CONCRETE

A. Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

3.5 FINISHING CONCRETE

A. Curbs and Gutters

1. Fill cavities with mortar and finish edges with an edging tool immediately after removal of forms and divider plates.
2. Trowel exposed face to a smooth, uniform surface and then brush exposed surfaces lightly.

B. Evaporation Retarder

1. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.1 lb/sq. ft. x h before and during finishing operations.
2. Apply according to manufacturer's written instructions one or more times after placing, screeding, and bull floating or darbying concrete, but before float finishing.

3.6 CURING CONCRETE

A. Begin curing procedures within 30 minutes of conclusion of finishing operations.

1. Cure concrete surfaces in accordance with ACI 308.1 utilizing one or a combination of the following methods:

(a) Water cure continuously for seven days utilizing sprinklers, soaker hoses, ponding, or fog spray. Take care to prevent damage to the surface of the concrete.
(b) Absorbent Cover

(1) Cover shall be water saturated and kept continuously wet.
(2) Cover concrete surfaces and edges with a 12 inch lap over adjacent absorptive covers when placing.
(3) Provide continuous supply of moisture such as sprinklers or soaker hoses when high temperature, low humidity, or windy conditions prevail. Do not allow Absorbent Cover materials to dry out during specified curing period.

(c) Moisture Retaining Cover Curing

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(1) Cover concrete surfaces with moisture retaining cover meeting ASTM C 171 as soon as possible after final finishing without marring the surface. Place in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
(2) Place the cover flat on the concrete surface, avoiding wrinkles, to minimize mottling immediately after wetting the slab to rejection. Place and weight the cover so that it remains in contact with the concrete during the specified duration of curing. Place windrows of sand or earth, or place pieces of lumber along all edges and joints in the film to retain moisture and prevent wind from getting under the film and displacing it.
(3) Immediately repair any holes or tears during curing period using cover material and waterproof tape.
(4) Install Moisture Retaining Fabric, in largest practical widths, in accordance with manufacturer's written recommendations. Wet the concrete to rejection, then thoroughly wet fabric side of cover and install with poly side up. Lap over adjacent covers a minimum 18". Weight all laps and outside edges to prevent displacement and to ensure intimate contact with concrete and adjacent covers. Rewet as necessary and protect covers from damage during curing process.
(5) Moisture cure or use moisture retaining covers to cure concrete surfaces to receive penetrating sealers, coatings, adhesives, or other subsequent treatments.

(d) Curing Compounds

(1) Protect surrounding site features during application including, but not limited to, structures, plantings, pavements, surface utilities, light poles, etc.
(2) Apply curing compound using the equipment and methods as recommended by the manufacturer.
(3) Rate of application shall be as recommended by the manufacturer.
(4) Ensure complete, uniform coverage over all concrete surfaces.

2. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

B. Protect newly placed concrete from damage by adjacent vibratory or backfilling operations for a minimum of 24 hours. Perform vibratory operations on backfilling 72 hours after placing concrete or after the concrete reaches a compressive strength of at least 3,000 psi.

3.7 CLEANUP

A. Remove all form materials, excess joint materials, concrete spoils, and excess concrete from the site.

3.8 CONCRETE WASHOUT AREA

A. Provide effective containment for all liquid and solid wastes generated by washout operations (concrete, paint, form release oils, curing compounds, and other construction materials) related to the construction activity.
1. The liquid and solid washout wastes must not contact the ground. Design the containment such that the contained material does not wash away or become mixed with surface runoff.
2. Liquid and solid wastes must be disposed of properly and in compliance with MPCA rules.
3. Install a sign adjacent to each washout facility.
(a) The sign shall require site personnel to utilize these containment facilities for disposal of concrete and other washout wastes.

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END OF SECTION 32 16 13

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SECTION 32 32 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Cast-in-place concrete as follows:
    (a) Walks
    (b) Slabs
    (c) Stairs
    (d) Miscellaneous appurtenances for stairs:
        (1) Handrail
2. Expansion joint material
3. Reinforcement materials
4. Caulking over expansion joints
5. Adequate measures to protect fresh concrete from traffic and damage/staining

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

B. Submit the following product information and shop drawings:

1. Mix Designs
2. Curing Compounds
3. Sealing Compounds
4. Admixtures
5. Expansion Joint Material
6. Reinforcement Materials
7. Handrails
    (a) Shop drawings shall include layout, measurements and dimensions demonstrating compliance with all applicable building codes.
    (b) Physical color samples

C. Submit the following plans (if applicable):

1. Cold Weather Placement Plan
2. Hot Weather Placement Plan
3. Alternative Jointing Plan
4. Plans shall include:
    (a) Proposed Adjustments to Mix Design
    (b) Proposed Method of Curing

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(c) Detailed Schedule

(d) Plan for Additional Testing Procedures

1.3 QUALITY ASSURANCE

A. Employ and pay for the services of a registered Engineer or Land Surveyor to stake and tape limits of Work.

B. The Owner will provide testing services performed by a testing laboratory. Should a test fail, correct the failure and pay costs for retesting until approved by the testing laboratory.

C. Cold weather and hot weather placement shall be in accordance with ACI 306.1 and 305.1, respectively, and as stated herein.

D. Source Limitations:

1. Each type or class of cementitious material shall be of the same brand from the same manufacturer's plant.

2. Obtain all aggregates from a single source.

3. For all admixtures, curing compounds and sealing compounds, one single product each shall be used to complete the entire project unless otherwise indicated.

E. Ready-mix concrete supplier shall comply with ASTM C94.

F. Installer's Qualifications: A certified ACI flatwork finisher shall be on site at all times during installation.

G. Field Quality Control

1. Testing:

(a) Test the first three truck loads then every fifth truck load thereafter.

(b) Sampling shall be per ASTM C172.

(c) Testing shall include:

(1) Slump per ASTM C143

(2) Temperature per ASTM C1064

(3) Water Content per AASHTO T-318

(4) Air Content per ASTM C231

(5) Strength per ASTM C39

(6) Minimum five cylinders required for overall testing

(d) All test reports indicating noncompliance shall be emailed immediately to all parties on the test distribution list.

(e) Work that fails to meet requirements shall constitute consideration for rejection by the Engineer. Cost of measures to make work satisfactory shall be paid for by the Contractor.

2. Finish

(a) Finished concrete shall be uniform in color and texture.

(b) Finished surface shall be free of pits, pop-outs, spalling, blisters, delamination, cracks (other than at control and construction joints), curling, scaling, or discoloration.

(c) Finished concrete that does not comply with this specification shall be removed and replaced in complete sections from joint to joint unless otherwise approved by the Engineer.

PART 2 - PRODUCTS

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2.1 CONCRETE

A. Mix Design Requirements

1. Strength:

(a) In place minimum compressive strength at 28 days shall meet or exceed 5,000 psi.

(b) High-early strength concrete shall have an in place minimum compressive strength at 3 days that meets or exceeds 3,000 psi.

2. Water-Cement Ratio:

(a) Shall not be more than 0.42

3. Air Content:

(a) Shall be 5 to 8.5% percent by volume.

4. Slump:

(a) Shall be +/- 1.5” of the design slump on the reviewed mix designs.

5. Workability:

(a) Concrete shall be of a consistency which will fill forms without voids or honeycombs, completely embed and bond to reinforcing without permitting materials to separate, and not promote excess water to collect on surface.

B. Materials

1. Cement shall meet or exceed ASTM C595, Type 1L.

(a) Adding additional amounts of Type I Portland cement may be used to produce high-early strength concrete when approved.

2. Fly Ash shall meet or exceed ASTM C618, Class C or F.

(a) Not more than 20% by weight.

3. Aggregates:

(a) Fine Aggregate for Concrete:

(1) Meet the requirements of Iowa DOT Section 4110 and Materials I.M. 409, Source Approvals for Aggregates.

(2) Comply with the following gradation:

Sieve Size	Percent Passing
3/8”	100
No. 4	90 to 100
No. 8	70 to 100
No. 30	10 to 60
No. 200	0 to 1.5
Iowa DOT Article 4109.02, gradation No. 1	

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(b) Crushed stone particles with Class 2 durability complying with Iowa DOT Section 4115 and Materials I.M. 409, Source Approvals for Aggregates.

(1) Comply with one of the following gradations:

Sieve Size	Gradation No. 3 Percent Passing	Gradation No. 4 Percent Passing	Gradation No. 5 Percent Passing
1 ½"	100	100	-
1"	95 to 100	50 to 100	100
¾"	-	30 to 100	90 to 100
½"	25 to 60	20 to 75	-
3/8"	-	5 to 55	20 to 55
No. 4	0 to 10	0 to 10	0 to 10
No. 8	0 to 5	0 to 5	0 to 5
No. 200	0 to 1.5	0 to 1.5	0 to 1.5
Iowa DOT Article 4109.02, gradation No. 3, 4, and 5.			

4. Water shall meet or exceed ASTM C1602.

5. Admixtures

(a) Provide admixtures certified by manufacturer to be compatible with other admixtures.

(b) Shall be used in accordance with manufacturers recommendations.

(c) Approved Manufacturers:

(1) The Euclid Chemical Company

(2) BASF Corporation

(3) Sika Group

(4) General Resource Technology

(5) GCP Applied Technologies

(6) Or Approved Equal

(d) Use of the following admixtures are at the Contractor's discretion:

(1) Air-Entraining Admixture shall meet or exceed ASTM C260.

(2) Water Reducing Admixture shall meet or exceed ASTM C 494/C 494M, Type A.

(3) Retarding Admixture shall meet or exceed ASTM C 494/C 494M, Type B.

(4) Water Reducing and Retarding Admixture shall meet or exceed ASTM C 494/C 494M, Type D.

(5) Viscosity Modifying Admixture (VMA) shall meet or exceed ASTM C 494/C 494M, Type S.

(6) Non Chloride, Non Corrosive Accelerating Admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.

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(e) Use of the following admixtures is prohibited:

(1) Calcium Chloride

2.2 EVAPORATION RETARDER:

A. Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Approved Products:

1. Euclid Chemical Company (The); Eucobar
2. BASF; MasterKure ER 50
3. Or Approved Equal

2.3 CURING AND SEALING

A. Absorbent Covers:

1. AASHTO M 182, Class 2, new, never been used before burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
2. Material shall be free of harmful substances, such as sugar or fertilizer, or substances that may discolor the concrete. To remove soluble substances, burlap should be thoroughly rinsed in water before placing it on the concrete.

B. Moisture Retaining Covers:

1. Plastic Film Curing Membrane: 4-10 mil thick polyethylene sheeting, complying with ASTM C171 and Product Standard PS17. Use white for hot weather applications and black for cold weather applications.
2. White burlap polyethylene sheet meeting ASTM C 171.
3. Conforming to ASTM C171: A naturally colored, non-woven polypropylene fabric with a 4 mil non-perforated reflective (white) polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention.
4. Approved Products

(1) PNA Construction Technologies, Inc.; Hydracure M15.

(2) Reef Industries Incorporated; Transguard 4000.

(3) Or Approved Equal

C. Curing Compounds

1. Shall meet ASTM C309, Type 1 Class A
2. Do not use products with a manufacturing date older than 1 year from the date of application.
3. Shall be a water based dissipating curing compound
4. Use one single product to complete the entire project unless otherwise noted.
5. Manufacturer’s certification is required.

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6. Approved Products:
    (a) DW WB Dissipating Cure 2519 by TK Products
    (b) Or Approved Equal.

D. Curing Compounds for cold weather applications
1. Products used in this section will require the Contractor to return to the site the following Spring, once weather permits, to apply the specified sealing compound to all concrete surfaces.
2. Shall meet ASTM C 1315, Type 1, Class A with Siloxane
3. Do not use products with a manufacturing date older than 1 year from the date of application.
4. Shall be a clear, membrane forming curing compound
5. Use one single product to complete the entire project unless otherwise noted.
6. Manufacturer's certification is required.
7. Approved Products:
    (a) PROSOCO, Single Step ® (not film forming)
    (b) TK Products, TK-ONE STEP (not film forming)
    (c) Or Approved Equal

E. Sealing Compounds
1. Shall be a penetrating silane/siloxane water repellent treatment providing a minimum 85% reduction in water absorption and 82% reduction in chloride penetration when tested in accordance with NCHRP 244.
2. Approved Products:
    (a) Euclid Chemical Company (The), Barricade WB 244
    (b) W.R. Meadows Inc, Intraguard
    (c) Or Approved Equal.

2.4 REINFORCING MATERIALS

A. Reinforcing Steel
1. Shall meet ASTM A615, Grade 60, with a yield stress of 60,000 psi, unless otherwise noted.
2. Shall be epoxy coated unless otherwise noted.

B. Macrofiber Reinforcement
1. Shall meet ASTM C1116 and ASTM D7508 Level 3.
    (a) The Steel Reinforcement Ratio (%) to calculate the f_{e3} value shall be 0.15
2. Approved Manufacturers:
    (a) BASF
    (b) Sika Fibers LLC
    (c) General Resource Technology (GRT)
    (d) Forta
    (e) Grace
    (f) Cemstone

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(g) Full Force

(h) Or Approved Equal

2.5 MISCELLANEOUS MATERIAL

A. Expansion Joints

1. Shall meet ASTM D1751and Federal Specification HH-F-341F, Type 1.
2. Shall be composed with fibers of cellular nature bonded together with bituminous binder with sheets saturated in asphalt.
3. An expansion joint cap shall be used.
4. Approved Products:
   (a) Fibre Expansion Joint with SNAP-CAP by W.R. Meadows Company
   (b) Or Approved Equal.
5. Natural Color unless otherwise noted.

B. Exterior Stair Components

1. Handrail
   (a) Pipe materials shall be as indicated on Drawings.
   (b) Finish per plans and details

C. Caulk

1. Shall be specifically designed for sealing Portland cement concrete joints.
2. Shall be suitable for temperature ranges from -20^{o}F to 120^{o}F.
3. Shall be non-sag.
4. Shall be weather and UV resistant.
5. Shall adhere directly to the concrete surface without the use of a primer.
6. Shall be gray in color.
7. Approved products:
   (a) Dow Corning 888 Silicone Joint Sealant.
   (b) Crafco RoadSaver #34902NS.
   (c) Or approved equal.

PART 3 - EXECUTION

3.1 INTEGRATION OF MACROFIBER REINFORCEMENT

A. Provide macrofiber reinforcement in all concrete covered by this Specification.

B. Add fibers to the concrete at the beginning of the mixing cycle, but not at the same time as the cement, at a proportion of 3 to 5 pounds per cubic yard.

C. Mix fibers with concrete for a minimum of 5 minutes at mixing speed to ensure complete dispersion and uniformity.

3.2 PREPARATION BEFORE PLACING CONCRETE

A. Examine conditions under which concrete work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

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B. Before concrete placement, complete formwork installation, secure reinforcement in place, and position all embedded items.

1. Use standard metal forms. Wood forms will not be permitted.

2. Construct forms in accordance with ACI 301, to the sizes, lines, and dimensions shown and as required to obtain accurate alignment, location, and grades.

3. Design, support, brace, and maintain formwork to safely support loads that will be applied.

4. Thoroughly clean and remove surface irregularities from forms and excavations including ice, water, wire, and other debris prior to pouring concrete.

5. Fog spray forms, reinforcement, and base materials just before placing concrete.

6. Level and plumb forms in finished structures.

C. Remove hardened concrete and foreign materials from inner surfaces of conveying equipment.

3.3 INSTALLATION OF REINFORCING STEEL

A. Place reinforcing steel in accordance with CRSI 63 and CRSI 65.

B. Clean reinforcement to remove loose rust, mill, scale, earth, and other materials which reduce or prevent bonding with concrete.

C. Provide sufficient quantity, of strength to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

D. Position, support and secure reinforcement against displacement. Arrange, space, and securely tie bars and bar supports together with wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so twisted ends are directly away from exposed concrete surfaces.

E. When splicing of reinforcement becomes necessary due to lengths of reinforcement required not being available in single lengths, provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Overlap bars by a minimum of 30 times the diameter of the bar, unless otherwise noted.

F. Place reinforcement to obtain minimum coverage for concrete protection as follows, unless otherwise noted:

1. Concrete Cast Against Permanently Exposed to Earth:

(a) Provide a minimum concrete coverage of 3 inches.

2. Concrete Exposed to Weather:

(a) Provide a 2 inch minimum cover for No. 6 through No. 11 bars.

(b) Provide a 1 ½ inch minimum concrete cover for bars No. 5 or smaller.

3.4 CONVEYING CONCRETE

A. Handle concrete from mixer to place of final deposit as rapidly as practical by methods which shall prevent segregation or loss of ingredients and in a manner which shall ensure that concrete quality is maintained.

3.5 PLACING CONCRETE

A. Do not allow concrete to drop freely more than 4 feet for conventional concrete and 10 feet for concrete containing the high range water reducing admixture.

B. Do not begin to place concrete while rain, sleet, or snow is falling unless adequate protection is provided and, when required, acceptance of protection is obtained. Do not allow rainwater to increase mixing water or to damage the surface of the concrete.

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C. Cold Weather Placement

1. Submit a plan prior to concrete installation in cold weather conditions.

2. Comply with ACI 306.1 and as follows:

(a) Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

(b) When average high and low temperature is expected to fall below 40˚F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

(c) Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

(d) Only approved admixtures shall be used.

D. Hot Weather Placement

1. Submit a plan prior to concrete installation in hot weather conditions.

2. Comply with ACI 305.1 and as follows:

(a) Maintain concrete temperature below 80^{o}F at time of placement.

E. Walks and Slabs

1. Provide steel reinforcement where indicated on the Drawings.

2. Thickness shall be as noted on the Drawings.

3. Provide control joints as indicated on the Drawings.

4. Provide a ½-inch thick expansion joint in concrete flatwork at intervals of a maximum of 60 feet in length of run. Provide expansion joint between concrete flatwork and stoops, between concrete flatwork and retaining walls, and between concrete flatwork and building walls.

5. Provide caulk sealant over expansion joint at all stoops, cast-in-place retaining walls, and building walls.

F. Concrete Stairs

1. Construct stairs in accordance with details shown on the Drawings.

2. Hand Rails:

(a) Construct handrails in accordance with ADA requirements and as generally shown on the Drawings.

(1) Mount handrails per plans and details

3.6 CONSOLIDATING CONCRETE

A. Consolidate concrete by vibrating, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, around embedded items, and into corners of forms to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

3.7 FINISHING CONCRETE

A. Walks and Slabs

1. Level concrete after striking off with template or straightedge. After water sheen has left surface, float and follow with a light trowel finish. Care shall be taken not to bring an excess of water and fine sand to surface.

(a) Walks:

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(1) Give surface a light broom finish with a coarse broom.

(b) Slabs

(1) Give surface a coarse broom finish.

2. Joints

(a) Provide control joints with the intended pattern as indicated on the Drawings. Alterations to jointing pattern shall be reviewed with and approved by the Engineer.

(b) Joints shall be either tooled or sawcut, but not both on a single site, to a minimum of 1/3 the thickness of the concrete section depth.

(1) Tooled Joints:

1. Round surface edges and edges adjacent to control joints and expansion joints to a 1/4-inch radius.

2. Maximum joint radius is ½ inch unless noted otherwise. Concrete with joints larger than ½ inch radius will require the sections of concrete to be removed and replaced.

(2) Sawcut Joints

1. Sawcut lines shall be measured for uniformity (equal distance between joint lines) and chalk lined before making the cuts.

2. A walk-behind type sawcut machine shall be used. Handheld saws will not be permitted. Use wet-cut saws for dust control.

3. Sawcut joints shall be 1/8 inch width.

4. Begin transverse joint sawing as soon as the concrete has hardened sufficiently to allow sawing without raveling or moving of aggregate. Saw joints before uncontrolled cracking takes place.

B. Stairs

1. Level concrete after striking off with template or straightedge. After water sheen has left surface, float and follow with a light trowel finish. Care shall be taken not to bring an excess of water and fine sand to surface.

2. Give surface a light broom finish with a coarse broom.

C. Evaporation Retarder

1. Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.1 lb/sq. ft. x h before and during finishing operations.

2. Apply according to manufacturer's written instructions one or more times after placing, screeding, and bull floating or darbying concrete, but before float finishing.

3.8 CURING CONCRETE

A. Begin curing procedures within 30 minutes of conclusion of finishing operations.

1. Cure concrete surfaces in accordance with ACI 308.1 utilizing one or a combination of the following methods:

(a) Water cure continuously for seven days utilizing sprinklers, soaker hoses, ponding, or fog spray. Take care to prevent erosion damage to the surface of the concrete.

(b) Absorbent Cover:

(1) Cover shall be water saturated and kept continuously wet.

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(2) Cover concrete surfaces and edges with a 12 inch lap over adjacent absorptive covers when placing.

(3) Provide continuous supply of moisture such as sprinklers or soaker hoses when high temperature, low humidity, or windy conditions prevail. Do not allow Absorbent Cover materials to dry out during specified curing period.

(c) Moisture Retaining Cover:

(1) Cover concrete surfaces with moisture retaining cover meeting ASTM C 171 as soon as possible after final finishing without marring the surface. Place in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

(2) On flat surfaces, the cover shall extend beyond the edges of the slab at least twice the thickness of the slab. Place the cover flat on the concrete surface, avoiding wrinkles, to minimize mottling immediately after wetting the slab to rejection. Place and weight the cover so that it remains in contact with the concrete during the specified duration of curing. Place windrows of sand or earth, or place pieces of lumber along all edges and joints in the film to retain moisture and prevent wind from getting under the film and displacing it.

(3) Immediately repair any holes or tears during curing period using cover material and waterproof tape.

(4) Install Moisture Retaining Fabric, in largest practical widths, in accordance with manufacturer's written recommendations. Wet the concrete to rejection, then thoroughly wet fabric side of cover and install with poly side up. Lap over adjacent covers a minimum 18". Weight all laps and outside edges to prevent displacement and to ensure intimate contact with concrete and adjacent covers. Rewet as necessary and protect covers from damage during curing process.

(5) Moisture cure or use moisture retaining covers to cure concrete surfaces to receive penetrating sealers, coatings, adhesives, or other subsequent treatments.

(d) Curing Compounds

(1) Protect surrounding site features during application including, but not limited to, structures, plantings, pavements, surface utilities, light poles, etc.

(2) Apply curing compound using the equipment and methods as recommended by the manufacturer.

(3) Rate of application shall be as recommended by the manufacturer.

(4) Ensure complete, uniform coverage over all concrete surfaces.

2. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

B. Protect newly placed concrete from damage by adjacent vibratory or backfilling operations for a minimum of 24 hours. Perform vibratory operations on backfilling 72 hours after placing concrete or after the concrete reaches a compressive strength of at least 3,000 psi.

3.9 SEALING CONCRETE

A. Apply sealing compound to concrete no earlier than 28 days after curing operations have completed.

B. Protect surrounding site features during application including, but not limited to, structures, plantings, pavements, surface utilities, light poles, etc.

C. Clean surfaces free from dirt, bitumen, efflorescence, oil, curing compounds, form oil, and other foreign matter. Thoroughly dry surfaces prior to application.

D. Apply sealing compound using the equipment and methods as recommended by the manufacturer.

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1. Rate of application shall be as recommended by the manufacturer.

E. Ensure complete, uniform coverage over all concrete surfaces.

F. Protect the treated area from all vehicular and pedestrian traffic until sealing compound has dried completely.

3.10 CLEANUP

A. Remove all form materials, excess joint materials, concrete spoils, and excess concrete from the site.

3.11 CONCRETE WASHOUT AREA

A. Provide effective containment for all liquid and solid wastes generated by washout operations (concrete, paint, form release oils, curing compounds, and other construction materials) related to the construction activity.

1. The liquid and solid washout wastes must not contact the ground. Design the containment such that the contained material does not wash away or become mixed with surface runoff.

2. Liquid and solid wastes must be disposed of properly and in compliance with Iowa DNR rules.

3. Install a sign adjacent to each washout facility.

(a) The sign shall require site personnel to utilize these containment facilities for disposal of concrete and other washout wastes.

END OF SECTION 32 16 23

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SECTION 32 33 00
SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Mailbox
2. Light Bollards

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

1. Shop drawings

(a) Light Bollards.

2. Product information:

(a) Mailbox

B. Submit maintenance instructions from each product manufacturer.

PART 2 - PRODUCTS

2.1 MAILBOX

A. Commercial grade package box with pedestal

1. Product to be USPS Approved
2. Approved Products:

(a) Salisbury Industries

(1) Model #4375BRZ
(2) Finish: Black
(3) Free Standing Pedestal Mount
(4) https://www.mailboxes.com/mail-package-drop-bronze/4375brz/

(b) Or approved equal

B. Provide one year manufacturer's warranty against defects in materials and workmanship.

2.2 LIGHT BOLLARD ON CONCRETE FOOTING

A. BEGA

1. Bollard head – 84-961
2. Bollard tube – 84001 (14.75")
3. Color: Black Textured finish

(a) Final color section to be approved by owner through physical color samples prior to ordering product

4. LED Color Temperature: Match existing lights on campus
5. Provide Integral Photocell

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6. Product Representative

Rob Beaman
Central Sales Lighting Alliance
515-650-8114

B. CONCRETE FOOTING

1. Caisson formed footing with ½" radius edge

(a) 12" diameter
(b) 36" depth
(c) Concrete mix to match 7" concrete mix

2. Embed bollard anchors as provided by manufacturer
3. Route Electrical conduit per electrical notes and as required by manufacturer
4. Top of footing elevation to match adjacent planting bed soil grade.
5. Remove all exposed portions of caisson

C. or approved equal

PART 3 - EXECUTION

3.1 MAILBOX INSTALLATION

A. Install in accordance with manufacturer's recommendations and instructions.
B. Install plumb.
C. Coordinate concrete pad installation with concrete walk installation.

3.2 LIGHT BOLLARD INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install plumb on concrete footing
C. Electrical work to be delegated design. Refer to Project Description for electrical scope of work.

3.3 CLEANING AND PROTECTION

A. Clear site of all excess spillage of concrete, grout, scrap materials, and excavation materials.

END OF SECTION 32 33 00

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SECTION 32 92 23
SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Removing temporary vegetation, weeds, root masses, rocks, and other extraneous matter from topsoil prior to sod-bed preparation.
2. Scarifying, loosening, and related sod-bed preparation of all sodded areas.
3. Soil preparation for the sod-bed, including tilling, raking, Fine Grading, and bringing soil to a smooth and uniform grade.
4. Fertilizing prior to laying sod.
5. Sodding and turfgrass establishment.
6. Protect sodded areas from weeds, disease, insects, geese, erosion, vandalism and trespassers.
7. Comply with requirements of the Storm Water Pollution Prevention Plan (SWPPP).
8. Restoration of existing lawn areas which are damaged by work being performed under the Contract. Restoration shall include proper preparation of underlying soils and providing new sod.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
B. Submit the following product information:

1. Fertilizer
2. Sod grower and blend

1.3 QUALITY ASSURANCE

A. Perform work only during periods when beneficial results are likely to be obtained. During periods of excessive drought, excessive moisture or freezing conditions, stop work and resume operations only when desired results are attainable.
B. Contractors Qualifications:

1. Sod-bed preparation, sodding, turfgrass establishment, and turfgrass maintenance shall be performed by a single firm which specializes in sodding work. The firm shall have not less than three years' experience in sod-bed preparation, Fine Grading, sodding, turfgrass establishment, and turfgrass maintenance.

1.4 DELIVERY, STORAGE AND HANDLING

A. Time delivery of sod to ensure that sod will be placed within 24 hours after stripping. Protect sod against drying and breaking of rolled strips.
B. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

PART 2 - PRODUCTS

2.1 SOD

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A. Provide a well-established (no less than 12 months old), well rooted, healthy, nursery-grown sod blend of improved Kentucky Bluegrass with a uniform color, leaf texture, density, and varieties consisting of a minimum of two and no more than four cultivars selected from the following list of Kentucky Bluegrass Cultivars:

4-Seasons	Bluenote	NuBlue
Arrowhead	Concerto	NuGlade
Award	Everest	Prosperity
Bewitched	Impact	Ridgeline
Beyond	Jackpot	Rubicon
Blue Chip Plus	Liberator	Rugby II
Blue Devil	Midnight	Skye
Blueberry		

B. Sod grown in peat bedded soil will not be accepted.
C. Ensure sod is free from objectionable grasses and broadleaf weeds, roots of trees or shrubs, stones, thatch, and other objectionable materials, nematodes and soil-born insects, and free from disease. Sod will be considered free of weeds if less than two such plants are found per 100 square feet of area.
D. Mow at a height of 2 inches prior to cutting.
E. Cut sod with a sod machine in strips of uniform width and length, with square ends. Cut to a uniform soil thickness of approximately 1/2 inch to 1 inch; thickness measurement excludes top growth.
F. Ensure sod is moist when placed.

2.2 FERTILIZER:

A. Comply with Iowa DOT Article 4169.03.
B. Commercial grade, uniform in composition, free-flowing material suitable for application with standard equipment.
C. Deliver fertilizer in original, unopened containers, bearing manufacturer's guarantee, analysis, name, and trademark.
D. Formulation:

1. 20-26-6 (20 percent Nitrogen, 26 percent Phosphate, 6 percent Potash) for First Application.
2. Fertilizer shall be formulated with a slow release sulphur coated Nitrogen and a slow release sulphur coated Potassium.

E. Stakes

1. Softwood Stakes: 3/4 inch diameter and 8 inches long.

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PART 3 - EXECUTION

3.1 SODDING SCHEDULE

A. Sod all areas in accordance with the scheduling / phasing indicated in the Contract Documents.
B. Do not install sod between the dates of June 15 and August 15.
C. Do not lay frozen sod; do not lay sod on frozen soil or when freezing conditions are forecasted within 24 hours.

3.2 TURFGRASS ESTABLISHMENT PERIOD

A. Maintenance, including watering, weeding, repairing, and other operations, shall continue until the following:

1. Turfgrass installation acceptable and healthy, as determined by the Engineer / Landscape Architect.

(a) Watering and maintenance of sod shall be turned over to the owner upon acceptance of installation of heathy sod.

B. It may be necessary to continue maintenance of watering by contractor beyond stated establishment period if the turfgrass is not healthy or installed during unfavorable conditions.

3.3 TILLING AND SOD-BED PREPARATION

A. Topsoil spreading, rough grading, and finish grading for areas to receive sod is specified in Section 31 00 00 Earthwork.
B. Remove temporary vegetation and weeds. Apply Roundup® or similar herbicide to temporary seeding, weeds, and other unwanted vegetation. Remove dead plant material, including root masses, prior to fine grading.
C. Cultivate soils to a depth of at least 6 inches to bring soil to a uniformly friable condition.

3.4 FERTILIZING

A. Fertilizing - First Application

1. Till topsoil using a disk, rototiller, Harley Rake, or other similar equipment when topsoil contains sufficient moisture and is easily worked. Exercise care when soil is moist.
2. After tilling, bring area to a smooth, even and well drained surface without undulations and irregularities.
3. Apply fertilizer to topsoil. Apply at the rate of 200 pounds per acre. Uniformly blend fertilizer into soil as specified under Fertilizing. Incorporate fertilizer into soil to a depth of 1 1/2 inches prior to placing sod.

B. Subsequent Fertilizer applications:

1. Apply subsequent application of fertilizer with a guaranteed analysis of 10-10-10 commercial fertilizer or the equivalent units of nitrogen (N), phosphate (P), and potash (K) at the rate of 300 pounds per acre 3 weeks after laying sod and prior to final acceptance. Adjust fertilizer application rates throughout the growing season. Apply Nitrogen based fertilizers according to the following:

(1) March – April: 0-½ lbs. per 1,000 ft^2
(2) May – June: ¾-1 lbs. per 1,000 ft^2
(3) July: No application of fertilizer
(4) August: ½-¾ lbs. per 1,000 ft^2
(5) September: 1 lbs. per 1,000 ft^2
(6) October – November: 1¼-1½ lbs. per 1,000 ft2

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3.5 FINE GRADING

A. Fine Grading shall be accomplished using a land plane, planer bar, drag, or similar light weight equipment designed to smooth the surface and provide a uniform, non-rolling and non-undulating grade.
B. Fine Grading for general turfgrass areas:

1. Fine Grading will be considered acceptable based on the following:

(a) Uniform surface
(b) No rills, ridges, tire depressions, windrows, or other irregularities that will affect mowing operations, including bouncing mowers, scalping turfgrass, and similar.
(c) Based on visual observation.

C. Fine Grade tolerance: 0.06' (3/4 inch) variation from finish grades.
D. Fine Grading must be reviewed by the Engineer / Landscape Architect prior to sodding. Failure to notify the Engineer / Landscape Architect to review Fine Grading will require redoing Fine Grading of deficient areas and resodding at the Contractor's expense.
E. Immediately prior to sodding, clear surface of soil clumps, brick, block, rocks, and stones larger than 1 inch in diameter. Remove all debris, trash, roots, vegetation clumps, branches, brush, wire, grade stakes, and other deleterious materials.

3.6 SODDING

A. Before laying sod, correct soft spots and inequalities and remove foreign materials. Sod shall be laid with no voids and shall be well tamped or rolled and thoroughly watered. At completion of Work, sod shall be true and set at finish grade, firm and even at all points.
B. Firm or heal in soil along the edges of the sodded areas.
C. Dampen dry soil prior to placing sod.
D. Carefully place sod in rows or strips evenly, with the longest edge parallel to the finished contours, and at right angles to the centerline of ditches and channels. On slopes, begin placing sod at the bottom and progress upward.
E. Minimize traffic on newly laid sod during installation. Provide plank or wood sheets to protect sod already laid from equipment and vehicles.
F. Tightly fit each strip against each other without voids. Do not overlap edges. Stagger joints at the ends of sod strips with adjacent strips of sod.
G. Finish sod edges at walks, curbs, planting, mulch edges, and other vertical surface by cutting and fitting tightly to edge.
H. Place sod mat approximately 1 inch below finished surface of walks, pavement, curbs, or other permanent features. Remove any sod not conforming to this requirement, adjust the subgrade, and re-lay the sod.
I. Where new sod meets existing sod, cut a clean, sharp edge to allow for a consistent, uniform, and straight joint between new sod and existing turfgrass. Jagged or uneven joints will not be accepted. Remove topsoil at the joint between new sod and existing turfgrass, as required, to allow new sod surface to be flush with existing turfgrass surface.
J. Stake sod on grades exceeding 4:1 and in drainage channels. Stake each roll at 2 foot intervals or as required to prevent movement during rainfall and stormwater runoff events.
K. Roll lightly-watered sod with a small mechanical or hand sod roller to sufficiently set or heal sod into soil and remove lumps. Roll as required to firm and level the sodded areas.

3.7 MAINTENANCE AND ESTABLISHMENT OF TURFGRASS

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A. General Requirements:

1. Establish a healthy, thick turfgrass, free of dead or yellow sod strips, eroded areas, bare areas, or gaps between sod panels.
2. Maintenance shall be accomplished until the latter of the time frames noted in Paragraph 3.2 “Turfgrass Establishment Period” of this Section.

B. Watering:

1. Immediately after sod has been laid and not longer than 1 hour after placement, thoroughly soak sod and sod bed.
2. Coordinate with owner on a watering schedule that will keep the soil saturated until sod has taken root.

   (a) Example watering schedule to be coordinated with the owner to follow as a guideline. Owner shall be responsible for continued watering after initial acceptance.

      (1) Week 1: 1/4 inch per day
      (2) Week 2: 1/4 inch every other day
      (3) Week 3: 1/4 inch every third day
      (4) Week 4: 1/4 inch every fourth day

3. Apply water uniformly and consistently on all sodded areas to prevent damage to sod, trees, and shrubs.
4. Keep sod adequately watered until maintenance dates noted herein. Dry or dead sod will not be accepted.

C. Contractor to coordinate procurement of water with the owner for existing water access locations.

D. Fertilization:

1. Continue to fertilize turfgrass areas as specified herein under Paragraph 3.4 B “Subsequent Fertilizer applications”.

E. Mowing:

1. Mowing shall be accomplished by the owner.

F. Weeding:

1. Spray weeds and undesirable vegetation with an appropriate herbicide. After killing, rake and remove weed remnants. Take care that turfgrass is well established before spraying chemicals.

G. Repairs:

1. Repair turfgrass areas that become eroded, gullied, or damaged, including damage due to vandalism or neglect. Repair yellowed or browned turfgrass areas. Reestablish approved conditions prior to sodding. Resod as originally specified and establish turfgrass. All repair costs will be at the Contractor’s expense.

3.8 TURFGRASS ACCEPTANCE

A. Continue Maintenance And Establishment Of Turfgrass until acceptable conditions are obtained.

B. Unacceptable Conditions:

1. Erosion or eroded areas will not be accepted.
2. Rills and ridges will not be accepted.

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3. Areas that include barnyard grass, crabgrass, quack grass, and similar undesirable grasses will not be accepted.
4. Areas that include broadleaf weeds will not be accepted.
5. Gaps in sod panels will not be accepted.
6. Dead sod will not be accepted.

C. Acceptance:

1. Turfgrass will be reviewed by the Engineer / Landscape Architect only after the minimum time frames specified herein in Paragraph 3.2.
2. The Engineer / Landscape Architect will visually observe the condition of the sod and turfgrass and determine if the sod is acceptable or not, based on the following:

(a) Sod strips that can be lifted by hand indicates the sod has not taken root. The Engineer / Landscape Architect will lift individual sod strips by hand to test for acceptance. Sod that can be lifted will mean the entire sodded area is not accepted.
(b) Sod strips shall be dark green in color at the time of acceptance, with no yellow or brown coloration.
(c) Turfgrass shall have no gaps between individual sod strips measuring 1" or greater.

3.9 FAILURE OF TURFGRASS ESTABLISHMENT

A. In the event an acceptable turfgrass is not established, treat, repair, and replace damaged work.
B. All costs related to Failure of Turfgrass Establishment will be at the Contractor's expense.

3.10 CLEANING

A. At completion of work, clean up and remove from site surplus materials, roots, stones, and debris and leave area in a clean, neat condition.
B. Remove promptly soil and other extraneous material brought onto paved areas by work operations. Keep paved areas clean at all times.
C. Restore ground areas disturbed as a result of sodding operations to their original condition or to desired new appearance.

3.11 PROTECTION

A. Protect turfgrass from damage due to landscape operations, operations by other contractors, weeds, disease, insects, erosion, vandalism, and trespassers.
B. Protection shall be accomplished until the latter of the time frames noted in Paragraph 3.2 "Turfgrass Establishment Period" of this Section.
C. Protect turfgrass from geese. Determine the means to accomplish.

3.12 EROSION CONTROL DEVICE REMOVAL

A. Remove erosion control devices, including, but not limited to, silt fence, sediment control logs, etc., after turfgrass is established and there is no risk of erosion.
B. Backfill and regrade trenches from erosion control devices. Sod and establish turfgrass in these areas.

END OF SECTION 32 92 23

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SECTION 32 93 00
PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes labor, materials, equipment, and accessories to provide the following:

1. Furnish and install plant stock including trees, shrubs, and perennials.
2. Provide wood mulch at tree pits.
3. Constructing shrub beds including wood mulch.
4. Furnish and install planting soil.

B. Provide warranty for plant stock.

1.2 SUBMITTALS

A. Submit information and shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
B. Submit the following product information:

1. Wood Mulch.

C. Submit copy of the Contractor's Iowa Certified Nursery Dealer or Grower certification.

1.3 QUALITY ASSURANCE

A. Contractors Qualifications:

1. Planting, installation of plant stock, and maintenance shall be performed by a single firm which specializes in tree and plant care. The firm shall have not less than three years' experience tree and plant installation and maintenance.

1.4 WARRANTY

A. Warranty Period:

1. Begins at project Substantial Completion and ends one year after project Substantial Completion.

(a) Plant stock shall be alive and in satisfactory condition at end of warranty period.

B. Review:

1. At end of warranty period, plant stock that are dead or in unsatisfactory condition, as determined by Landscape Architect, shall be removed from site and replaced as soon as conditions permit during normal planting season.

C. Replacement:

1. The Contractor will bear all costs associated with replacing plant stock.
2. Replace plant stock with the same kind and size as noted in the Contract Documents.
3. Replacement plant stock are subject to inspection and rejection by the Landscape Architect before and after planting.

1.5 DEFINITIONS

A. Plant Stock: The term 'plant stock' used in this Specification includes reference to any and all of these types of vegetation: coniferous trees, deciduous trees, coniferous shrubs, deciduous shrubs, perennials, and other container grown plants.

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PART 2 - PRODUCTS

2.1 PLANT STOCK

A. Identification:

1. Plant stock shall be in accordance with nomenclature of "Standardized Plant Names", as adopted by the American Joint Committee on Horticultural Nomenclature, latest edition.
2. Size and grading standards shall meet the requirements published in the "American Standard for Nursery Stock" from the American Horticulture Industry Association, latest edition.
   (a) No substitutions of size or grade shall be permitted without written permission of Landscape Architect.
3. Plant stock shall be properly identified with legible waterproof tags securely fastened to the plant or bundle of plants.

B. Form:

1. Plant stock shall be well formed for that specific species or variety.
2. Trees:
   (a) Shall have single trunks.
   (b) Crotches shall be sound and unsplit.
3. Deciduous Trees and Shrubs:
   (a) Plant stock shall be symmetrically developed, of uniform habit of growth, with straight poles or stems, and free from objectionable disfigurement.
4. Evergreen Trees and Shrubs:
   (a) Plant stock shall have well developed symmetrical tops with typical spread of branches or leads for each particular species or variety.
5. Perennials and Container Grown Plants:
   (a) Plant stock shall be grown in sufficiently sized container for a minimum of 1 year with a root system to have developed to hold its soil together, firm, whole, and moist when taken from the container.
   (b) No loose root systems in the container nor root bound nor circling of the root system will be accepted.
6. Bare Root Plants:
   (a) Not to be used

C. Health:

1. Requirements of local, state, and federal laws pertaining to inspection, sale, and shipment of plant stock shall be met.
2. Plant stock, including their roots, shall be free of injurious insects, insect eggs, borers, and all forms of infestation, plant diseases, moldy or dried roots, or damage to trunk, bark, branches, leaders or root systems, or cut-leaders. All plants shall be free of defects, disfiguring knots, sunscald injuries, and frost cracks. All plants to be free of rodent damage to bark and buds.
3. Plant stock with broken or cut back terminal leaders will be rejected.
4. Plant stock shall show good annual growth. Buds shall be plump and well filled for that species.
5. Trees:

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(a) Trunk bark shall be sound.
(b) Trees shall have no large wounds. Small wounds shall have a satisfactory callus roll formed or forming over them.

D. Quality:

1. Plant stock shall meet the requirements of SUDAS Section 9030 – Plant Material and Planting.
2. Plant stock shall meet the minimum requirements of size and grade in the latest edition of American Standard for Nursery Stock, ANSI Z60.1.
3. Plant stock shall be nursery grown of high quality, with normally shaped uniform heavy branching and healthy well-developed root systems. One-sided branching plant stock from tightly planted nursery rows will be rejected.
4. Height and caliper of trees and diameter of root balls are the minimum dimensions required.
5. Plant stock sizes are dimensions of plants as they stand in the nursery, without straightening branches or leaders. Caliper, up to a 4-inch caliper size, shall be taken 6 inches above ground level, and shall be taken 12” above the root flare for all other plant stock sizes. When sizes, dimensions or other plant stock characteristics are not indicated in the Contract Documents, the current edition of the "American Standard for Nursery Stock" from the American Horticulture Industry Association shall govern.
6. Plant stock shall have been transplanted or root-pruned at least once in the 3-year period immediately preceding the current season of growth.
7. Where Grown:

(a) Plant stock shall have been grown under similar climatic conditions as the project site.
(b) Plant stock shall be grown and dug for shipment in Climatic Zone III as outlined in "Trees for American Gardens" by Donald Wyman.

2.2 MISCELLANEOUS MATERIALS

A. Planting Soil:

1. Topsoil shall meet SUDAS Section 2010 – Earthwork, 2.01 Topsoil.

(a) Existing on-site topsoil to be salvaged and respread over planting bed area

2. Compost shall meet the requirements of mulch for pneumatic seeding in SUDAS Section 9010, 2.07

B. Fertilizer:

1. Commercial grade, uniform in composition, dry, and free-flowing.
2. Fertilizer which becomes caked or damaged shall not be used.
3. Formulation:

(a) Standard N-P-K formula 10-6-4, and may contain minor trace elements.

C. Mulch:

1. Wood Mulch

(a) Provide double shredded hardwood mulch.

D. Water:

1. Potable water.

PART 3 - EXECUTION

3.1 PLANTING BED PREPARATION – COMPOST AMENDED SOIL

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A. Compost shall be uniformly applied over the planting area at an average depth of 2 inches.
B. Incorporate uniformly to a depth of 8 inches using a rotary tiller or other appropriate equipment.
C. Pre-plant fertilizer and pH adjusting agents (e.g., lime and sulfur) may be applied in conjunction with compost incorporation, as necessary.
D. Rake soil surface smooth prior to planting.
E. The soil surface shall be reasonably free of large clods, roots, stones greater than 2 inches, and other material which will interfere with planting and subsequent site maintenance.

3.2 PLANTING SCHEDULE

A. Evergreen Plant Stock (B&B and Container): Planting period shall be from September 1 to October 15 or from April 1 to June 1.
B. Deciduous Plant Stock (B&B and Container): Planting period shall be from August 15 to November 15 or spring planting prior to June 1.
C. At the option and on the full responsibility of the Contractor, planting may be conducted under unseasonable conditions, except in weather below 32°F or above 90°F without additional compensation nor variance from the specified warranty requirements or inspection and acceptance requirements.
D. No plant stock shall be installed before finish grading and other construction has been completed in the immediate planting area.

3.3 INSPECTION

A. Inspect plant stock as required by State, Federal, and other authorities, and secure required permits and certificates.
B. Plant stock are subject to observation and approval by the Landscape Architect at the place of growth. Arrange for observation before digging, or upon delivery, for quality, size, and variety. Approval, however, shall not impair the right of rejection at job site during progress of Work, for size, shape, appearance, condition of balls, roots, latent defects, or injuries.
C. Remove rejected plant stock immediately from job site.

3.4 TEMPORARY STORAGE AND HEELING-IN

A. When temporary storage or heeling-in is required, provide and prepare a suitable heeling ground or heeling-in nursery, located near the planting site, prior to shipment of plant stock from the growing nursery or other source.
B. Immediately heel-in or transport plant stock to site and plant. Material left above ground overnight or left with its roots bare to the sun, or otherwise unprotected during transit, unloading, or storage, will be rejected by the Landscape Architect, if, in their judgment, such lack of protection has caused damage to roots of the plant stock or in any other way injured the plant stock.

3.5 DIGGING AND HANDLING

A. General Requirements: Take precautions, which are customary in good trade practice, when preparing plant stock for planting, in accordance with American Standard for Nursery Stock. Work that fails to meet the highest standards will be rejected.
B. Planting on Slopes:

    1. Place the top of the root crown at or slightly above finish grade at the center of the planting pit.
    2. For all plant stock planted on significant slope, form a saucer as a dam or shoulder on the downhill side to catch and hold water and to avoid erosion.

C. Setting Ball and Burlap Plant Stock:

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1. Dig plant stock marked "B&B" with root systems as solid units and with balls of earth firmly and securely wrapped.
2. Balls shall be of natural earth in which plant was growing. No manufactured, artificially produced or mudded-in balls will be accepted.
3. Balls shall be firm, unbroken, and of large enough size to adequately enclose plant's fibrous root system.
4. Ball and burlap plant stock may be rejected due to their failure to meet good digging practices.

   (a) Plant stock with cracked, broken or loosely wrapped balls will be rejected.

5. Lift and handle plant stock from bottom of ball.
6. Dig pits essentially circular with a diameter one foot greater than the root ball diameter. Depth of pit shall be enough to accommodate the ball or roots when plant stock is set to finish grade, plus a 6 inch depth of planting soil below roots of plant stock.
7. Add one pound of commercial fertilizer per cubic yard of planting soil.
8. Before setting plant stock, backfill pits with planting soil to a depth of 6 inches. Thoroughly tamp and water the planting soil.
9. Tamp planting soil under and around base of each root ball to fill voids, in 6-to-8-inch lifts, and puddle each lift thoroughly.
10. Set plant stock in the planting pit to proper grade and alignment.
11. Set plant stock upright, plumb, and oriented for desired effect.
12. Place plant stock at such a level to ensure that after settlement, root flare will be at or slightly above grade.
13. Remove burlap from the root ball top and adjust burlap to prevent air pockets. Do not pull burlap from under the root ball.
14. Form shallow basins or saucers around plant stock, a little larger than the diameter of the root ball, to hold additional water.

D. Setting Container Grown Plant Stock:

1. Dig holes essentially circular with a diameter 2 inches to 3 inches greater than the container. Depth of holes shall be enough to accommodate the roots when plant stock is set to finish grade.
2. Install container grown trees to allow the root flare to be at grade.
3. Space plant stock in accordance with indicated dimensions.
4. Add one pound of commercial fertilizer per cubic yard of planting soil.
5. Remove the container prior to planting.
6. Set plant stock in the hole to proper grade and alignment.
7. Set plant stock upright, plumb, and oriented for desired effect.
8. Place plant stock at such a level to ensure that after settlement, the natural relationship between original grade at which plant stock grew, and present grade, shall be the same or 2” - 3” above finished grade.
9. Form shallow basins or saucers around plant stock, a little larger than the diameter of the container, to hold additional water.

3.6 POST-PLANTING CARE

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A. Pruning:

1. Neatly prune plant stock after planting in accordance with the best standard practices. Prune plant stock to preserve its natural form and character, in a manner appropriate to its particular requirements. Pruning shall be done with clean, sharp tools. Cuts over ½-inch in diameter shall be immediately covered with an approved asphaltic based paint.

B. Watering:

1. Thoroughly soak the plant stock roots immediately after planting.
2. Following planting, for the first 1-2 weeks, water daily.
3. Coordinate watering requirements with owner after initial acceptance of planting.

3.7 PLANT STOCK MULCHING

A. Place mulch in the planting saucer within 4 calendar days of planting. Do not place mulch on trunk.
B. Provide a minimum of 18 inch radius mulch area from tree trunks and shrub branch lines.
C. Provide a continuous mulch area around plant groupings.
D. Thoroughly water mulched areas. Rake to a smooth finish surface.

3.8 PLANT ESTABLISHMENT AND MAINTENANCE

A. The plant establishment period will start when the plant stock is planted and will end at the end of the Warranty Period.
B. Provide continuous care and maintenance of plant stock through the duration of the plant establishment period.
C. During the growing season, keep plants in healthy condition using good horticultural practices.
D. Maintenance shall consist of (but may not be limited to), the following:

1. Fertilizing.
2. Maintaining adequate soil moisture at all times.
3. Repairing, adjusting, or replacing the tree wrapping, staking and guying, mulch, or planting soil.
4. Rodent protection.
5. Applying insecticide spray as necessary.
6. Maintaining the plants in an upright position.
7. Removing all weed growth.
8. Furnishing and installing replacement plant stock as needed, including new mulch and planting soil.
9. Other incidental items.

E. Inspect and maintain plant stock on a minimum basis of every 15 days, or additionally as may become necessary.
F. All plant stock establishment costs will be at the Contractor's expense, including the costs of any replacement materials required.

3.9 INSPECTION AND ACCEPTANCE

A. Inspection:

1. Inspection of this Work will be made by the Landscape Architect.

B. Notice of Deficiencies:

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1. After inspection, Contractor will be notified in writing by the Landscape Architect of all deficiencies in the Work.

C. Acceptance:

1. Planting must be totally complete and all plant stock in good, healthy condition before acceptance or starting of warranty period. The warranty period will not begin on any plant stock until all replacement plant stock, identified by the Landscape Architect in the Notice of Deficiencies, are installed. Plant stock will not be considered acceptable until they are properly staked, guyed, mulched, pruned, and watered.

3.10 CLEANING

A. General Requirements: Collect, and remove from site, all excess materials, containers, packaging, branches, trimmings, and other debris left over from planting operations. Restore ground areas disturbed as a result of planting operations to their original condition or to the desired new appearance.

END OF SECTION 32 93 00

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