Project Manual

Princeton Dental Center
Princeton, MN

Prepared for

Cole Group Architects

Larson Project No. 12256012
Issue Date: April 30, 2025

Larson Engineering
816 W. St. Germain St.
Suite 308
St. Cloud, MN 56301

SECTION 00 01 05

CERTIFICATION PAGE

Project:
Princeton Dental Center
Princeton, MN

General Contractor:
Keystone Design Build, Inc.
233 34th Ave S.
Waite Park, Minnesota 56387
320.253.3301

Architect:
Cole Group Architects
David Majchrzak
216 Park Avenue South, Suite 102
St. Cloud, Minnesota 56301
320.654.6570

Civil Engineer:
Larson Engineering, Inc.
Tom Herkenhoff
816 W. St. Germain St.
Suite 308
St. Cloud, MN 56301
320.428.5824 Fax: 651.481.9201

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

April 30, 2025	25520
Thomas J. Herkenhoff, P.E.	Date	Registration No.

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33 30 00	Sanitary Sewer
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GEOTECHNICAL BASELINE REPORT

1. GENERAL

A. Subsurface exploration, evaluation and recommendations have been performed at this site to assist in the design process.

2. REPORT

A. A copy of the report is included in this Section hereby referenced as Geotechnical Baseline Report (GBR). The report is described as follows:

TITLE: Report of Geotechnical Exploration for Princeton Dental
DATE: August 23, 2024
PREPARED BY: Independent Testing Technologies

B. The GBR is incorporated as a Contract Document.

3. TECHNICAL DATA

A. The GBR contains Technical Data as defined by Article 1 of the General Conditions.

B. Contractor may rely upon the accuracy of the Technical Data included in the GBR in accordance with the Supplementary Conditions and the terms of the GBR.

4. DIFFERING SUBSURFACE CONDITIONS

A. Differences between encountered conditions and conditions indicated in the GBR shall be reported to the Owner and Engineer in accordance with the General and Supplementary Conditions.

B. Possible adjustment to the Contract Time or Contract Price, or both, shall be in accordance with the General and Supplementary Conditions.

5. RELATIONSHIP

A. The Contractor shall be responsible for verifying and correlating relationships of report elevations to the plan and site elevations.

END OF DOCUMENT

INDEPENDENT TESTING TECHNOLOGIES
337 31st Avenue South • Waite Park, MN 56387 • (320) 253-4338 • www.independenttestingtech.com

AUGUST 23, 2024

PROJECT 24-297
REPORT OF GEOTECHNICAL EXPLORATION

For

PRINCETON DENTAL
PRINCETON, MINNESOTA

Prepared For:

KEYSTONE DESIGN BUILD

INDEPENDENT TESTING TECHNOLOGIES
337 31st Avenue South • Waite Park, MN 56387 • (320) 253-4338 • www.independenttestingtech.com

August 23, 2024

Mr. Grant Mumm
Keystone Design Build
233 34th Avenue South
Princeton, MN 56387

RE: 24-297 Report of Geotechnical Exploration
Princeton Dental
Princeton, Minnesota

Dear Mr. Mumm:

Independent Testing Technologies, Inc. is pleased to submit the results of our subsurface investigation program for this project in Princeton, Minnesota. This report represents our work on this project as authorized by you. An electronic copy is submitted.

The soils on this site are well suited for the proposed building and site improvements. The soils encountered were mostly native fine grained poorly graded sands (SP). They were fairly loose. We recommend surface compacting the soils in the building area prior to placing any fill or foundations. Groundwater was observed in all of the borings at depths of 9.0 to 10.5 feet during our investigation and should not be an issue with design or construction.

Mr. Mumm, it has been our pleasure to work with you on this project. Independent Testing appreciated the opportunity to perform this geotechnical evaluation and look forward to continuing our participation during the construction phase of this project. Please contact Patrick Johnson if you have any questions regarding this report. Please contact Tyler Burkes if you would like a proposal for the materials testing services that may be needed.

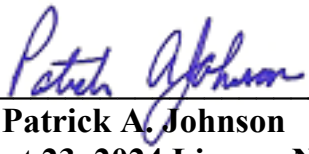
Sincerely,

Patrick A. Johnson, P.E.
Minnesota License #22037

Kevin T. Reller
President

CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Minnesota.



Patrick A. Johnson
Date: August 23, 2024 License No.: 22037

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GEOTECHNICAL EXPLORATION
PRINCETON DENTAL
PRINCETON, MINNESOTA
PROJECT 24-297

A. Introduction

This report is being prepared for use by our client on this specific project. We intend to present this report and our findings in the same logical manner that led us to arrive at our recommendations. This report is based on some general assumptions regarding the anticipated construction based on experience with similar projects. These assumptions and the entire report should be reviewed immediately upon receipt.

Purpose:

The purpose of our investigation was to evaluate the existing soil and water conditions on this site and provide a report of our findings and recommendations regarding design and construction of the proposed improvements. The project will consist of construction of a one-story, slab-on-grade, stick framed structure on standard, cast-in-place concrete spread footings. In accordance with your written authorization, we have conducted a subsurface exploration program for the proposed project.

Scope of Services:

Our authorized scope of services included the following:

1. To investigate the subsurface soil and water conditions encountered at seven (7) split-spoon soil boring locations on the site. The borings were planned to depths of just under fifteen (15) feet at each location in the proposed building areas and ten (10) feet in the parking lot and stormwater pond areas.
2. To provide a report of our findings including the results of our subsurface investigation and recommendations regarding earthwork, fill and compaction, building foundation suitability, soil bearing capacity, estimated settlement, wall backfill, slab support, stormwater infiltration, parking lot subgrade preparation and bituminous pavement design.

General Site Conditions:

The site is currently a vacant parcel at 1921 2nd Street North on the west side of the City of Princeton. The site is on the south side of 2nd Street, between 19th Avenue North and 21st Avenue North. The site is in an industrial/ commercial area at the southwest quadrant of US Highway 169 and Minnesota Highway 95. The site is an open, level grassy field. The site is relatively flat with slopes of 0-4%

Available Subsurface Information:

According to the Geologic Map of Minnesota, Quaternary Geology, prepared by Howard C. Hobbs and Joseph E. Goebel (1982, Minnesota Geological Survey), this site lies within an outwash unit not associated with any particular moraine. This is associated with the Des Moines Lobe glaciation of Pleistocene, Late Wisconsinan age. The deposits generally consist of sandy outwash with significant limestone and shale portions. The drift is derived from parent material in Manitoba and eastern North Dakota.

According to the Soil Survey of Mille Lacs County prepared by the Soil Conservation Service, the site lies within Zimmerman fine sands. The individual soils mapped on this site are fine sands that have slight limitations for development of small commercial building sites due to locally shallow depth to seasonal groundwater.

B. Exploration Program

Seven (7) split-spoon soil borings were conducted on this project. The borings were advanced to 10 feet to just under 15 feet deep using a 3 ¼ inch I.D. hollow stem auger. Samples were obtained every 2 ½ feet for the first 10 feet and every 5 feet thereafter using a 2-inch O.D. split spoon sampler in accordance with the American Society for Testing and Materials (ASTM D1586). Standard penetration values (N-values) were obtained at each sample interval by driving the sampler into the soil using a 140-pound hammer falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler 12 inches is known as the standard penetration resistance or N-value. Where the sampler cannot be driven at least 6 inches by 50 blows of the hammer, the total number of blows as well as the distance driven is reported on the boring logs.

Groundwater levels were noted during drilling and immediately after completion. The holes were backfilled with auger cuttings. Some settlement of the bore holes may be expected. All of the borings were conducted with a truck mounted CME-45 drill rig. The ground surface elevations at each boring location are based on the assumed elevation of 100.0 for the top of the fire hydrant at the front of the lot.

Exploration Results:

All of the borings were conducted in the existing open lot and encountered topsoil material consisting of fine silty sand (SM) to depths of 4 to 8 inches.

Below the topsoil, all of the boring encountered native, fine grained poorly graded (SP) to their termination depths.

Penetration Test Results:

The standard penetration blow counts in the native, inorganic fine sands (SP) ranged from 3 to 25, which are very low to moderate, indicating that they are in a very loose to medium dense condition. The lowest blow counts were at the surface and generally became higher with increasing depth below the surface. This is typical of normally consolidated soils. Refusal of the spoon or auger did not occur in any of the borings. Drilling was relatively easy.

Water Level Observations:

Observations of the subsurface water conditions were made during drilling operations. Groundwater was encountered in all the borings at depths of 9.0 to 10.5 feet during drilling. The following table shows the depth of water at each location:

Boring	Water
SB-1	10.5 feet
SB-2	9.0 feet
SB-3	10.5 feet
SB-4	10.5 feet
SB-5	9.5 feet
SB-6	10.5 feet
SB-7	10.0 feet

The groundwater levels were observed over a relatively short period of time. However, we feel they are an accurate reflection of the true water levels at the time of our investigation due to the

relatively high permeability of the native sand soils. The soils were dry above the water levels.

It should be noted that fluctuations in the level of the groundwater can occur due to variations in rainfall, temperature, spring thaw and other factors not evident at the time of our investigation. Mottled soils were not observed. Mottled native soils are a historical indication of a temporarily or seasonally saturated soil condition. Grey soils were also not observed. Grey native soils are an indication of a permanently saturated soil condition.

Laboratory Testing

Moisture Content Tests- Moisture content tests were performed on every split spoon sample in accordance with ASTM method D2216; *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. Individual test results are shown on the boring logs adjacent to the sample that was tested.

C. Engineering Review

Discussion:

Based on our findings, the site appears to be well suited for the proposed building and site improvements. The existing topsoil should be removed from all the building and parking lot areas. We estimate this will require an excavation of 4 to 8 inches across the site. After stripping the topsoil, we recommend watering and compacting the exposed soils in the proposed building area with three passes of a heavy vibratory roller in each of two perpendicular directions prior to placing any fill.

The building is expected to be a one- story, slab-on-grade, stick framed structure placed on standard, cast-in-place concrete spread footings. We assume exterior wall footings will be placed at elevations ranging from 2 to 3 feet below the existing ground level. We expect the foundation will be placed on the native fine grained sand soils.

Maximum foundation loads could be expected to be in the range of 4-6 kips per linear foot for wall footings and 150-200 kips for column loads. The native sand soils on this site appear suitable for support of the proposed building.

Groundwater is not expected to have an impact on the project. Natural moisture contents of the soil above the water level generally ranged from 5 to 19 percent. Optimum moisture is estimated to be between 12-16% for these soil types. We recommend that all fill placed in the building and parking lot areas consist of soil at or near optimum moisture for compaction.

D. Recommendations

The following recommendations are based on our understanding of the proposed project. If our understanding of the project is not accurate, or if changes are made to the project scope, please inform us so that our recommendations can be amended, if necessary. We have included recommendations regarding earthwork and construction that may help in cost estimates and aid in design. We should be allowed to review the proposed construction plans to provide further detailed recommendations, if necessary. Without the opportunity to review the final construction plans, the recommendations made in this report may no longer be valid.

Site Grading:

We recommend that all topsoil material be completely removed from the construction area prior to beginning grading. We estimate that this will require 4 to 8 inches of excavation across this site. The topsoil should be removed from the site, or it could be stockpiled and used for landscaping.

After removal of the topsoil and any uncontrolled fill, we recommend the native fine sands be wetted and compacted with three passes of a heavy vibratory roller in each of two perpendicular directions. This will help to increase the density of the fine sands and to make the soils consistent across the building. We recommend the bottom of the excavation be observed by a soils engineer or a qualified technician to verify that native, competent material has been reached. We recommend the excavation be oversized one foot for every foot of fill required to reach planned grade (1:1 oversizing). Soils can change dramatically over short horizontal distances; therefore, the recommended excavation depths should be used as a guide.

After removal of the topsoil and any soft, unsuitable soils, we recommend clean, mineral fill, meeting the requirements of structural fill, be placed, and compacted to bring the building and parking lot areas to grade. We recommend all standing water be removed from any excavation before placing fill.

Structural Fill:

The on-site soils consisting of poorly graded sands (SP) are considered excellent material for use as structural fill. These soils are easy to work with and easy to compact with vibratory compaction equipment.

We recommend that all fill consist of mineral soils meeting the following requirements. No organic soils, roots, stumps, logs, brush, etc. should be used as structural fill below any foundation or pavement section. We recommend that all fill material be free of soft, wet, or frozen soils, highly expansive soils, rubble, debris, and rocks in excess of 6 inches in diameter. The fill should be as uniform as possible both in composition and moisture content.

We recommend all fill be compacted to the minimum relative density levels shown in the table below:

Location	Recommended Compaction Level (percent of Std. Proctor ASTM D698)
Below Foundations	98 %
Below Slabs, including interior and exterior wall backfill	95%
Below Pavements, deeper than 3 feet from finished subgrade	95%
Below Pavements within 3 feet of finished subgrade	100%

We recommend all fill placed in the building and pavement areas be compacted in 8-inch loose lifts. All fill should be compacted at a moisture content within plus or minus 2% of the optimum moisture as determined by a standard proctor. We recommend compaction tests be taken on any fill in the building and pavement areas at a rate of one test per vertical foot per 2,500 square foot area, with a minimum of two tests per fill area.

Foundations:

It appears the existing native soils on this site are in a loose to medium dense condition capable of supporting the proposed structure. We recommend all footings be supported on native sands or properly compacted structural fill as recommended.

All exterior footings in heated building areas should be placed at a minimum depth of 60 inches

below the proposed final grade to provide protection from frost damage. Interior footings in heated areas can be placed at any convenient depth as long as they are placed on the native fine sands or properly compacted fill.

Any footings placed on native soils or on properly compacted fill should be proportioned for a maximum net allowable soil bearing pressure of 2000 psf. We recommend compaction tests be taken on any fill below the footings at a rate of one test per 50 linear feet for wall footings and one test per column footing. We recommend compaction tests be taken immediately prior to pouring the footings.

The recommended bearing pressure is a net value and represents the actual loads that may be transmitted to the soil independent of overburden pressures. We estimate total settlement to be less than 1inch with differential settlement about half of this if the recommendations in this report are followed.

Slabs

We recommend a minimum of 6 inches of clean, free draining washed sand with less than 5% passing a No. 200 sieve be placed beneath the floor slabs. This will provide a capillary break and a uniform level subgrade for the floor slabs. We recommend slabs be designed using a modulus of subgrade reaction of 250 pounds per cubic inch.

A vapor barrier should be placed under all concrete floors on ground that are likely to receive an impermeable floor finish or be used for any purpose where the passage of water vapor through the floor is undesirable. Floor coverings such as linoleum, vinyl tile, carpeting, wood, and synthetic surfacing effectively seal the moisture within the slab where it eventually may loosen, buckle, or blister the floor covering. We recommend a vapor moisture barrier consisting of a minimum of 6-mil polyethylene sheeting be placed under concrete slabs on grade. The plastic sheeting should be placed between the sand and the concrete, not below the sand.

In order to lessen the moisture post-construction, we recommend using a low water-cement ratio

concrete, less than .45. We recommend allowing the slab a 2-month drying period and testing the slab's moisture condition before installing any floor covering.

Wall Backfill

We assume the walls will be backfilled with on-site granular materials. We recommend all wall backfill be compacted to at least 95% of standard proctor maximum density. We recommend below grade walls be designed using a coefficient of active pressure (Ka) of 0.44, an at-rest coefficient (Ko) of 0.28, and a passive coefficient (Kp) of 3.5. We recommend below grade walls be designed using the bulk unit weight of 120 pounds per cubic foot.

Stormwater Pond:

The native sand soils on this site are good for infiltration treatment. According to the *Minnesota Stormwater Manual, November 2005*, prepared by the Minnesota Pollution Control Agency, it is our opinion that the native sands consisting of fine grained poorly graded sands (SP) are in Hydrologic Group "A."

We recommend using an assumed infiltration rate of 1.0 inches per hour for the design of infiltration facilities on this site that will extend into the fine grained, poorly graded sands. Infiltrometer testing may be warranted to verify this value due to the fine grained nature of the native soils. The pond bottom should be at least three feet above the ground water level for infiltration basins.

E. Pavement Recommendations

The expected subgrade soil will likely consist of poorly graded sands (SP). The soils encountered are classified as A-3 soils in accordance with the American Association of State Highway Transportation Officials (AASHTO) classification system. A-3 soils are rated excellent material for use as parking lot subgrade material. In no instance should organic soils be used as parking lot subgrade material. Without benefit of a laboratory R-value determination and based on MnDOT guidelines, an R-value of 70 can be assumed for these materials.

Based on an assumed R-value of 70, we recommend the following bituminous pavement section

for general car and light truck parking lots:

Thickness	Course/Description	G.E.
4.0”	MnDOT Superpave Bituminous	9.0”
6.0”	MnDOT 3138 Class 5 Aggregate Base	6.0”
10.0”	TOTAL	15.0”

For the concrete pavement section, we recommend 4.5 inches of Portland cement concrete mix with a minimum compressive strength of 4500 p.s.f. We recommend placing a minimum of 3 inches of aggregate under the concrete to provide a level, uniform surface for the concrete pavement. The subgrade should be dampened immediately prior to pouring the concrete pavement.

In using the assumed R-value for bituminous pavement or concrete design, it is essential that the subgrade be constructed of uniform soils at a moisture content and density in accordance with MnDOT specification 2105 and capable of passing a test roll in accordance with MnDOT specification 2111. The native, undisturbed soils may need preparation (drying and compacting) to pass a proof roll. If the subgrade is not compacted, uniform and capable of passing a test roll, then we recommend the subgrade be scarified and recompacted or subcut and replaced with geotextile fabric and select granular material meeting MnDOT specification 3149. The top of the subgrade should be compacted to a minimum of 100% of standard proctor maximum density. The subgrade should be sloped towards the edges to provide drainage.

F. Closing

Our work was performed for geotechnical purposes only and not to document the presence or extent of any contamination on the site. We can note that our crew did not detect any obvious contamination by sight or smell during drilling operations. However, human senses are limited in terms of contamination detection and, therefore, the lack of detection through human sensing does not preclude the possibility of the presence of contamination of the site.

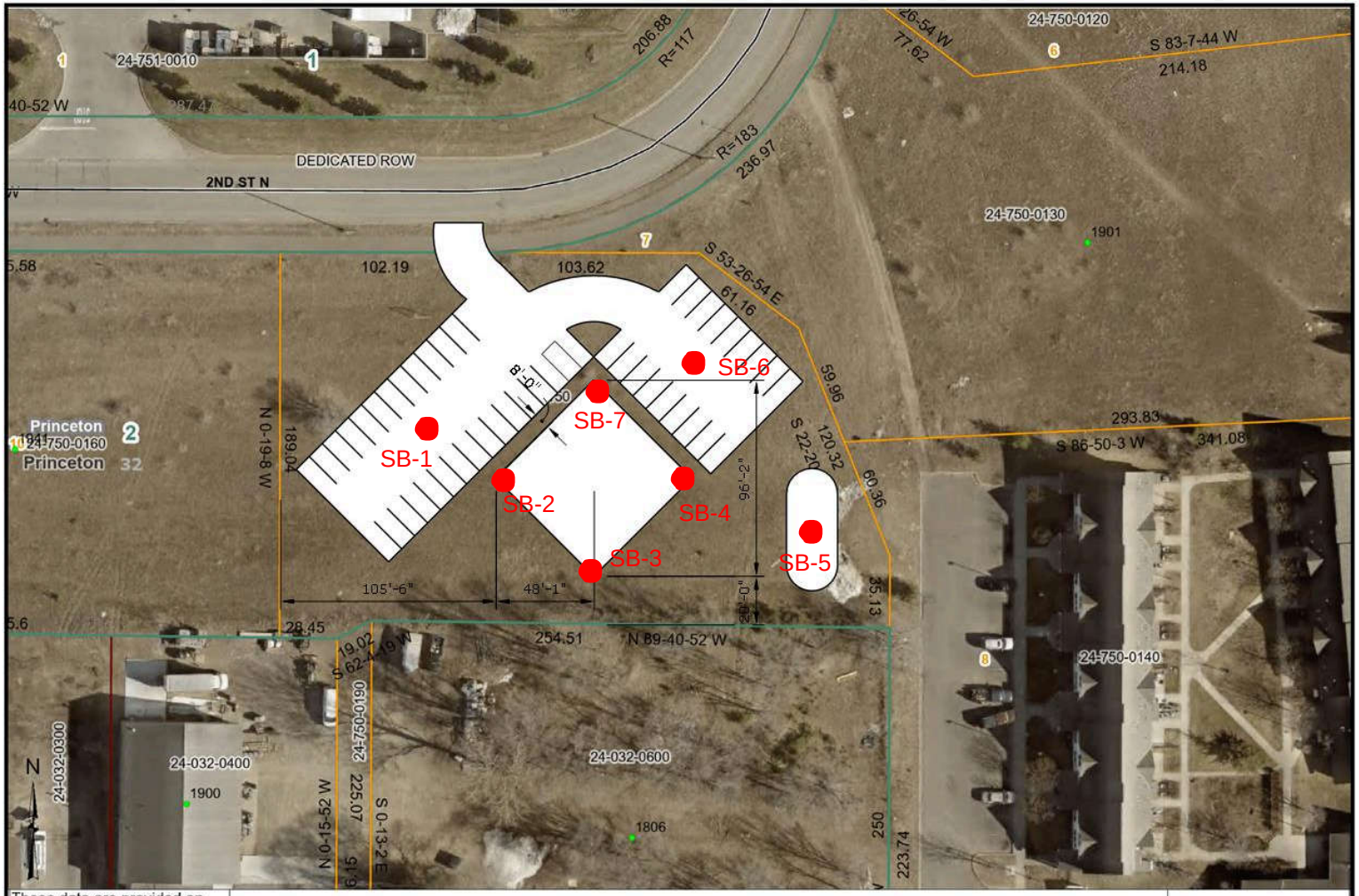
This report represents the result of our subsurface investigation and is based on information gathered at specific locations. Subsurface conditions can change a great deal over short horizontal

distances. Also, the actual interface between strata will likely be a gradual transition rather than an abrupt change as represented on the boring logs.

Geotechnical engineering is based extensively on opinion. Therefore, the data contained in this report should be used as a guide, and we recommend that construction monitoring be performed by a qualified geotechnical engineer or technician. We recommend ITT be retained due to our familiarity with the soils on this site. Any changes in the subsurface conditions from those found during this geotechnical investigation should be brought to the attention of a soils engineer.

APPENDIX 1

BORING LOCATION PLAN



These data are provided on an "AS-IS" basis, without warranty of any type, expressed or implied, including but not limited to any warranty as to their performance, merchantability, or fitness for any particular purpose.

Date: 7/31/2024

This map is not a substitute for accurate field surveys or for locating actual property lines and any adjacent features.

APPENDIX 2

SOIL BORING LOGS

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-1**
START TIME: **8:15** *END TIME:* **8:30**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	*ASTM Symbol*	*Soil Description*	*Sample #*	*N Value*	*W_n*	*Notes*
6.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, brown.**				
			1	**6**	5.6	
5.0						
			2	**10**	6.5	
			3	**7**	10.1	
10.0						
			4	**8**	26.4	**V Water encountered at 10.5 feet during drilling.**
11.5						
		Boring complete to 11.5 feet. **No water encountered during drilling.** **No water measured to cave-in at 8' 6" after completion.**				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-2**
START TIME: **8:35** *END TIME:* **8:55**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
5.0"	SM	SILTY SAND, fine grained, dark brown.				
	SP	POORLY GRADED SAND, fine grained, brown.				
			1	4	4.8	
5.0						
			2	5	4.8	
			3	3	18.7	V Water encounterd at 9 feet during drilling.
10.0						
			4	5	21.4	
			5	6	25.2	
14.9						
		Boring complete to 14.9 feet. Water encountered at 9 feet during drilling. No water measured to cave-in at 9 feet after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-3**
START TIME: **9:00** *END TIME:* **9:20**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
6.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, brown.**				
			1	**3**	5.0	
5.0						
			2	**4**	8.4	
7.5						
			3	**5**	10.6	
10.0						
			4	**5**	19.5	**V Water encounterd at 10.5 feet during drilling.**
			5	**6**	28.4	
14.9						
		Boring complete to 14.9 feet. **Water encountered at 10.5 feet during drilling.** **No water measured to cave-in at 9' 9" after completion.**				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-4**
START TIME: **9:25** *END TIME:* **9:45**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
4.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, loght brown.**				
			1	**5**	4.7	
5.0						
			2	**6**	4.4	
		brown	**3**	**4**	4.5	
10.0						
			4	**4**	19.9	**V Water encounterd at 10.5 feet during drilling.**
		fine to medium grained.	**5**	**6**	19.8	
14.9						
		Boring complete to 14.9 feet. **Water encountered at 10.5 feet during drilling.** **No water measured to cave-in at 9' after completion.**				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-5**
START TIME: **9:50** *END TIME:* **10:05**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	*ASTM Symbol*	*Soil Description*	*Sample #*	*N Value*	*W_n*	*Notes*
4.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, tan, brown.**				
			1	**3**	3.5	
5.0						
			2	**4**	5.0	
			3	**5**	12.0	
						V Water encounterd at 9.5 feet during drilling.
10.0		**fine to medium grained.**				
			4	**4**	20.4	
11.5		**Boring complete to 11.5 feet.** **Water encountered at 9.5 feet during drilling.** **No water measured to cave-in at 9' after completion.**				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-6**
START TIME: **10:10** *END TIME:* **10:30**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	*ASTM Symbol*	*Soil Description*	*Sample #*	*N Value*	*W_n*	*Notes*
5.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, dark brown.**				
			1	**10**	7.0	
5.0		**brown.**				
			2	**25**	6.0	
			3	**9**	12.8	
10.0		**fine to medium grained.**				
			4	**4**	21.5	**V Water encounterd at 10.5 feet during drilling.**
11.5		**Boring complete to 11.5 feet.** **Water encountered at 10.5 during drilling.** **No water measured to cave-in at 8' after completion.**				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **24-297** **KEYSTONE DESIGN BUILD, INC.**
PRINCETON DENTAL
PRINCETON, MINNESOTA

DATE: **8/12/24** *12-Aug* **SB-7**
START TIME: **10:35** *END TIME:* **11:00**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **CD/RS**

LOCATION: **See Boring Location Plan**
ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
8.0"	**SM**	**SILTY SAND, fine grained, dark brown.**				
	SP	**POORLY GRADED SAND, fine grained, brown.**				
			1	**9**	8.3	
5.0						
			2	**20**	6.2	
			3	**8**	17.1	
10.0						**V Water encounterd at 10 feet during drilling.**
		fine to medium grained.	**4**	**6**	19.3	
			5	**7**	18.7	
14.9		**Boring complete to 14.9 feet.** **Water encountered at 10 feet during drilling.** **No water measured to cave-in at 8' 6" after completion.**				

Unified Soil Classification (USC) System (from ASTM D 2487)

Major Divisions			Group Symbol	Typical Names
Course-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	**Gravels** 50% or more of course fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of course fraction passes the 4.75 (No. 4) sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	**Silts and Clays** Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock four, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic
Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. Supply all labor, transportation, materials, apparatus, and tools necessary for the entire proper completion of this Work. Install, maintain, and remove all equipment for the proper execution of this Contract. Be responsible for the safe, proper, and lawful performance of equipment, maintenance and use of the same and perform in the best manner and everything properly incidental thereto, as stated on the Contract Documents or reasonably implied therein.

1.02 EXISTING CONSTRUCTION - VERIFICATION

A. The existing construction may not be as shown on the plans and some modifications of the details may be required to accomplish the intent of the documents. The details shown and the information provided may have been taken from the original plans for the site, but are not represented or guaranteed by the Owner and Engineer as being accurate as to the actual "as built" and present conditions. Verify all conditions at the site and perform all work to complete the project under this Contract, regardless of variations that may be found, without additional cost to the Owner. All modifications or adjustments are to be approved in advance by the Engineer.

B. Contact Gopher State One Call (800-521-0579) to locate underground utilities prior to performing any excavation or demolition work at the site. The owner should also be consulted as to the presence of any "private" utilities within the work areas. Where utility locations are in question, the contractor shall retain the services of a private utility locator to determine the location of the underground utilities. The contractor will be responsible to repair any utilities damaged as part of the contractor's work for this project.

1.03 DEFINITIONS

A. The words install, provide, furnish, include, supply, apply, place, or any combination thereof, are intended to be synonymous and to indicate that the material and/or work specifically mentioned is to be furnished and installed by this Contractor and/or this Contractor's Subcontractors.

1.04 PERMITS

A. Prior to beginning any construction or demolition, obtain all required permits from the City, State, County and Watershed District where work is taking place.

1.05 SEDIMENT CONTROL

A. Install silt fence and catch basin inlet protection, as required to prevent runoff sediment from the construction area from washing into the adjacent catch basins, streets and properties.

1.06 SITE RESTORATION

A. The contractor is responsible for any damage due to the contractor's construction activity to existing lawn areas, bituminous drives and parking lots, concrete curb and gutter, concrete sidewalks, valley gutter, etc., and underground utilities, including irrigation systems adjacent to and within the project site. The contractor shall repair all damaged items and areas to their original condition or better, at the contractor's expense.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1 GENERAL

1.01 GENERAL

A. All materials, systems, or assemblies shall be installed or applied in accordance with these specifications and, where not specifically designated otherwise, in accordance with the State Department of Transportation "Standard Specifications for Construction", current edition. If, in the opinion of the Contractor, any work is indicated on the plans or specified in such manner as to make it impossible to produce work of the highest quality, or should discrepancies appear between plans, or plans and specifications, the Contractor shall advise the Engineer before proceeding.

B. References: Without limiting the generality of other requirements of the specifications, all work specified shall conform to, or exceed the applicable requirements of the documents referenced in each section of the specifications to the extent that the provisions of such documents are not in conflict with the requirements of that section.

1.02 SURVEYING, STAKING AND SITE LAYOUT

A. The Contractor is responsible for performing all construction staking and site layout. If a topographic survey is required to construct the project in accordance with the specifications, the Contractor shall provide the survey from an Independent licensed, bonded and insured land surveyor. The Engineer will verify the construction staking, site layout and topographic survey only for quality assurance purposes.

1.03 INSPECTIONS AND TESTS

A. The Contractor shall retain and pay an independent testing agency for all construction materials testing. The testing laboratory shall submit test reports to the Engineer and Contractor within 48 hours after test has been performed.

B. The Engineer may request tests of any materials in addition to the tests specified. The Contractor shall pay for the additional tests if the test results show the material not in conformance with the specifications.

C. Repeat tests required because test results show materials not in conformance with the specifications, shall be paid for by the Contractor.

D. Notify the Engineer not less than 24 hours in advance whenever work is to be performed. Failure to notify the Engineer at least 24 hours in advance shall be reasonable cause for the Engineer to order a sufficient delay in the Contractor's schedule to allow time for inspections and any remedial or corrective work required. All costs of such delays, including its effects upon other portions of the work, shall be borne by the Contractor and no time extension will be permitted.

E. When notification has been given to the Engineer by the Contractor to be present on the job site to perform inspections and the Contractor fails to show up or arrives more than two hours later than the scheduled time, all costs incurred by the Engineer shall be charged to the Contractor. The costs shall be deducted from the Contract in the form of a change order.

F. During the construction of a project, if it is determined the Work does not conform to the requirements of the plans and specifications; the Contractor shall repair, replace or correct the Work to meet the intent of the plans and specifications. All costs incurred by the corrective work shall be borne by the Contractor. Engineering fees for inspections and tests shall also be the responsibility of the Contractor. Such fees shall be paid directly by the Contractor or be deducted from the Contract in the form of a change order.

G. Provide documentation for all unit price items. Contractor's foreman and Engineer will confirm daily.

H. Test samples of materials and completed work at the project site will be taken in the presence of the Engineer.

I. Cooperate by furnishing materials required for testing, access to the Work, and space for necessary storage.

J. Properly repair sample/test location openings made in the work required for testing and inspections to the satisfaction of the Engineer.

K. The Manufacturer of all products used must have source quality control capabilities to show conformance of the products to the specification requirements prior to shipment to the Owner.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 USE OF EXISTING FACILITIES

A. The Contractor may use utilities, i.e. water, electricity, etc. owned by the Owner only if approved in advance. Coordinate the use of utilities with the Owner. At no time shall utilities be wasted.

B. The Contractor shall not interrupt the utility service for the site in any way unless agreed upon by the Owner.

C. The Contractor shall make arrangements for portable sanitary facilities, as necessary. The Contractor shall be responsible for maintaining the cleanliness of any facility used.

D. The Owner's telephone and restroom will not be available for Contractor use.

1.02 CONTROLS OF PUBLIC AGENCIES

A. All Federal, State, County, City, or any other governing agency permits, licenses and fees associated with the Work shall be obtained and paid for by the Contractor. Copies of all required permits must be submitted to the Engineer prior to the start of construction. If the permits have not been obtained in advance of the start construction and such non-conformance to the regulations requires a change in the scope of work, all such costs associated with the change in scope of work shall be borne by the Contractor. The Contractor shall repair, replace or correct the Work to meet the requirements of the regulating/governing body. Engineering fees for inspections and tests shall also be the responsibility of the Contractor. Such fees shall be paid directly by the Contractor or be deducted from the Contract in the form of a change order.

B. The Work shall meet the requirements of all governing codes, ordinances, laws, regulations, safety orders, and directives relating to the Work, including any specific requirements of the city and state of jurisdiction.

C. The Work on, adjacent to, or over public land, streets, alleys, or other public facilities, shall be approved by the proper authorities. Make arrangements with such authorities regarding all details, timing, materials, methods, protection, and similar items in connection with the Work, including street use, work on streets, or blocking of streets. Make repairs, file bonds, conform to directions, and such other requirements that may be necessary.

1.03 REFERENCE STANDARDS

A. Publications in effect on the date of issue of these Contract Documents shall apply to the work performed under this Contract, except when a specific date is specified.

1.04 SPECIAL CONTROLS

A. Disturbing or disruptive noise that interferes with the normal site occupancy will not be permitted. Operations creating noise of this type must be scheduled in advance with the Owner.

B. The Contractor shall discharge any worker creating a nuisance on the premises.

C. Protect the building, site and adjoining property from objectionable dust and wind-blown debris.

D. Provide necessary controls to prevent pollution of the air by odors or particulate matter.

E. Exercise reasonable precautions to prevent vandalism and to safeguard the public at the existing building and site.

F. Disposal of Materials:

1. Load disposal materials directly into trucks by means that will prevent damage to the existing or new surfaces and to control pollution.

2. No accumulation of disposal materials will be permitted at any time, except as otherwise specified. The Contractor is responsible for prompt removal from the site and disposal in a manner approved by the local authorities.

3. Transport and legally dispose of materials off-site.

G. When earth materials are exposed, the Contractor shall install adequate erosion control measures, such as silt fences, hay bales, riprap, erosion control blankets, etc., to prevent soils from exiting the site.

H. Utilities within the project site shall be protected from receiving soils or other types of debris when extensive or copious amounts of rainfall or wind occur.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 60 00

PROTECTION, REPAIR AND CLEANING

PART 1 GENERAL

1.01 PROTECTION OF EXISTING PROPERTY

A. The construction site must be protected from unauthorized personnel at all times. The installation of a semi-permanent construction fence may be required on projects that will be prolonged over a period of time. The installation of temporary fences, barricades, cones and signs may also be required. No additional compensation will be made to the Contractor for construction site protection.

B. Provide protective materials and methods, as required, to protect existing buildings and adjacent surfaces, features, and property. The Contractor is responsible for any damage resulting from work under this Contract.

C. Take precautions to protect the building grounds from damage due to necessary construction traffic.

D. Existing materials that are to be salvaged for reuse, or given to the Owner, shall be removed carefully and stored in a manner and location to prevent damage until utilized.

E. Prevent access by the public to materials, tools, or equipment.

1.02 REPAIRS OF EXISTING PROPERTY

A. Access to the construction site will be the responsibility of the Contractor. Property that is traveled over to gain access to the construction site will be properly repaired to the existing conditions or better, at the Contractor's expense, to the satisfaction of the Owner. This includes all bituminous, concrete, grass or other types of surfacing materials.

B. When it is required to remove or alter the existing property, all affected areas shall be properly repaired to the existing conditions or better, at the Contractor's expense, to the satisfaction of the Owner.

C. Existing materials designated to remain, which are damaged or defaced as a result of the Work and are unsuitable for the use intended, shall be replaced at the Contractor's expense to the satisfaction of the Owner.

D. Use approved procedures and materials to repair defective or incomplete surfaces caused or exposed by work at the project.

E. Repairs required by the Contract, or necessary because of damage from this Work, shall use products equivalent to, and compatible with, the existing materials.

1.03 CLEANING

A. Refer to the General Conditions for requirements pertaining to the removal of waste materials or rubbish caused by the Work, and the restoration of existing areas affected by the Work. In case of undue delay or dispute, the Owner may remove rubbish, materials, and equipment and charge the costs to Contractor. These actions are permissible by the Owner 48 hours after a written notice has been transmitted to the Contractor.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02 10 00

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal and disposal of vegetation and topsoil.
2. Removal and disposal of existing concrete construction.
3. Removal and disposal of existing bituminous pavement.
4. Removal of existing fence construction.

1.02 PROTECTION OF EXISTING CONDITIONS

A. Provide protection necessary to prevent damage to existing conditions indicated to remain in place and offsite property.

B. Restore all damaged areas to their original condition, as acceptable to the Owner.

1.03 SUBMITTALS REGARDING EXISTING CONDITIONS

A. Provide pre-demolition photographs of the existing conditions prior to beginning any work at the site.

B. Bring to the attention of the Engineer in writing within 48 hours any items damaged during the demolition process that are to be salvaged for re-use. If it is determined that the damage to the item(s) could have been prevented by the Contractor taking reasonable measures or precautions, the damaged item(s) will be replaced or repaired at the Contractor's expense.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 SITE ACCESS

A. Demolition and removal operations shall be performed to ensure minimum interference with roads, parking lots, sidewalks and pathways.

B. Erect temporary fencing as necessary to keep people out of the work area.

3.02 DEMOLITION

A. Remove vegetation, improvements, or obstructions interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated.

B. Store salvaged materials on-site in a location where they will not be damaged or interfere with the use of the facilities.

C. Promptly dispose of demolished materials off-site. Do not allow demolition materials and debris to accumulate on-site.

D. Restore all damaged underground piping and utilities, including irrigation.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal and disposal of vegetation and topsoil.
2. Clearing and grubbing.
3. Removal and disposal of pavements.
4. Removal and disposal of miscellaneous construction.

1.02 PROTECTION OF EXISTING CONDITIONS

A. Provide protection necessary to prevent damage to the existing conditions indicated to remain in place.

B. Restore damaged areas to their original condition, as acceptable to the parties having jurisdiction.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 SITE CLEARING

A. Remove vegetation, improvements, or obstructions interfering with the installation of new construction. Remove such items elsewhere on the site or premises as specifically indicated.

B. Mark trees to be removed and notify Engineer/Landscape Architect for review prior to removal.

C. Clear the site of trees, stumps, roots, shrubs, or other vegetation, except for those indicated to remain standing.

D. Completely remove stumps, roots, and other debris protruding through the ground surface or to the depths indicated. Stumps located in areas to be landscaped can be ground down to 18” below finished grade.

E. Abandonment or removal of certain underground pipes or conduits as shown on the Plans is also included in this section.

F. Remove and dispose of pavements identified on the plans. Sawcut all edges of pavements to remain.

END OF SECTION

SECTION 31 20 00

EARTH WORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparing subgrades for structures and concrete/bituminous pavements.
2. Fill material as required to construct grades as shown.
3. Building and foundation excavation and backfilling.
4. Stormwater basin excavating.
5. Rough and final grading.
6. As-built grading plan for all stormwater basin construction.

1.02 DEFINITIONS

A. Backfill: Material meeting the requirements of Section 32 05 00 and as recommended in the geotechnical evaluation report.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Drainage Aggregate: Backfill materials located directly within a drainage trench to provide drainage to the drain tile.

D. Engineered Fill: Soil materials used to raise existing grades within building and pavement areas.

E. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material ¾ cubic yards or more in volume that exceed standard penetration resistance of 100 blows/2 inches when tested by an independent geotechnical testing agency, per ASTM D1586.

F. Structures: Buildings, footings, foundations, retaining walls, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of fill or backfill immediately below subbase, drainage fill, or topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

I. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Geotechnical Engineer.

1.03 SUBMITTALS

A. Product Data: For the following:
  1. Controlled low-strength material, including design mixture.

B. Material Test Reports: From qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  1. Classification per ASTM D2487of each soil material proposed for fill and backfill.
  2. Laboratory compaction curve per ASTM D698 for each soil material proposed for fill and backfill.

C. Pre-excavation/demolition photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit photographs to Owner/Construction Manager before earthwork begins.

D. As- Built grading plan:
  1. Provide an as built topographic survey of the excavation bottom for all storm water ponding areas prior to final seeding and restoration to verify correct slopes and depths. Final restoration (seeding, planting, etc.) shall not be performed until topographic survey is reviewed and approved by the Engineer.

1.04 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified per ASTM E329 to conduct soil materials and rock-definition testing, as documented per ASTM D3740 and ASTM E548.

1.05 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Owner or Architect and then only after arranging to provide temporary utility services per requirements indicated.
  1. Notify Construction Manager/Engineer not less than 2 days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Construction Manager's written permission.
  3. Contact Gopher State One Call before excavating.
  4. Retain the services of a private utility locating company to locate utilities not covered by the Gopher State One Call system.
  5. The utilities shown on the Plans are approximate only. Provide adequate means of protection during excavation operations. Properly cap, raise, or lower to grade existing valve covers, cleanouts, manholes, drop inlets, or other utilities as shown on the Plans.
  6. Consult utility owner immediately for directions if uncharted or incorrectly charted piping or other utilities are encountered during the excavation. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation.

The Contractor shall repair damaged utilities to the satisfaction of the utility owner at no expense to the Owner.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

C. Data from, Geotechnical Evaluation Report, if included in this project manual was used for basis of design. This information is not intended as representations or warranties of accuracy or continuity between soils information. It is expressly understood that Owner will not be responsible for interpretations drawn there from Contractor. Data is made available for convenience of Contractor.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide imported soil materials when sufficient satisfactory soil materials are not available from excavations. All excess materials shall be removed from the site and properly disposed of.

B. Satisfactory Soils: ASTM D2487 Soil Classification Groups GW, GP, SW, and SP, or combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT per ASTM D2487, or combination of these groups, unless approved by Geotechnical Consultant.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Borrow and backfill: Naturally or artificially graded mixture of natural or crushed gravel, stone, and/or sand. See Aggregates Section for additional information and requirements. All fill materials shall also be approved by Project Geotechnical Engineer.

E. Topsoil: Topsoil salvaged from on-site can be re-used. If additional materials are required, the topsoil shall be new and imported material. The topsoil, whether it is new or salvaged, should be screened and pulverized. The topsoil should be dry and ready to be fine graded.

Topsoil shall consist of sandy loam soil, reasonably free of clay lumps, stones, and other objects over 1 inch in diameter, without weeds, roots and other objectionable material and shall meet the requirements of MN/DOT Section 3877 for Select Topsoil materials.

	Minimum	Maximum
Material passing #10 sieve	90%	---
Clay	5%	30%
Silt	10%	70%
Sand and gravel	20%	70%
Organic matter	3%	20%
pH	6.1	7.5

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, stone, and/or sand; ASTM D2940; with 100 percent passing 2 inch sieve, less than 40% passing the No. 40 sieve, and not more than 12 percent passing No. 200 sieve. Engineered fill shall also be approved by Project Geotechnical Engineer.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other potential hazards created by earthwork operations.

B. Prepare subgrade for earthwork operations, including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.

C. Protect and maintain all erosion and sedimentation controls.

D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.02 EXCAVATION

A. Excavation is Unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

1. Earth Excavation includes removal and disposal of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

3.03 STABILITY OF EXCAVATIONS

A. General: Comply with local codes, ordinances and requirements of agencies having jurisdiction.

B. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3.04 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install dewatering system as required to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required. Refer to Project geotechnical report and addenda for information related to ground water elevations.
3. Dewatering systems to include measures to prevent sediment transport in accordance with MPCA regulations.

C. All dewatering required to complete the work under this contract is considered incidental.

3.05 EXPLOSIVES

A. The use of explosives is not permitted.

3.06 STORAGE OF EXCAVATED MATERIALS

A. Stockpile satisfactory excavated materials until required for backfill or fill. Place, grade and shape stockpiles for proper drainage. Provide erosion and sediment control measures in accordance with MPCA guidelines.

B. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

C. Dispose of excess soil material and waste materials off site.

3.07 EXCAVATION OF PAVEMENTS

A. Saw cut pavements and excavate underlying materials to comply with cross-sections, elevations and grades as shown.

3.08 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.09 BACKFILL AND FILL

A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below (see geotechnical evaluation report for additional information) using materials specified in Part 2 of this Section and/or the Aggregates specification section.
1. Under grassed areas, use satisfactory excavated or borrow material.
2. Under pavements, use satisfactory excavated or granular borrow materials in the upper 3 feet of the subgrade as shown on the plans and details. Materials are to be placed up to the bottom of the aggregate base in pavement areas.
3. Under the structures, use satisfactory excavated, structural fill or combination. Refer to the geotechnical report for specific requirements.

4. When backfilling is performed during freezing conditions (winter construction) non-frost susceptible granular backfill should be used. Frost should not be allowed to penetrate below footings and frozen soils should not be used for backfill.
5. Under piping and conduit, use granular borrow for bedding and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.
6. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete level to bottom of adjacent footing.
7. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by Owner's Geotechnical Consultant. Use care in backfilling to avoid damage or displacement of pipe systems.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
2. Approval of exposed subgrade materials by Geotechnical consultant.
3. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
4. Removal of concrete formwork.
5. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
6. Removal of trash and debris from excavation.
7. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.10 PLACEMENT AND COMPACTION

A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.

B. Inspection: Prior to placement of fill, excavations shall be inspected by the Geotechnical Engineer to verify that all unsuitable materials have been properly removed. Where the soil borings of the geotechnical consultant indicates that organic, soft or otherwise unsuitable soils are present, test pits will be required to determine the suitability of the existing soils.

1. Exposed soils at the bottom of the excavation shall be compacted with a large vibratory roller to not less than 98% standard proctor density (ASTM D698).
2. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

C. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

E. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

F. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Geotechnical Engineer if soil density tests indicate inadequate compaction.

G. Compact soil to not less than the percentages of maximum density, in accordance with ASTM D698 (see geotechnical report for additional requirements):

1. Under structures, slabs, steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 98 percent maximum density.

2. Under exterior slabs, sidewalks and parking lot pavement areas, compact the top 12 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density, except in the upper 3 feet beneath the pavement where the compaction shall be 100 percent.

3. Under areas to be landscaped, soils shall be loosened to a minimum depth of 12 inches below grades. It will be assumed that all areas to be landscaped exceed specified compaction unless the Contractor demonstrates otherwise with compaction test results. The soils shall be loosened using ripping teeth mounted on a bulldozer or other approved methods. The space between ripping teeth shall be 12” to 18”. If a single tooth is used, passes shall be 12” to 18” apart. The area shall be tilled in two directions that are perpendicular to each other. The loose soils shall then be re-compacted to 92% of Standard Proctor Density. If topsoil is present, the topsoil shall be stripped, prior to ripping, and re-spread.

H. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

2. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.11 ROUGH GRADING

A. Remove topsoil from areas to be excavated, re-landscaped, or re-graded, without mixing with foreign materials. Stockpile on-site for re-use upon completion of grading operations.

B. Do not remove topsoil when wet.

C. Make soil corrections defined in the Geotechnical Report; follow procedures and use materials defined in the Report. Generally:

1. For building and structure foundations, including isolated column footings, excavate full depth to remove topsoil and organic soils and surface soils and expose natural glacial soils. Exposed subgrade soils should be evaluated by the project geotechnical engineer to determine their suitability for support of foundation and slab loads.
    - **a.** If excavation extends below required footing bearing elevation, oversize laterally beyond the outside edges of the foundations at a ratio of 1:1 lateral oversize.
    - **b.** Where excavations are adjacent to existing foundations, excavations should not extend within a zone extending outward a distance of 5 feet from the existing slab or footing and then down and outward at a slope of 1:1. The geotechnical consultant should evaluate the suitability of the remaining soils for foundation and slab support. If excavations are required within these limits, ground improvement, retention or underpinning may be required, as directed by the geotechnical consultant.
    - **c.** Obtain approval of on-site geotechnical consultant before proceeding with compaction and fill work.
    - **d.** Surface compact exposed natural soil surface.
    - **e.** Place and compact backfill soils; see Geotechnical evaluation report, along with structural plan notes and Section 32 05 00 for additional requirements.
2. For floor slabs, strip topsoil and underlying soil material to a depth required for the new slab and sand cushion materials. The suitability of the exposed soils will be evaluated for slab support by the geotechnical consultant.
3. For pavement surfaces, subcut the existing soil to allow the new pavement section. Obtain approval of on-site Geotechnical consultant before proceeding with surface compaction of the exposed, existing soil surface.
4. For Infiltration Basins, subcut the existing soil to allow for the new planting medium. Disc the upper 12 inches of the exposed subgrade soils to loosen prior to placing planting medium.

D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

F. When excavations extend below footing and slab bearing elevations, oversize the excavation horizontally 1 foot for every foot of excavation depth below the indicated bearing elevation.

G. When excavating through roots, perform work by hand and cut roots with sharp axe.

H. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

I. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.12 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected and tested.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.

E. Place topsoil in areas where seeding, sodding, and planting are indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to the following compacted thicknesses:
   1. Areas where seed is installed: 4 inches.
   2. Areas where sod is installed: 4 inches.

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. Lightly compact placed topsoil.

3.13 TOLERANCES

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10-foot above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10-foot above or below required subgrade elevation.

3. Pavements: Shape surface or areas under pavement to line, grade, and cross-section, with finish surface not more than 0.5-inch above or below required subgrade elevation. Subgrade shall be graded to drain to drain tile locations.

C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.14 TRENCHING

A. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Remove excess excavated material from site.

I. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

J. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

K. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.15 FIELD QUALITY CONTROL

A. Quality assurance testing is the responsibility of the Owner. The Owner shall employ the services of an independent materials testing firm to provide the final test information. The Contractor may use their own personnel to provide tests of the materials during the placement and compaction operations; however, an independent testing firm must take the final tests. The testing firm shall test the materials as construction work is performed.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed Work comply with requirements.

C. Testing agency will test compaction of soils in place per ASTM D1556, ASTM D2167, ASTM D2922, and ASTM D2937, as applicable. Perform tests at the following locations and frequencies:

Description	Minimum % Standard Proctor	Minimum Tests/ Unit Area/Lift
Natural sub-grade	92%	1/250 sq. yds.
Below pavements and structures	100% (top 3') 95% (below 3')	1/250 sq. yds.
Base aggregate	100%	1/250 sq. yds.
Landscape fill areas	92%	1/250 sq. yds.
Utility trenches (except under slabs and pavements)	95%	1/100 ln. ft.

D. Field Density Test Report shall clearly identify the following information for each test:

1. Horizontal and vertical location of test.
2. Material type being tested.
3. Proctor test method.
4. Maximum proctor density.
5. Specified density.
6. Optimum moisture density.
7. Field test method.
8. Actual moisture content.
9. Actual dry density.
10. Pass/fail indication.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained. Consult Project Geotechnical Engineer for additional or supplemental recommendations.

F. After all grading, backfilling and planting is completed within the infiltration basins, these areas shall be flood tested by the contractor to verify that the required volume of infiltration water for the simulated 1 inch rain fall event draws down within 48 hours. If the flood testing indicates that it requires more than 48 hours for the water to draw down, corrections to the infiltration basin will be required to bring the draw down time to less than 48 hours. These corrections will be made at no additional cost to the Owner.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Where non frost susceptible soils and drainage aggregate have been installed, protect these areas from settlement during construction. This may require the installation of additional erosion control measures.

C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and re-compact.

D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent Work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 31 20 00

EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
  1. Excavation.

1.02 REFERENCES

A. ASTM D2487, Standard Test Method for Classification of Soils for Engineering Purposes.

PART 2 EXECUTION

2.01 UTILITIES

A. Locate existing underground utilities in areas of Work. The utilities shown on the Plans are approximate locations only. Provide adequate means of protection during excavation operations. Properly cap, raise, or lower to grade existing valve covers, cleanouts, manholes, drop inlets, or other utilities as shown on the Plans.

Contact Gopher State One Call (800-521-0579) to locate underground utilities prior to performing any excavation or demolition work at the site. The owner should also be consulted as to the presence of any "private" utilities within the work areas. Where utility locations are in question, the contractor shall retain the services of a private utility locator to determine the location of the underground utilities. The contractor will be responsible to repair any utilities damaged as part of the contractor's work for this project.

B. Consult utility owner immediately for directions if uncharted or incorrectly charted piping or other utilities are encountered during the excavation. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. The Contractor shall repair damaged utilities to the satisfaction of the utility owner at no expense to the Owner.

C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer.

2.02 USE OF EXPLOSIVES

A. The use of explosives is not permitted.

2.03 EXCAVATION

A. Remove topsoil, sod, grass, organic materials, or other unsuitable soil from areas to receive new materials.

B. Sawcut the existing bituminous pavement to be removed to form a smooth vertical edge. Chiseling, jackhammering or blade ripping of the existing bituminous will not be permitted except if approved in advance by the Engineer. Remove the bituminous where indicated on the Plans or as marked in the field by the Engineer.

C. Excavate repair areas as indicated by the Geotechnical Report. After the required excavation has been completed, thoroughly clean the exposed vertical and bottom surfaces of all loose materials. The excavation bottom shall be firm and dry.

D. Do not allow water to accumulate in the excavations. Remove water to prevent softening of subgrade or foundation soils or to eliminate other changes detrimental to the stability of the subgrade. Provide and maintain surface drainage and other dewatering system components necessary to convey water away from the excavations.

E. For the excavation of the subgrade, conform to the elevations and dimensions shown within a tolerance of plus or minus 0.10 feet.

F. Notify the Engineer at least 3 days in advance of any excavation so the Engineer can examine and evaluate the subsoils before placement of the new materials.

G. All work specified in this section shall be performed by the Contractor at his own expense in accordance with the Contract. If additional excavations are required, the Contractor shall not proceed until given notice by the Engineer. Additional payment will be made under separate unit prices for additional excavation if such unit prices have been established; otherwise payment will be made in accordance with a negotiated price.

H. Use all means necessary to prevent operations from producing dust. The Contractor shall be responsible for damage resulting from dust originating from their operations.

2.04 OVER-EXCAVATION NOT ORDERED, SPECIFIED OR SHOWN

A. Excavations carried below the elevations or depths specified shall be backfilled to the required grade with the specified materials and compaction percentages. The Contractor shall perform such work at his own expense.

2.05 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The Contractor shall remove and dispose of excess excavated material at his own expense.

2.06 FIELD QUALITY CONTROL

A. Inspections will be performed during the excavation for the following.

1. Review of the excavation cross-section.
2. Evaluation of natural subgrade materials.

END OF SECTION

SECTION 31 25 00

TEMPORARY EROSION CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
  1. Temporary Erosion Prevention and Sediment Control.

PART 2 PRODUCTS

2.01 CATCH BASIN INLET PROTECTION

A. Prefabricated sediment control devices designed for use in catch basin structures in the size and shape for proper installation. Devices installed on curb inlets shall protect the curb opening.
  1. InfraSafe Debris Collection Device
  2. Wimco Road Drain
  3. Dandy (Curb) Sack
  4. Approved equal on Mn/DOT's approved product list.

B. In grass areas, silt fence backed by wire mesh reinforcing installed in a 4' by 4' square may be used.

2.02 SILT FENCE FABRIC

A. Ten Cate Mirafi 100X or approved equal woven fabric of polypropylene fibers treated to resist degradation caused by exposure to sunlight, resistant to soil chemicals, mildew, and insects. The fabric shall be non-biodegradable with the following properties:

Apparent Opening Size, ASTM D4751	USS #30 maximum
Minimum Weight	2.5 oz/sq. yd.
Tearing Strength, ASTM D4533	65 lb. minimum
Sediment Retention Efficiency	80% minimum
Flow Rate, ASTM D4491	10 gal/min/ft² Minimum
UV Resistance at 500 hours, ASTM 4355,%	70 minimum

B. The silt fence shall be ultraviolet stable and have high tear resistance and low permeability.

2.03 ROCK CONSTRUCTION ENTRANCE

A. Washed aggregate with a nominal size of 1.5".

2.04 EROSION CONTROL FABRIC

A. North American Green SC150BN. (Extended Term Erosion Control, 18 months; 2:1 to 1:1 slopes)

1. Material Data Requirements:

Top net:	Woven, 100% biodegradable, natural organic fiber, 9.3 lbs./ 1,000 square feet
Bottom net:	Woven, 100% biodegradable, natural organic fiber, 9.3 lbs./ 1,000 square feet
Matrix:	70% Straw at 0.35 lbs./ square yard 30% coconut at 0.15 lbs./ square yard
Thread:	Biodegradable

B. Approved equal.

2.05 SEDIMENT LOGS

A. Straw, wood fiber, compost, or rock filter log meeting Mn/DOT 3897, size as indicated on the plans.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Installation techniques shall be in accordance with the Minnesota Construction Site Erosion and Sediment Control Planning Handbook and Minnesota Pollution Control Agency Best Management Practices.

B. Perimeter and down gradient sediment control measures shall be installed prior to land disturbing activity. Install intermediate and temporary measures as construction progresses.

C. Contractor personnel overseeing the SWPPP and installing and maintaining of BMPs shall be in compliance with the training requirements of the MPCA Stormwater Permit for Construction Activity.

D. Infiltration areas shall be protected from sediment of ongoing construction activities.

3.02 INLET PROTECTION

A. Install in accordance with manufacturer's instructions.

3.03 SILT FENCE FABRIC

A. Erect posts to support the silt fence fabric with post spacing maximum of 8 feet on-center.

B. Install the fabric and firmly attach to the posts. Dig a trench along the intended face line and cover the fabric, or lay the bottom 6 inches on the ground and backfill over the fabric to create a good seal.

3.04 ROCK CONSTRUCTION ENTRANCE

A. Construct the rock construction entrance a minimum of 20 feet wide and 50 feet in length, over soil separation fabric.

3.05 EROSION CONTROL FABRIC

A. The installation of the erosion control fabric shall be in strict compliance with the manufacturer's installation instructions.

B. Prepare the soil before installing the blankets, including the application of fertilizer and seed.

C. Staple the fabric onto the slopes as recommended by the manufacturer.

3.06 SEDIMENT LOGS

A. Install in accordance with manufacturer's instructions.

3.07 INSPECTION

A. The Contractor shall inspect the entire site immediately after each rainfall event greater than 0.5 inches in 24 hours, daily during prolonged rainfall, and at least every 7 days. Inspections must include surface waters including drainage ditches and conveyance systems, for evidence of erosion and sediment deposit.

B. The Contractor shall inspect adjacent streets for vehicle tracking of sediment daily.

3.08 MAINTENANCE

A. Remove sediment when it reaches 1/3 the capacity of the BMP.

B. BMPs shall be repaired or replaced when they become damaged, clogged, or otherwise ineffective.

C. Maintenance and repairs shall be performed within 24 hours of discovery or as soon as field conditions allow access.

D. Sweeping of tracked sediments on pavements shall be performed daily.

E. Removal and stabilization of sediment deposited in surface waters shall be performed within 7 days of discovery.

F. BMPs shall remain in place and be maintained until final stabilization is established.

3.09 RECORD KEEPING

A. The SWPPP shall be kept onsite at all times.

B. All inspections, maintenance, and changes shall be recorded in the SWPPP.

3.10 CLEANUP

A. BMPs shall be removed when the up gradient areas have been permanently revegetated or paved.

END OF SECTION

SECTION 32 05 00

AGGREGATES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
- **1.** Aggregate base
- **2.** Engineered fill
- **3.** General backfill
- **4.** Unsuitable material
- **5.** Stabilizing aggregate
- **6.** Fine filter aggregate (non-frost susceptible fill)
- **7.** Coarse filter aggregate
- **8.** Riprap
- **9.** Washed rock
- **10.** Modified select granular borrow (sand section)

1.02 SUBMITTALS

A. Submit laboratory test reports indicating the proposed aggregate grading meets the requirements specified herein.

B. Submit laboratory test results indicating the proposed aggregate base material meets the Los Angeles Abrasion requirements, and minimum percent crushed as specified herein.

C. The information must be current and represent the material to be supplied to the project site. If test information is not available from the supplier, the Contractor shall make arrangements and pay for required tests.

1.03 REFERENCES

A. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction, Current Edition
- **1.** Section 3601 - Riprap Material

B. Minnesota Department of Transportation (Mn/DOT) Materials Lab Supplemental Specifications for Construction, Current Edition
- **1.** Section 3138 - Aggregate for Surface and Base Courses
- **2.** Section 3149 - Granular Material

C. ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

D. ASTM C127, Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Course Aggregate

E. ASTM C131, Standard Test Method for Resistance to Degradation of Small-Sized Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

F. ASTM D698, Standard Test Method for Moisture Density Relations of Soils and Soil- Aggregate Mixtures, using a 5.5 pound Rammer and 12-inch Drop.

G. ASTM D1557, Standard Test Method for Moisture Density Relations of Soils and Soil-Aggregate Mixtures, using a 10.0 pound Rammer and 18-inch Drop.

H. ASTM D2487, Standard Test Method for Classification of Soils for Engineering Purposes.

I. ASTM D2922, Standard Test Method for Density of Soils and Soil-Aggregate In- Place by Nuclear Method (Shallow Depth).

J. ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils

1.04 QUALITY ASSURANCE

A. In-place field density tests will be performed in accordance with ASTM D2922.

B. The testing laboratory shall submit test reports to the Engineer and Contractor within 48 hours after the test has been performed.

PART 2 PRODUCTS

2.01 AGGREGATE BASE

A. Class 5 Aggregate Base.

1. Crushed rock graded according to Mn/DOT 3138 Class 5 Gradation as follows:

Percent Passing by Weight						
Sieve Size	< 25% Recycled Aggregate		≥ 25% Recycled Aggregate < 75% Recycled Concrete		> 75% Recycled Concrete	
	Class 5	Class 5Q	Class 5	Class 5Q	Class 5	Class 5Q
2 inch	-	100	-	100	-	100
1-1/2 inch	-	-	100	-	100	-
1 inch	100	65 - 95	-	65 - 95	-	65 - 95
3/4 inch	90 - 100	45 - 85	90 - 100	45 - 85	90 - 100	45 - 85
3/8 inch	50 - 90	35 - 70	50 - 90	35 - 70	50 - 90	35 - 70
No. 4	35 - 80	15 - 45	35 - 80	15 - 45	35 - 80	15 - 45
No. 10	20 - 65	10 - 30	20 - 65	10 - 30	20 - 65	10 - 30
No. 40	10 - 35	5 - 25	10 - 35	5 - 25	0 - 8	0 - 8
No. 200	3 - 10	3 - 10	0 - 10	0 - 10	0 - 3	0 - 3

2. The coarse aggregate (that portion retained on the No. 4 sieve) shall have a percent of wear of not more than 40 at 500 revolutions as determined by ASTM C131.

3. Class 5 aggregate shall contain not more than 10 percent shale in the total sample except that when the part passing a No. 200 sieve exceeds 7 percent, the percentage of shale in the sample shall not exceed 7 percent.

B. Recycled Content

1. Recycled aggregates composed only of recycled asphalt pavement (RAP), recycled concrete materials, recycled aggregate materials, or certified recycled glass, may be substituted for virgin aggregates.
2. Recycled aggregates must meet the requirements of the following table:

Requirement	**Classes 1, 3, 4, 5, 5Q, and 6**
Maximum Bitumen Content of Composite	3.50%
Maximum Masonry Block %	10%
Maximum Percentage of Glass [1]	10%
Maximum Size of Glass [1]	3/4" [19 mm]
Crushing (Class 5, 5Q and 6) [2]	10% for Class 5 and 5Q [3] 15% for Class 6 [3]
1 Glass must meet the requirements on the grading and base website. Combine glass with other aggregates during the crushing operation.	
2 Material crushed from quarries is considered crushed material	
3 If material is ≥ 20% (RAP + Concrete), Class 5 and 5Q crushing requirements are met	
3 If material is ≥ 30% (RAP + Concrete), Class 6 crushing requirement is met	

2.02 ENGINEERED FILL

A. Granular material graded according to Mn/DOT 3149.2E as follows:

Sieve Size	Percent Passing By Weight
2 inch	100
No. 4	35 - 100
No. 10	20 - 70
No. 40	10 - 35
No. 200	3.0 - 10.5

2.03 GENERAL BACKFILL

A. Clean, fine earth, sand, free from organic material, rocks, roots, brush, stumps or other large objects.

B. The largest particle size shall be less than 2 inches in diameter.

C. The backfill shall be brought up to within the specified elevation less the depth of topsoil required for the project.

2.04 UNSUITABLE MATERIALS

A. Unsuitable soils include soils classified under ASTM D2487, which fall in the classifications of PT, OH, CH, MH, OL, CL, or ML.

2.05 STABILIZING AGGREGATE

A. Granular material graded according to Mn/DOT 3149.2C as follows:

Sieve Size	Percent Passing By Weight
1 inch	100
3/4 inch	90 - 100
3/8 inch	50 - 95
No. 4	35 - 85
No. 10	20 - 70
No. 40	10 - 45
No. 200	7 - 15.5

2.06 FINE FILTER AGGREGATE (NON-FROST SUSCEPTIBLE GRANULAR FILL)

A. Clean, free draining material graded according to Mn/DOT 3149.2J as follows:

Sieve Size	Percent Passing By Weight
3/8 inch	100
No. 4	90 - 100
No. 10	45 - 90
No. 40	5 - 35
No. 200	0 - 3.5

2.07 COARSE FILTER AGGREGATE

A. Clean, free draining aggregate excluding crushed carbonate quarry rock, crushed concrete and salvaged bituminous mixtures, meeting the following gradation requirements according to MnDOT 3149.2H):

Sieve Size	Percent Passing By Weight
1 inch	100
3/4 inch	85-100
3/8 inch	30-60
No. 4	0-10

2.08 RIPRAP MATERIAL

A. The Contractor shall furnish only durable, field quarry, stone of the quality approved by the Engineer meeting the following gradation requirements for (Class I, II, III, IV, V) per MnDOT 3601,Table 3601-1:

	Approximate % of Total Mass				
	Class of Riprap				
Sieve Size (inches)	**I**	**II**	**III**	**IV**	**V**
30	--	--	--	--	100
24	--	--	--	100	--
21	--	--	--	--	75
18	--	--	100	--	--
15	--	--	--	75	50
12	--	100	75	50	--
9	--	75	50	--	--
6	100	50	--	--	10
4	--	--	--	10	--
3	50	--	10	--	--
2	--	10	--	--	--
1	10	--	--	--	--

2.09 WASHED ROCK

A. Clean, washed, free draining aggregate excluding crushed carbonate quarry rock, crushed concrete and salvaged bituminous mixtures, meeting the following general gradation requirements.

Sieve Size	Percent Passing By Weight
2 inch	100
1 inch	50 - 80
1/2 inch	20 - 60
No. 4	0- 5

2.10 MODIFIED SELECT GRANULAR BORROW (SAND SECTION)

A. Clean, free draining material graded according to Mn/DOT 3149.B2 as modified below:

Sieve Size	Percent Passing By Weight
1 inch	100
No. 4	90 - 100
No. 10	45 - 90
No. 40	5 – 40
No. 200	0 - 5

PART 3 EXECUTION

3.01 AGGREGATE BASE, ENGINEERED FILL, GENERAL BACKFILL, STABILIZING AGGREGATE, FINE FILTER AGGREGATE AND MODIFIED GRANULAR BORROW PLACEMENT

A. Deposit and spread in uniform 6-inch maximum thickness layers (after compaction) without segregation of size.

B. Compact each layer of material until there is no further evidence of consolidation using a sheeps foot roller, pneumatic tired roller, or vibratory steel roller as approved by the Engineer.

C. Compact each layer of material to at least (100% of maximum dry density as determined in accordance with ASTM D698, the Standard Proctor Method) OR (95% of maximum dry density as determined in accordance with ASTM D1557, the Modified Proctor). Use equipment that is consistently capable of achieving the required degree of compaction. Compact each layer over its entire area while the material is at the required moisture content.

D. Apply water to the material if the moisture content is below optimum during the mixing, spreading and compacting operations, when and in the amounts directed by the Engineer, as considered necessary for proper compaction.

E. Flooding, ponding, or jetting shall not be used for compaction.

3.02 BACKFILL AND COARSE FILTER AGGREGATE PLACEMENT

A. Deposit and spread in uniform 8-inch minimum thick layers as shown on the Plans.

B. Compact each layer until there is no further evidence of consolidation using hand or machine operated compaction equipment.

3.03 RIPRAP MATERIAL PLACEMENT

A. Deposit and spread in uniform layers as shown on the Plans. The placement of the riprap shall be performed in a manner to not break any of the rocks into smaller pieces.

B. The riprap material shall be placed over soil separation fabric, unless otherwise specified.

3.04 FIELD QUALITY CONTROL

A. Quality assurance testing is the responsibility of the Contractor/Owner. The Contractor/Owner shall employ the services of an independent materials testing firm to provide the final test information. The Contractor may use their own personnel to provide tests of the materials during the placement and compaction operations; however, an independent testing firm must take the final tests. The testing firm shall test the materials as construction work is performed.

1. The Contractor shall arrange for the laboratory to perform field density tests in accordance with ASTM D2922 (nuclear densometer method).
2. Laboratory shall make at least one random field density test of new materials for every 250 square yards of area for each 12 inch depth of material, but in no case less than one test per 12 inch depth.

B. Provide additional density testing if the test results are below the specified density until passing test results are achieved. The additional tests shall be performed at the Contractor's expense.

C. Inspections will be performed during the excavation for the following.
1. Examination of fill soil, including the thickness and compaction of fill layers.

END OF SECTION

SECTION 32 10 00

PLANT MIX BITUMINOUS PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
  1. Plant mix bituminous pavement

1.02 REFERENCES

A. Minnesota Department of Transportation (MNDOT) Materials Supplemental Specifications for Construction, Current Edition
  1. Section 2360, Plant Mixed Asphalt Pavement.
  2. Section 2357, Bituminous Tack Coat.
  3. Section 3139, Graded Aggregate for Bituminous Mixtures.

B. AASHTO M226, Viscosity Graded Asphalt Cement.
AASHTO T304, Uncompacted Void Content of Fine Aggregate.
AASHTO T176, Test Method for Plastic Fines in Graded Aggregates and Soil by use of the Sand Equivalent.

C. ASTM C131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

D. ASTM D1559, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

E. ASTM D2041, Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

F. ASTM D3203, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

G. ASTM D4791, Test Method for Flat or Elongated Particles in Course Aggregate.

H. ASTM D5821, Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.

I. International Building Code, Chapter 11.

J. International Code Council A117.1, Accessible and Usable Buildings and Facilities.

K. Minnesota Accessibility Code, Minnesota Rules Chapter 1341.

1.03 QUALITY ASSURANCE

A. Compaction shall be by the Ordinary Compaction Method, unless stated otherwise.

1.04 WARRANTY

A. Provide a warranty for the paving work against failure of defects for a period of one year after the final acceptance of the project by the Owner. Repair or replace, to the satisfaction of the Owner and Engineer, failed or defective work that occurs during the warranty period at no cost to the Owner.

PART 2 PRODUCTS

2.01 PLANT MIXED ASPHALT PAVEMENTS AGGREGATE GRADATIONS

Broad Band Aggregate Gradation for Asphalt Mixtures
(% passing of total washed aggregate)

Sieve Size	A	B	C	D
1"			100	
3/4"		100[1]	85-100	
1/2"	100[1]	85-100	45-90	
3/8"	85-100	35-90	-	100
No. 4	60-90	30-80	30-75	65-95
No. 8	45-70	25-65	25-60	45-80
No. 200	2.0-7.0	2.0-7.0	2.0-7.0	3.0-8.0

[1]With the approval of the Engineer, the gradation broadband for the maximum aggregate size may be reduced to 97% passing for mixtures containing RAP, when the oversize material comes from the RAP source. The virgin material must remain 100% passing the maximum aggregate sieve size.

2.02 MIXTURE AGGREGATE REQUIREMENTS

Aggregate Blend Property	Traffic Level 2	Traffic Level 3	Traffic Level 4	Traffic Level 5
20-year Design ESAL's	<1 million	1-3 million	3-10 million	10-30 million
Min. Coarse Aggregate Angularity (ASTM D5821) (one face / two face), %-Wear (one face / two face), %-Non-Wear	 30/- 30/-	 55/- 55/-	 85/80 60/ -	 95/90 80/75
Min. Fine Aggregate Angularity (FAA) (AASHTO T304, Method A) %-Wear %-Non-Wear	 40 40	 42 40	 44 40	 45 40
Flat and Elongated Particles, Max % by weight, (ASTM D4791)	-	10 (5:1 ratio)	10 (5:1 ratio)	10 (5:1 ratio)
Min. Sand Equivalent (AASHTO T 176)	-	-	45	45

Max. Total Spall in fraction retained on the #4 sieve – Wear Non-Wear	5.0 5.0	2.5 5.0	1.0 2.5	1.0 2.5
Maximum Spall Content in Total Sample – Wear Non-Wear	5.0 5.0	5.0 5.0	1.0 2.5	1.0 2.5
Maximum Percent Lumps in fraction retained on the #4 sieve	0.5	0.5	0.5	0.5
Class B Carbonate Restrictions				
Maximum % -#4 Final Lift/All Other Lifts	100/100	100/100	80/80	50/80
Maximum % +#4 Final Lift/All Other Lifts	100/100	100/100	50/100	0/100
Max. allowable scrap shingles – MWSS (1) Wear/Non-Wear	5/5	5/5	5/5	5/5
Max. allowable scrap shingles – TOSS (1) Final Lift/All other Lifts	5/5	5/5	0/5	0/0

(1) MWSS is manufactured waste scrap shingle and TOSS is tear-off scrap shingle

2.03 MIXTURE REQUIREMENTS

	Traffic Level 2	Traffic Level 3	Traffic Level 4	Traffic Level 5
20-year Design ESAL's	<1 million	1-3 million	3-10 million	10-30 million
Gyratory Mixture Requirements				
Gyrations for N_{design}	40	60	90	100
% Air voids at N_{design}, wear	4.0	4.0	4.0	4.0
% Air voids at N_{design}, Non-wear and all shoulder	3.0	3.0	3.0	3.0
Adjusted Asphalt Film Thickness, minimum μ	8.5	8.5	8.5	8.5
TSR*, *minimum %*	75 (1)	75 (1)	85 (2)	85 (2)
Fines / effective asphalt	0.6 – 1.2	0.6 – 1.2	0.6 – 1.2	0.6 – 1.2

* Use 6 inch [150 mm] specimens in accordance with 2360.2.I, "Field Tensile Strength Ratio (TSR)."

(1) MNDOT Min = 65, (2) MNDOT Min = 70

2.04 REQUIREMENTS FOR RECYCLED MATERIALS

A. Control recycled materials used in mixture by evaluating the ratio of new added asphalt binder to total asphalt binder in accordance with Mn/DOT 2360.E.7, and as shown in the following table.

Requirements for Ratio of Added Asphalt Binder to Total Asphalt Binder, min %			
Specified Asphalt Grade	Recycled Material		
	RAS Only	RAS + RAP	RAP Only
PG XX-28, PG 52-34, PG 49-34, PG 64-22			
Wear	70	70	70
Non-Wear	70	70	70
PG 58-34, PG 64-34, PG 70-34			
Wear & Non-wear	80	80	80

2.05 PLANT-MIXED BITUMINOUS SURFACE / WEAR COURSE MNDOT 2360

A. The bituminous mix designs for the surface or wear course shall be as follows:
1. Parking lots and drives: SP 9.5 with 30% maximum RAP (SPWEA340B).

2.06 PLANT-MIXED BITUMINOUS BASE / NON-WEAR COURSE MNDOT 2360

A. The bituminous mix designs for the base or non-wear courses shall be as follows:
1. Parking lots and drives: SP 12.5 with no restrictions (SPNWB330B).

2.07 PERFORMANCE GRADE ASPHALT BINDER

A. Only Performance Grade (PG) Asphalt Binder is approved for use. The inspection, sampling and testing of PG Asphalt Binder shall conform to the Schedule of Materials Control and the Combined State Binder Group Method of Acceptance for Asphalt Binders.
1. Parking Lots and Drives: Grade B Binder = PG 58-28 [PG 58S-28].

2.08 TACK COAT

A. Tack coat to be used where plant mix pavement will be in contact with previously constructed asphalt or Portland cement concrete shall be CSS-1, CSS-1H, or CRS-2 Cationic Emulsified Asphalt. Dilution of the emulsion to 7 parts emulsion to 3 parts water is only allowed by the supplier. No field dilution is allowed. Residual asphalt content must meet the requirements as set forth in MNDOT 2357.

Residual Asphalt Content		
	Minimum Residual Asphalt Content	
Emulsion	Undiluted	Diluted (7:3)
CSS-1 or CSS-1h	57%	40%

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Do not begin paving until deficient areas have been corrected and are ready to receive paving.

B. Pavement surfaces must be dry and completely free of dust, dirt, debris, and all loose materials and vegetation.

C. Apply a tack coat to the vertical surface of previously constructed bituminous or concrete that will be in contact with the plant mix bituminous. Distribute the tack coat at a rate between 0.05 and 0.07 gallons per square yard of surface for undiluted asphalt emulsion.

D. When a successive lift of plant mix bituminous is to be placed, the existing surface shall receive a tack coat if the previous layer is dirty or over 48 hours old.

E. Complete all reconstruction repairs in accordance with the specifications.

3.02 PLANT MIX BITUMINOUS

A. Plant Mix Bituminous: The aggregate grading shall conform to the specification limits. Asphalt cement content shall be within 0.3 percent of the job mix formula optimum asphalt content.

B. The trucks for hauling bituminous mixtures shall have tight, clean and smooth beds that have been sprayed with a minimum amount of approved anti-adhesive agent to prevent the mixture from adherence to the beds. Provide each truck with a cover of suitable material and size to protect the mixture from the weather.

3.03 PLANT MIX BITUMINOUS TEMPERATURE CONTROL

A. The minimum laydown temperature in all courses (as measured behind the paver of spreading machine) of the bituminous mixture shall be in accordance with the temperature requirements specified herein:

	Compacted Lift Thickness			
Air Temp	**1 inch**	**1 ½ inch**	**2 inch**	**3 inch or more**
32 - 40	-	265	255	250
41 - 50	270	260	250	245
51 - 60	260	255	245	240
61 - 70	250	245	240	235
71 - 80	245	240	235	235
81 - 90	235	230	230	230
91 - up	230	230	230	225

B. The plant mix bituminous mixture shall not exceed 310 degrees F. or the load will be rejected at Contractor's expense.

3.04 PLANT MIX BITUMINOUS PLACEMENT

A. General: Place the plant mix bituminous on a prepared surface with a paver. Place inaccessible and small areas by hand. Place each course to the required elevation, cross-section, and compacted thickness. The in-place compacted thickness shall be plus or minus 1/4 inch of the planned thickness. Any area, which is constructed to less than the required minimum thickness,

may be removed and replaced by the Contractor at the discretion of the Engineer, and at the Contractor's expense.

B. Equipment: All equipment furnished by the Contractor shall be maintained and in sound mechanical condition capable of performing the work.

C. Placement: The mixture shall be delivered to, and spread by, the plant mix bituminous paver. The mixture shall be laid in strips to minimize the number of longitudinal joints required.

D. Paver:

1. The paver shall be a self-contained, power-propelled unit provided with adjustable activated screed or strike-off assembly, heated, and capable of spreading and finishing courses of plant mix bituminous material. The paver must be capable of laying the plant mixed bituminous in widths applicable to the typical section and thickness shown on the Plans.

2. Equip the paver with a control system capable of automatically maintaining elevations as specified. The control system shall be automatically actuated from either a reference line or surface through which a system of mechanical sensors will maintain the paver screed at a predetermined slope at the proper elevation to obtain the required surface. When directed, the transfer slope control system shall be made inoperative and the screed shall be controlled by sensor directed automatic mechanisms, which will independently control the screed elevation from the reference line or surface.

E. Joints: Make joints between old and new pavements, or between a successive day's work, to ensure a continuous bond between the adjoining work. Construction joints shall be vertical and have the same texture, density, and smoothness as other sections of the bituminous course. Contact surfaces shall be clean and a tack coat applied.

F. Wear Course: Place the surface wear course in maximum 2-inch lifts unless otherwise specified by the Engineer.

G. Restrictions: No MNDOT bituminous mixtures shall be placed after November 1.

H. ADA Compliance: Paved slopes in handicap accessible parking stalls and access aisles shall not exceed 2% in any direction.

3.05 COMPACTION/ROLLING

A. Compact the plant mix bituminous mixture as quickly as possible after placement. Breakdown rolling shall immediately follow the paver. Intermediate rolling shall follow behind the breakdown rolling. Compaction of the pavement shall continue until in-place air voids are within the specified range. Finish rolling shall be performed at as high a temperature as practical and shall eliminate all the marks left from breakdown and intermediate rolling. All rolling must be completed before the bituminous mixture cools below 180 degrees F.

B. Rollers:

1. Steel-wheeled: Self-propelled and capable of reversing without backlash, weighing not less than 8 tons, and exerting a pressure on the rear drum of not less than 250 pounds

per linear inch. When vibratory rollers are used, they shall operate at a frequency of 8 to 10 impacts per foot.

2. Pneumatic-tired: Self-propelled, with a minimum of 7 tires, and exerting a pressure of not less than 200 pounds per inch of rolling width.
3. Trench: Self-propelled, exerting a pressure of not less than 250 pounds per linear inch of rear roll.

C. Rolling:

1. Unless otherwise directed, begin rolling at the side and proceed longitudinally parallel to the paving lane centerline, overlapping each trip half the roller width, and gradually progressing to the crown of the parking lot or roadway.
2. When the pavement abuts a previously placed lift, roll the longitudinal joint first followed by regular rolling procedures.
3. On sloped sections, begin rolling at the low side and progress to the high side, by overlapping the longitudinal trips parallel to the paving lane centerline.
4. Along forms, curbs, headers, walls, and other places not accessible to rollers, thoroughly compact the mixture with hot hand tampers or with mechanical tampers.
5. The pavement shall be rolled so that no roller marks, ridges, porous spots or impressions are visible and the resulting surface has the required elevation and surface smoothness requirements.

D. Compaction shall be obtained by the Ordinary Compaction Method. Uniformly compact each course until there is no further evidence of consolidation and all roller marks are eliminated. A minimum of two rollers shall be on the site at all times. A vibratory steel roller shall be used for breakdown and finish rolling and a pneumatic roller shall be used after breakdown, unless directed otherwise by the Engineer.

E. Protection: Erect barricades to prohibit vehicular traffic from the pavement after final rolling until it has fully hardened and cooled to the same temperature as the surrounding soil or original asphalt pavement.

3.06 FIELD QUALITY CONTROL

A. The plant mix bituminous pavement will be tested for compliance with the following project requirements. The tests and all costs shall be provided by the Contractor/Owner.

1. Asphalt Cement Content.
2. Plant mix bituminous density requirements, if necessary.
3. Thickness requirements, as specified, +/- ¼ inch.
4. Surface Smoothness, +/- 1/8 inch in 10 feet measured in any direction.

B. Test Frequency: the plant mix bituminous pavement shall be tested for mat thickness and surface smoothness during laydown.

C. The surface of the pavement when finished shall be of uniform texture, smooth, true to crown and elevation and free from defects to the satisfaction of the Engineer. When tested with a 10-foot straight edge in any direction, the maximum deviation of the surface shall not exceed 1/8 inch. Unsatisfactory joints, as determined by the Engineer, will be rejected and replaced at the

Contractor's expense. Areas showing deviations greater than 1/8 inch or where surface water ponding will result, shall be milled, tack coated and repaved with bituminous.

D. Remove and replace areas mixed with foreign materials or defective areas as directed by the Engineer. Sawcut the areas, remove the existing bituminous and replace with new, hot plant mix bituminous. Compact the area by rolling to the air voids and smoothness specified. The removal and replacement of contaminated plant mix bituminous shall be done at no cost to the Owner.

END OF SECTION

SECTION 32 20 00

CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
- **1.** Portland cement concrete.
- **2.** Expansion joint material.
- **3.** Truncated domes.

1.02 SUBMITTALS

A. Submit at least 7 days in advance of placement, a Portland cement concrete and grout mix design, meeting the requirements of MN/DOT specifications. The mix design shall show the source and type of aggregate and cement; scale weight of each aggregate, cement, and water; and volume and type of admixtures per cubic yard.

B. Coarse and fine aggregate reports indicating the source, grading, specific gravity, absorption, and fineness modulus shall be submitted along with the concrete mix design at least 7 days prior to placement.

1.03 REFERENCES

A. Minnesota Department of Transportation (MN/DOT) Materials Lab Supplemental Specifications for Construction, Current Edition and subsequent revisions.
- **1.** Section 2301, Concrete Pavement.
- **2.** Section 2461, Structural Concrete.
- **3.** Section 3101, Portland Cement.
- **4.** Section 3126, Fine Aggregate for Portland Cement Concrete.
- **5.** Section 3137, Coarse Aggregate for Portland Cement Concrete.

B. ACI 214, Recommended Practice for Evaluation of Strength Test Results of Concrete.

C. ACI 318, Building Code Requirements for Reinforced Concrete.

D. ACI 304.2R-96, Placing Concrete by Pumping Methods.

E. ACI 305, Hot Weather Concreting.

F. ACI 309, Cold Weather Concreting.

G. ACI 347, Guide to Formwork for Concrete.

H. ASTM C31, Test Methods for Making and Curing Concrete Test Specimens in the Field.

I. ASTM C33, Specification for Concrete Aggregates.

J. ASTM C39, Test Method for Compressive Strength of Cylindrical concrete Specimens.

K. ASTM C40, Test Method for Organic Impurities in Sand for Concrete.

L. ASTM C42, Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

M. ASTM C88, Test Method for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.

N. ASTM C131, Test Method for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.

O. ASTM C143, Test Method for Slump of Portland Cement Concrete.

P. ASTM C150, Specification for Portland Cement.

Q. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

R. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.

S. ASTM C309, Specification for Liquid Membrane-Forming Compounds for curing Concrete.

T. ASTM C494, Specification for Chemical Admixtures for Concrete.

U. International Building Code, Chapter 11.

V. International Code Council A117.1, Accessible and Usable Buildings and Facilities.

W. Minnesota Accessibility Code, Minnesota Rules Chapter 1341.

1.04 QUALITY ASSURANCE

A. Quality assurance personnel shall perform a complete set of tests (Slump, Air Content and Cast 4” by 8” or 6” by 12” Test Cylinders) each day concrete is placed.

1.05 WARRANTY

A. Provide a warranty for the concrete work against failure of defects for a period of one year after the final acceptance of the project by the Owner. Repair or replace, to the satisfaction of the Owner and Engineer, failed or defective work that occurs during the warranty period at no cost to the Owner. Excessive concrete pop-outs, greater than 5 per square yard, shall be deemed defective.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT

A. ASTM C150, for Type I, II, III.

2.02 FINE AGGREGATE

A. Fine aggregate shall be well graded from coarse to fine; and, when tested by means of laboratory sieves, shall conform to MN/DOT 3126 as listed below:

Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	55 - 85
No. 30	30 - 60
No. 50*	5 - 30
No. 100	0 - 10
No. 200	0 – 2.5

B. When tested in accordance with ASTM C40, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

C. Deleterious materials shall not exceed the following cumulative totals:
- **1.** Shale, Alkali, Mika, Soft/Flaky Materials = 2.5% by weight.
- **2.** Coal and Lignite = 0.3% by weight.

2.03 COARSE AGGREGATE

A. Aggregate shall comply with MN/DOT 3137 specifications for coarse aggregate. Class A aggregates consisting of crushed quarry rock including quartzite, granite, gneiss, traprock and other igneous rock types, with no more than 4% non-Class A aggregate.

B. Clean, washed, hard, durable aggregates conforming to MN/DOT 3137 specifications for coarse aggregate and one of the following MN/DOT gradations.

	Percent Passing by Weight		
Sieve Size	**CA 45**	**CA 50**	**CA 60**
1-1/4 inch	100	-	-
1 inch	95 - 100	100	-
¾ inch	65 - 95	85 - 100	100
5/8 inch	-	-	85 - 100
3/8 inch	25 - 55	30 - 60	40 - 70
No. 4	0 - 7	0 - 12	0 – 12

C. Aggregate quality tests shall meet the following criteria.
- **1.** When tested in accordance with ASTM C131, the coarse aggregate shall show a loss not exceeding 40% after 500 revolutions.

2. When tested in accordance with ASTM C88, the loss resulting after five cycles shall not exceed 15% for coarse aggregate when using magnesium sulfate.
3. Coarse aggregate shall also meet the quality requirements of MN/DOT 3137.

2.04 WATER

A. Potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities.

2.05 AIR-ENTRAINING AGENT

A. ASTM C260. Use sufficient air-entraining agent to provide a total air content of 5.5% to 7.5%, add to the batch in a portion of the mixing water. Batch by means of a mechanical batcher capable of accurate measurement.

2.06 ADMIXTURES

A. Admixtures will be required at the Engineer's discretion or, if not required, may be added at the Contractor's option to control the set, effect water reduction, and increase workability. In either case, the addition of an admixture shall be at the Contractor's expense. The use of an admixture shall be subject to acceptance by the Engineer. Concrete containing an admixture shall be first placed at a location determined by the Engineer. If the use of an admixture is producing an inferior end result, the Contractor shall discontinue use of the admixture. Admixtures specified herein shall conform to the requirement of ASTM C494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.

2.07 CONCRETE MIX DESIGN

A. The mix design shall be composed of Portland cement, coarse and fine aggregate, water, and an air-entraining admixture, and shall be proportioned to meet the MN/DOT 2461, designation 3F52 design, or 3F32 for mechanically placed concrete for curb and gutter.

B. Design mix shall be normal weight air-entrained concrete meeting the following criteria:

Ingredient	**Range of Acceptable Values**
Portland Cement	Type I, II, III,
Maximum Cementitious Content	750 lbs. per cubic yard
Max. Fly Ash Content (3F32)	30%
Max. Fly Ash Content (3F52)	25%
Max. Water/Cement Ratio (3F32)	0.42
Max. Water/Cement Ratio (3F52)	0.45
Minimum 28 Compressive Strength	4500 psi
Target Air Content	6.5% (+2.0% and -1.5%)
Slump (3F32)	1/2 to 3 inches
Slump (3F52)	2 to 5 inches

C. For High-Early concrete mixes to achieve minimum strength for opening to traffic in 48 hours, the mix design shall be composed of Portland cement, coarse and fine aggregate, water, and an air-entraining admixture, and shall be proportioned to meet the MN/DOT 2461, designation 3HE52 design, or 3HE32 for mechanically placed concrete for curb and gutter. Design mix shall be normal weight air-entrained concrete meeting the following criteria:

Ingredient	**Range of Acceptable Values**
Portland Cement	Type I, II, III,
Maximum Cementitious Content	750 lbs. per cubic yard **(1)**
Max. Fly Ash Content (3HE32)	0%
Max. Fly Ash Content (3HE52)	0%
Max. Water/Cement Ratio (3HE32)	0.42
Max. Water/Cement Ratio (3HE52)	0.42
Minimum 48-hr. Compressive Strength	3000 psi
Minimum 28-day Compressive Strength	4500 psi
Entrained Air Content	6.5% +/- 1.0%
Slump (3HE32)	1/2 to 3 inches
Slump (3HE52)	2 to 5 inches

Note (1) Additional cementitious materials may be required to achieve early strength.

2.08 READY-MIXED CONCRETE

A. When the concrete is mixed in a ready-mix truck, the number of revolution of the drum at mixing speed shall not be less than 50 or more than 150. All revolutions over 150 shall be at agitating speed.

B. Type I concrete shall be discharged within 90 minutes of the time the air entraining agent is added at the plant.

C. Type III concrete shall be discharged within 60 minutes of the time the air entraining agent is added at the plant.

D. In hot weather, or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F. or above, the time between the introduction of the cement to the aggregate and discharge shall not exceed 45 minutes.

2.09 EXPANSION JOINT MATERIAL

A. The expansion joint material shall consist of 1/2” fiberboard or Deck-O-Foam polyethylene closed cell expansion joint filler.

2.10 TRUNCATED DOMES

A. Powder coated, cast-iron truncated dome plates, 24”x24”, manufactured by Neenah Foundry Co.

B. Approved equal.

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

A. Prior to placing concrete, thoroughly wet surfaces by sprinkling. Keep surfaces moist by frequent sprinkling up to the time of concrete placement. The surface shall be free from standing water, mud and debris at the time of concrete placement.

B. Forms

1. Forms shall be of wood, metal, or other suitable material and shall extend for the full depth of the concrete. Forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete without displacement. Bracing and staking of forms shall be such that the forms do not move when the plastic concrete is placed. Forms shall be covered with an approved form release agent before concrete placement.

2. The top surface of the forms shall show no deviations over 1/8" for the length of the form. The face of the form shall show no deviation over ½" from a 10-foot straight edge.

C. Hot weather concreting conditions shall have additional surface preparations and curing provisions as specified by ACI 305.

D. Cold weather concrete conditions shall have additional surface preparations and curing provisions as specified by ACI 306.

3.02 PLACING CONCRETE

A. The proportioning, mixing, and placing of the concrete shall be in accordance with the requirements for the concrete specified herein. Deposit concrete in one course to prevent segregation.

B. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

C. Finish surface with a wooden float and light brooming. No plastering of the surface will be permitted.

D. Outside edges of the slab and all trowelled joints shall be edged with a 1/4 inch radius-edging tool.

E. ADA Compliance:

1. Sidewalk cross slopes shall not exceed 2%.

2. Curb ramp shall not have a slope greater than 8.33% (1:12) or height greater than 6".

3. The maximum allowable vertical change is ¼".

4. Vertical changes between ¼" and ½" shall be beveled at 1:2.

5. Vertical changes over ½" shall be sloped no greater than 1:12.

F. Pumping of concrete shall be in accordance with ACI 304.2R.

3.03 CONTRACTION JOINTS

A. Slabs: The joint spacing shall not exceed 2 times (in feet) the slab thickness (in inches) i.e. a 4" thick slab shall not have joints spaced more than 8' by 8'. Where applicable, the joint spacing shall match the existing joint spacing.

B. Sidewalks: The joint spacing shall not exceed the width of the sidewalk or 2 times (in feet) the slab thickness (in inches) i.e. a 5' wide sidewalk shall have perpendicular joints every 5' or a 4" thick slab shall not have joints spaced more than 8' by 8'. Where applicable, the joint spacing shall match the existing joint spacing.

C. Curb and Gutter: The perpendicular joint spacing shall not exceed 10'. Where applicable, the joint spacing shall match the existing joint spacing.

D. All the joints shall be hand troweled or sawcut to a depth of 1/3 the depth of the concrete section. Sawcutting shall occur within 4 to 12 hours after concrete has hardened.

3.04 EXPANSION JOINTS

A. The expansion joint material shall go the full depth of the slab or curb and gutter.

B. Slabs: place the expansion material against buildings or previously placed concrete. Construction joints or designed expansion joints with steel reinforcing dowels shall be placed as shown on the plans or at a maximum interval of 80 feet in either direction of a continuous slab.

C. Sidewalks: place the expansion material against buildings or previously placed concrete. The expansion material shall be placed the full depth of the concrete thickness at a maximum distance of every 200 lineal feet.

D. Curb and Gutter: place the expansion material 3 feet on either side of any catch basin or manhole structure. The expansion material shall be placed the full depth of the curb and gutter cross section at a maximum distance of every 200 lineal feet.

3.05 CURING

A. Cure concrete using a liquid membrane-forming compound complying with ASTM C309, Type 2. The white-pigmented compound shall be applied at a rate of coverage not more than 150 square feet per gallon, providing a uniform white appearance.

B. Prohibit traffic, both pedestrian and vehicular, from freshly placed concrete for a period of not less than 72 hours. Vehicular traffic shall be excluded for such additional time as the Engineer may direct.

3.06 TRUNCATED DOMES

A. Install truncated domes in accordance with manufacturer's instructions.

3.07 SEALING

A. Concrete sidewalks and slabs-on-grade placed after September 15 shall be sealed with two (2) applications of concrete sealer.

B. Install each coat at a rate of 300 s.f./gal in accordance with manufacturer's recommendations.

3.08 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Contractor shall remove and dispose of excess materials at its own expense.

B. Liquid and solid wastes shall be contained in a leak-proof containment facility or impermeable liner in accordance with state and federal regulations.

3.09 FIELD QUALITY CONTROL

A. Sampling and testing for quality control during placement of concrete shall be arranged and paid for by the Contractor and shall include the following, as directed by the Engineer.

1. Slump: ASTM C143; one test for each set of compressive strength test specimens.

2. Entrained Air: ASTM C231; one test for each set of compressive strength specimens.

3. Casting and Curing Concrete Test Specimens: ASTM C31; cast one set of four standard test cylinders for each 100 cubic yards or fraction thereof, of concrete placed in any one day or for each 5,000 square feet of surface area placed.

4. Compression Strength Test Specimens: ASTM C39; per set of four standard cylinders, test one specimen at 7 days, two specimens at 28 days, and one specimen held in reserve for later testing, if required.

5. When total quantity of a given class of concrete is less than 50 cubic yards, the Engineer may waive strength test if, in his judgment, adequate evidence of satisfactory strength is provided.

6. Slump (ASTM C143) and Air Control (ASTM C231): One sample shall be taken from each of the first three trucks in each separate placement operation. After three acceptable tests without failure, the frequency shall be one test for every 100 cubic yards of concrete placed.

B. Test results will be reported in writing to the Engineer and Contractor on the same day that tests are made. Reports of compressive strength tests shall contain the project identification and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportion and materials; compressive breaking strength, and type of break for both 7-day and 28-day tests.

C. Additional Tests: The testing service will make additional tests of in-place concrete when compressive strength test results indicate specified concrete strengths have not been attained. The hardened concrete will be cored as specified with ASTM C42, or by other

methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required when unacceptable concrete is verified.

D. Irregularities, abrupt or gradual, in the finished concrete surface in excess of 1/8" (Class A) as measured with a 5-foot straightedge, in accordance with ACI 347, shall be corrected. The corrective action and resulting product shall be approved by the Owner and Engineer prior to execution.

END OF SECTION

SECTION 32 58 00

LANDSCAPING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
- **1.** Topsoil
- **2.** Fertilizer
- **3.** Sod
- **4.** Seed
- **5.** Mulch
- **6.** Hydromulch
- **7.** Plants
- **8.** Trees
- **9.** Erosion Control Blankets
- **10.** Planting Soil

1.02 SUBMITTALS

A. Furnish the Engineer with the Supplier's or Manufacturer's product specification data or testing results stating the materials furnished meet the requirements of the specifications.

B. Furnish the Engineer with a certificate of compliance stating the species, sizes, quantities furnished, and nursery supplier.

1.03 REFERENCES

A. Minnesota Department of Transportation (MN/DOT) Standard and Specifications for Construction, Current Edition
- **1.** Section 2571, Plant Installation and Establishment
- **2.** Section 2575, Establishing Turf and Controlling Erosion
- **3.** Section 3876, Seed
- **4.** Section 3877, Topsoil Material
- **5.** Section 3878, Sod
- **6.** Section 3881, Fertilizer
- **7.** Section 3882, Mulch Material
- **8.** Section 3884, Hydraulic Erosion Control Products

B. Minnesota Department of Transportation (MN/DOT) Current Seeding Manual.

C. ANSI Z60, American Standard for Nursery Stock

1.04 WARRANTY

A. All material shall be guaranteed by the Contractor to be in good, healthy, and vigorous conditions of active growth typical of the species for a period of one full year following the date of the final inspection.

B. Material that at any time during the guarantee period dies or is in obviously declining condition shall be removed immediately and replaced as soon as favorable conditions exist.

C. At the end of the guarantee period, replace material that, in the opinion of the Engineer or Owner, is in an unhealthy or unsightly condition. Remove rejected materials from the site and replace as originally specified.

PART 2 PRODUCTS

2.01 TOPSOIL

A. All topsoil shall be new and imported material. Topsoil found on the site may be used only if approved in advance by the Engineer and Owner. The topsoil, whether it is new or salvaged, should be screened and pulverized. The topsoil should be dry and ready to be fine graded.

B. Sandy loam soil, reasonable free of clay lumps, stones, and other objects over 1 inch in diameter, without weeds, roots, and other objectionable material.

2.02 FERTILIZER

A. Fertilizers shall be applied at a rate determined by the seed or sod supplier. The type of fertilizer shall be determined based on the type and properties of the topsoil, seed or sod.

B. The Contractor shall apply the fertilizers until the turf has been established, i.e. until all seeded areas have developed into turf or all new sod areas have developed a sound root structure.

C. Once the turf has been established and accepted by the Engineer and Owner, the Owner will be responsible for further fertilizing of the landscaped areas.

2.03 SOD

A. Lawn and boulevard mineral sod shall consist of densely rooted Kentucky bluegrass. The sod shall have a minimum of 3 varieties of Kentucky Bluegrasses. The sod shall have a lush appearance, uniform texture, and bright color throughout, weed free, containing no more than 1/4 inch of thatch over the base soil. At least two thirds (2/3) of the grasses, as determined by initial seeding proportions, shall be of acceptable improved type Kentucky bluegrass varieties. Acceptable varieties include Adelphi, Monopoly, Aspen, American Baron, Glade, Columbia, Eclipse, Fylking, Touchtown, Merit, Nassau, Midnite, and Victa.

B. Sod furnished shall be in acceptable condition upon delivery to the site. Sod strips shall not have dry or dead edges and shall not be cut more than 24 hours in advance of delivery. The

grass height of the delivered sod shall not exceed 2 inches. Deliver and unload sod the same day it is loaded on the delivery unit.

2.04 SEED

A. State-certified seed of the latest season's crop. Deliver in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination, weed and seed content, and inert material. Label the packages in conformance with the U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. On-site seed mixing shall be done only in the presence of the Engineer.

B. The origin shall be clearly identified on the seed label for all seed types, including native forbs.

C. The seed mix or species to be furnished and used shall be a uniform blend as stated in MN/DOT Section 3876 and the 2014 Seeding Manual. Seed mixture 22-111 can be used for temporary stabilization of slopes and grading areas during construction. Seed mixtures 25-131 (Commercial Turf) or 25-151 (Residential Turf) can be used in lawn areas. Seed mixture 25-141 should be used for general roadside applications. Seed mixtures 33-261 or 33-361 should be used in areas of the detention basin located between the normal water level and the crest.

Mixture No.	Category	Name
22-111	Mid-Term Stabilization	Two-year Stabilization
25-131 (Commercial)	Non-Native Grassland	Low Maintenance Turf
25-141	Non-Native Grassland	Mesic General Roadside
25-151 (Residential)	Non-Native Grassland	High Maintenance Turf
33-261	Stormwater Facilities	Stormwater South and West
33-361	Stormwater Facilities	Stormwater Northeast

D. Protect the seed from moisture from the time of delivery until the time it is used. Wet or moldy seed shall not be used.

2.05 MULCH

A. MN/DOT 3882 Type 3 Mulch: Clean grain straw (i.e. oats, wheat) that is certified by the Minnesota Crop Improvement Association (MCIA) to be weed free. All mulch bales shall be in air-dried condition at the time of delivery and shall have an MCIA inspection tag attached indicating that the mulch has passed inspection.

2.06 HYDROMULCH

A. MN/DOT 3884 Type - Hydraulic Mulch: Shall consist of wood cellulose fibers that shall contain no germination or growth inhibiting factors. It shall not contain sawdust or pulverized newspaper. It shall be dyed a color that allows for visual monitoring of its application. It shall contain 2.5 to 5.0 percent tackifiers (Type I) by weight. The moisture content shall not exceed 15% at the time of delivery. When washed on a #20 sieve at least 50 percent shall be retained.

2.07 PLANT STOCK

A. Plants furnished shall be Minnesota, North Dakota or South Dakota, Wisconsin, Iowa, or Michigan nursery grown stock, and shall have been growing in a nursery for at least two years. The term plant shall mean any or all trees, bushes, shrubs, vines, annuals or perennials.

B. Plants to be of size and type as indicated on plans.

2.08 TREES

A. Straight trunks with leader intact, undamaged, and uncut. Old abrasions and cuts shall be completely callused over. Measure when branches are in their normal position. Height and spread dimensions specified refer to the main body of the tree and not from branch or root tip to tip.

B. The determining measurement for trees shall be the caliber, which shall be taken 6 inches above the ground for trees up to 4-inch caliber, and 12 inches above the ground for larger sizes. Trees to be of size and type as indicated in the plans.

C. Tree wrapping material shall be standard burlap, heavy crepe paper, or other suitable material in strips 4 to 10 inches wide and shall be specifically designed and manufactured for horticultural use and have insect resistant qualities.

2.09 EROSION CONTROL FABRIC

A. Erosion control fabric shall be in accordance with MN/DOT 3885.
1. Category 3, Type Straw 2S (3-12 months)
2. Category 4, Type Straw/Coconut 2S (24-36 months)
3. Category 7, Type Coconut 3S (Greater than 36 months)

2.10 PLANTING SOIL

A. Highly organic blend of 1/3 peat, 1/3 black dirt, and 1/3 compost for use in ornamental planting areas.

2.10 WATER

A. Potable (or as otherwise approved) and suitable for plant growth.

2.11 MISCELLANEOUS LANDSCAPE MATERIALS

A. Stakes and deadmen: Sound new hardwood, treated softwood, or redwood, free of knotholes and other defects.

B. Wire ties and guys: Two-strand, twisted, pliable galvanized iron wire not lighter than 10 gauge with zinc-coated turnbuckles. Protect tree trunks from damage by wires.

C. Wood chip mulch shall be a mixture of even consistency, 1/8" thick by 3/4" to 1-1/2" square shaven solid stumpwood; free from soil, twigs, leaves, rock, rubble, weeds, or synthetic matter.

D. Wood chip mulch shall be double-shredded for even consistency; free from soil, twigs, leaves, rock, rubble, weeds, or synthetic matter.

E. Edging: Commercial grade, black PVC edging.

PART 3 EXECUTION

3.01 SOIL PREPARATION

A. Immediately prior to placing the topsoil, scarify the existing soils to a minimum depth of 3 inches for all areas on slopes shallower than 2 horizontal to 1 vertical.

B. Perform soil preparation immediately prior to seeding or placing sod to prevent undesirable weed growth or soil erosion.

C. Place the topsoil and spread uniformly over lawn areas to a minimum depth of 4 inches. Firm and smooth the topsoil after working the soil.

D. Apply a starter fertilizer at the Manufacturer's or Supplier's recommended rates and work into the topsoil. The lag time between seeding or placing sod and fertilizing shall not exceed 48 hours.

E. Rake the surface until it is smooth and of uniform fine texture immediately prior to seeding or placing sod.

3.02 SOD PLACEMENT

A. Carefully place the sod strips beginning at the bottom of the slope and progressing upward. Place the sod strips with staggered end joints without stretching. Tightly abut the joints between the sod strips.

B. Immediately after completing the sod placement, water and compress the sod into the underlying soil by rolling or tamping. The initial watering and rolling or tamping shall be sufficient to provide a firm contact and bond between the sod and the underlying soil. The sod surface shall be level and smooth, free of humps and depressions.

C. Remove and dispose of waste sod, stones or other debris removed from the sodded area(s), at completion of the sod placement.

D. Sod placed under the Contract shall be fertilized and maintained by the Contractor until the sod has uniformly rooted over the landscaped areas.

3.03 SEEDING

A. The seed mixture shall be placed with a seed drill that will accurately meter the types of seed to be planted and keep all seeds uniformly mixed during drilling. The application rate for all seed mixes can be found in the MnDOT Seeding Manual, 2014 Edition. The drill shall be equipped with disk furrow openers and packer assembly to compact the soil directly over the drill row. Seeding shall be done at a right angle to the surface drainage. The seeding shall be done with two passes over the entire area, with the second pass in a direction at a right angle to the first pass.

B. Seeded areas shall have the seedbed firmed after seeding and prior to mulching. Soil firming shall be done with a drag cultipacker or other approved soil firming equipment. On slopes too steep to operate mechanical equipment, the seed shall be covered by hand raking or other approved means, wherever feasible, prior to mulching. Accomplish the soil firming or seed covering immediately after seeding.

C. The mulch shall be spread by mechanical means to provide a uniform distribution at an application rate of 2.0 tons/acre of MN/DOT Type 3 Mulch.

D. Seed placed under the Contract shall be fertilized and maintained by the Contractor until the seed has developed into a lush turf over the landscaped areas.

3.04 HYDROSEEDING

A. Mix the seed, fertilizer, and mulch material in the required amount of water to produce a slurry mixture.

B. Type 5 Hydromulch

1.	Seed mixture	100 lbs/acre
2.	Mulch	2,100 lbs/acre or 100% coverage

C. Incorporate the mulch into the slurry mix after the seed and fertilizer have been thoroughly mixed.

D. Direct the spray during the application to obtain a uniform material distribution.

E. Empty the slurry mixture within one hour after the seed is added to the tank.

F. Hydroseed placed under the Contract shall be fertilized and maintained by the Contractor until the seed has developed into a lush turf over the landscaped areas.

3.05 PLANTING TREES AND SHRUBS

A. Excavate pits, beds, and trenches with vertical sides and with the bottom of the excavation slightly raised at the center to provide proper drainage. Loosen hard subsoils in the bottom of the excavation.

B. For balled and burlapped trees and shrubs, make excavations at least half again as wide as the ball diameter and equal to the ball depth. Allow for setting the ball on a 3 inch layer of good quality topsoil.

C. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to the size of the container width and depth. Cut into the sides of the root ball, approximately 1/3 through the ball to loosen the root mass prior to planting.

D. Retain a portion of the existing subsoils and thoroughly mix approximately 25% with 75% new topsoil. Place the soil mixture under and around the new plantings.

E. Set the balled and burlapped stock on a layer of good quality topsoil and subsoil mixture, plumb and in the center of the pit or trench with the top of the ball 3" higher than the adjacent finished landscape elevations. Remove the burlap from the top and 1/3 the depth of the sides of balls. Retain the burlap on the remaining 2/3 of the sides and bottom. When the planting is set, place additional backfill around the base and sides of ball, and work each layer to settle the backfill and eliminate voids and air pockets.

F. Fill approximately 1/2 of the excavations with the topsoil and subsoil mixture, then water thoroughly and allow it to percolate out before placing additional backfill. Once the backfill operations are complete, thoroughly water the plants again.

G. Set container grown stock as specified for balled and burlapped stock. Remove and dispose of all containers.

H. Place mulch pits around all trees and plantings and within all landscaped planting beds as required. Provide not less than a 6-inch depth of mulch and finish level with the adjacent finished elevations.

I. Stake trees and plantings in place, as required, immediately after planting.

3.07 EROSION CONTROL FABRIC INSTALLATION

A. The installation of the erosion control fabric shall be on all slopes greater than 1:4, on all drainage swale areas, and at all locations where drain tile lines or culverts empty water out on to the surface of seeded areas. The placement of the fabric is not dependent on strict slope requirements, rather on retaining the topsoil and seed for the site.

B. The installation of the erosion control fabric shall be in strict compliance with the manufacturer's installation instructions.

C. Staple the fabric onto the slopes as recommended by the manufacturer.

D. Prepare the soil before installing the blankets, including the application of fertilizer and seed.

3.08 PROTECTION AND CLEANING

A. Keep the pavements clean and the work area in an orderly condition during landscaping work.

B. Protect the landscape work and materials from damage due to landscape operations or by other Contractors and trades, and trespassers. Maintain the protection measures during the installation and maintenance periods.

END OF SECTION

SECTION 33 10 00

WATER DISTRIBUTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Underground water service piping, watermains and appurtenances.

1.02 CODES

A. All work shall comply with the most current requirements of the Minnesota Department of Health, the Minnesota Plumbing Code and all applicable codes and ordinances.

1.03 REFERENCES

A. AWWA B300, Hypochlorites.

B. AWWA B301, Liquid Chlorine.

C. AWWA C100, Thickness Design of Cast-Iron Pipe.

D. AWWA C151, Ductile Iron Pipe Centrifugally Cast in Metal Moulds or Sand-Lined Molds.

E. AWWA C500, Gate Valves for Ordinary Water Works Services.

F. AWWA C502, Fire Hydrants for Ordinary Water Works Services.

G. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

H. AWWA C800, Threads for Underground Service Line Fittings.

I. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4” through 12” for Water.

J. ANSI A21.4, American National Standard for Cement-Mortar Lining for Cast Iron and Ductile-Iron Pipe and Fittings for Water.

K. ANSI A21.10, American National Standard for Gray-Iron and Ductile-Iron Fittings, 2” through 48”, for Water and Other Liquids.

L. ANSI A21.11, American National Standard for Rubber-Gasket Joints for Cast-Iron and Ductile-Iron Pressure Pipe and Fittings.

M. ASTM B88, Standard Specifications for Seamless Copper Water Tube.

N. ASTM D429, Standard Test Methods for Rubber Property Adhesion to Rigid Substrates.

O. ASTM D1784, Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds (Type 1, Grade 1).

P. ASTM D1785, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe Schedules 40, 80 and 120.

Q. ASTM D2239 Standard Specifications for Polyethylene (PE) Plastic Pipe.

R. ASTM D2241, Standard Specifications for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T).

S. ASTM D2609, Standard Specifications for Plastic Insert Fittings for Polyethylene Plastic Pipe.

T. ASTM D3139, Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

U. ASTM F477, Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

V. Ten States Recommended Standards for Water Works, Most Current Edition.

1.04 SUBMITTALS

A. The Contractor shall submit for approval, complete shop drawings and details for all couplings, valves, operators, and other special appurtenances. This required submission for approval shall include all the manufacturer's product data, dimensions, sizes, types, maximum loading, and thrust anchorages.

B. The manufacturer shall furnish an affidavit stating that the valves and all materials conform to the applicable requirements and all tests specified under the respective standard have been performed and requirements have been met.

1.05 SITE CONDITIONS

A. The existing underground utilities, as shown on the plans, are located in accordance with available data, but the locations may vary and cannot be guaranteed. The exact locations shall be determined by the Contractor as the work proceeds. The excavation work shall be done carefully so as to avoid damaging the existing utilities.

B. The Contractor shall provide for the protection, temporary removal and replacement, or relocation of said obstructions as required for the performance of the work required in these contract documents. No extra payment will be made for this work.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE

A. ASTM D1784, Type 1, Grade 1 PVC pressure pipe shall be manufactured in accordance with the latest revision of AWWA Standard C900. The pipe shall be Class 150, SDR 18. The outside diameters shall conform to the outside diameters of ductile iron pipe for the various sizes.

B. ASTM D1785, Schedule 40 PVC pressure pipe shall be manufactured in accordance with the latest codes. The outside diameters shall conform to the outside diameters of ductile iron pipe for the various sizes.

C. Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.

2.02 PVC PRESSURE PIPE JOINTS

A. The joints shall be rubber gasketed conforming to ASTM D3139.

B. The lubrication material shall be water soluble, non-objectionable in taste and odor imparted to the water, non-supporting of bacterial growth, with no deteriorating effects on the PVC or rubber gaskets.

2.03 DUCTILE IRON PIPE, SPECIALS, AND FITTINGS

A. All pipe, specials, and fittings shall be ductile iron conforming to ANSI A21.10. The joints shall conform to the requirements of ANSI A21.11. The fittings shall all have bell connections of standard AWWA dimensions or special dimensions as required, or shall be equipped with adapters of the proper class for the size of the pipe as required by the manufacturer. Specials and fittings shall have a pressure rating of 250 psi. Where mechanical joints are utilized, all bolts shall be Cor-Blue T-bolts.

B. The ductile iron pipe shall be Class 52 unless otherwise noted on the plans and shall be provided with a Portland cement lining conforming to the requirements of AWWA C151/ANSI A21.4 for standard thickness of lining. The thickness of any cement mortar pipe lining furnished shall not be less than the minimum thickness specified for the applicable pipe size in the following table:

Size of Pipe	**Minimum Lining Thickness**
12 inches or smaller	1/16 inch
16 inches	3/32 inch

C. All exterior surfaces of the pipe and fittings shall have a tar or bituminous seal coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

D. All joint fittings and valves shall be fastened with Cor-Blue T-bolts, as manufactured by NSS Industries, Plymouth, Michigan, or approved equal.

E. Conductive gaskets with approved copper inserts equal to American Fastite or copper straps shall be welded to the pipe and connected with a silicone bronze bolt. Conductors shall be rated at 600 amps sustained current.

F. Wrap the ductile iron pipe and cast iron fittings with polyethylene plastic film having a minimum thickness of 0.008 inches.

2.04 CONNECTIONS TO DUCTILE-IRON FITTINGS

A. Connections between ductile-iron and polyvinyl chloride pipe and cast-iron fittings or gate valves shall be made with jointing materials recommended by the pipe manufacturer and approved by the Engineer.

2.05 GATE VALVES

A. The gate valves shall conform to AWWA C500, designed for a minimum working pressure of 150 psi. All gate valves shall be resilient seated gate valves. The mechanical joints shall conform to AWWA C111/ANSI A21.11-85. The gate valves furnished shall comply with the following supplementary requirements.

1. Resilient wedge gate valves shall conform to ANSI/AWWA C509. The valves shall be R/W resilient wedge gate valves as manufactured by Clow Corporation, or approved equal.
2. The gate valves shall have joints as specified for the piping in which they are installed. Stems for non-rising stem assemblies shall be cast bronze with integral collars. The non-rising stem stuffing box shall be the O-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open at the full rated working pressure.
3. The gate valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. There shall be two low torque thrust bearings located above and below the stem collar. The stem nut shall be separate from the wedge and shall be of solid bronze.
4. Each valve shall have an open indicating arrow, the manufacturer's name, pressure rating, and year of manufacture cast on the body.
5. The gate valves shall be two-faced, double disc type, with parallel seats and a 2" operating nut opening counterclockwise.
6. The wedge shall be cast iron completely encapsulated with polyurethane rubber (except for guide and stem area). The polyurethane rubber shall be permanently bonded to the cast iron wedge to meet ASTM tests for rubber to metal bond (ASTM D-429).
7. All gears on the gate valves shall be cut tooth steel gears, housed in heavy cast iron extended type grease cases of approved design.
8. All gate valves shall have mechanical joint ends.
9. Both the interior and exterior of the body and bonnet shall be coated with fusion bonded epoxy.

B. All the valves shall be provided with valve boxes. All valve boxes shall be of cast iron, buffalo-type adjustable. The valve boxes shall be provided for 7.5 feet of cover, except where greater depths are indicated on the profiles of the plans. The valve boxes shall not be less than 5" in diameter, shall have a minimum thickness at any point of 3/16", and shall be provided with suitable cast iron bases and covers. The covers shall have the word "water" cast on them.

2.06 TAPPING SLEEVE AND TAPPING VALVE

A. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.

1. Tapping Sleeve: Stainless steel 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or sealing rings in sleeve body. Use sleeve that mates with size and type pipe material being tapped. Outlet flange shall be size required for branch connection.

2.07 FIRE HYDRANTS

A. The fire hydrants shall be Waterous Model WB-67 pacer type with traffic flange or approved equal, conforming to AWWA C-502.

B. Traffic Flange Type to be supplied with a 16" break-off section.

C. AWWA C502.64 Standard Specifications for Fire Hydrants for Ordinary Water Works Service shall govern the design, construction and manufacture of fire hydrants unless as added to or modified herein.

1. Hydrants shall be the City standard.
2. Operating nut and nozzle caps shall be the standard pentagon nut type of the dimension, which currently exists in the City.
3. Main Valve Opening: 5
4. The hydrant barrels shall be two-piece, non-jacket type, with flanged joints above the finished elevation line and with mechanical joint connections at the hub end.
5. Type of Shut-Off: Compression, unless otherwise approved by the Engineer.
6. Bury Length: 7 .5' from the ground surface to the top of the connecting pipe.
7. The hydrants shall have two outlet nozzles for 2-1/2" (I.D.) hose connection and one outlet nozzle for 4" (I.D.) steamer connection. All outlet nozzle threads shall be National Standard threads, equal to those presently in use by the Owner. The Contractor shall obtain the necessary thread information.
8. Operating Nut: One 1-1/2" National Standard Pentagonal operating nut.
9. The hydrant operating mechanisms shall be provided with "O" ring seals preventing entrance of moisture and shall be lubricated through an opening in the operating nut or bonnet.
10. The hydrants shall include stainless steel clips for the two upper bolts on the water pipe side of the elbow.
11. Direction to Open: To the left (counterclockwise).
12. Finish Paint above the Ground Line: standard red.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. Handling

1. Thoroughly clean the interior of the pipe of all foreign materials before lowering it into the trench.
2. Perform pipe cutting in a neat and workmanlike manner without damage to the pipe. The cutting methods used shall conform to the manufacturer's recommendations.

B. Granular Pipe Bedding

1. The bedding material shall be a clean pit-run sand or fine gravel, free from deleterious matter and rocks over 1" in diameter. Place the bedding material uniformly over the trench bottom to a minimum depth of 3". Shape the material to give uniform support to the lower fourth of the pipe for its entire length. Make depressions in the bedding to accommodate the joints. Carry bedding material to 6" above the top of the pipe.

C. Pipe Laying

1. Do not lay the pipe in water or when the trench or weather conditions are not suitable for the work except by permission of the Engineer. When the work is not in progress, securely close open ends of the pipe and fittings so that no water or other foreign matter enters the pipe or fittings.
2. Unless shown otherwise on the plans, the pipe shall have a minimum of 7.5' of cover below all finished elevations and shall not be laid closer horizontally than 10' to a sanitary sewer line. Deflections from a straight line or grade as required by horizontal or vertical curves shall not exceed 5 degrees (a 5-degree deflection is equivalent to an offset of approximately 1" per lineal foot of pipe). If the alignment required deflects in excess of this limit, provide bends and fittings or shorter lengths of pipe until these conditions are met. Brace bends and fittings in the pipe with concrete thrust blocks poured in place against undisturbed earth.

D. Gate Valves and Valve Boxes

1. Install where shown on the plans or as directed by the Engineer.
2. Set the gate valves and valve boxes plumb and center the valve boxes on the valves. Carefully place and compact fill materials around the valve box for a distance of 4' on all sides of the box, or to the undisturbed trench face, whichever is less. Set the top of the valve box at the elevation of the existing ground or as shown on the plans.
3. Post indicator valves shall be maintained in a plumb position with 36" between the finish ground elevation and the top of the valve.

E. Fire Hydrants

1. Set the fire hydrants at such an elevation that the specified minimum pipe cover is provided throughout the length of the branch supply line and that the nozzles are 24" above the proposed ground elevation. Set the hydrants plumb and place on a concrete pad not less than 4" deep and 15" square. Firmly block the back of the hydrants, opposite the pipe connections, against the vertical face of the trench with a concrete thrust block poured in place against undisturbed earth with minimum dimensions of 12" each way. If, in the opinion of the Engineer, the soil is unstable

and will not support the thrust block, use bridle rods to secure the hydrant. The rods shall be a minimum of 3/4" in diameter and shall be covered with an acid resistant coating.

2. Place a minimum of 9 cubic feet of crushed rock or coarse gravel at the base of each hydrant for drainage.
3. Place and compact fill around the hydrant to a minimum distance of 4' on all sides of the hydrant or to the undisturbed sides of the trench, whichever is less.

3.02 SANITARY SEWER, STORM SEWER, AND WATER CROSSINGS

A. Water pipe crossing sewers shall be laid to provide a separation of at least 18" between the bottom of the water pipe and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used.

1. Construct the sewers of materials equal to water service piping standards of construction.
2. Protect the water pipes passing under sewers by providing a vertical separation of at least 18" between the bottom of the sewer and the top of the water pipe.
3. Provide adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking the water pipe. The length of water piping shall be centered at the point of crossing the sewer pipe so that the joints will be equidistant from the crossing.

3.03 STERILIZATION

A. Sterilize each completed portion of the water pipe installation with chlorine before use for domestic purposes.

B. The materials used may be either liquid chlorine conforming to AWWA B301 or hypochlorites conforming to AWWA B300.

C. The amount of dosage shall provide a minimum of 50 parts per million of chlorine. The chlorine solution shall remain in the pipe for a maximum of 24 hours before the system is flushed. Open and close the valves in the mains being sterilized a minimum of three times during the contact period.

D. After the contact period is over, thoroughly flush the pipe with clean water until the residual chlorine content is less than one part per million.

E. Extreme care shall be taken during the sterilizing operation to ensure that a strong chlorine solution does not enter the existing water supply.

3.04 HYDROSTATIC TESTING OF WATER MAINS

A. After the pipe has been laid, including fittings, valves and blocking, all newly-laid pipe or any valved section thereof, unless directed otherwise by the Engineer, shall be subject to hydrostatic pressure of 150 pounds per square inch. The duration of each such test shall be at least two hours.

B. Each section of pipe to be tested shall be filled with water and all air expelled at the highest point. The required taps to expel air or to fill the water main shall be supplied and installed by the Contractor and shall be ¾ inch and shall include an approved service saddle when required.

The test apparatus shall be applied at the lowest elevation on the section to be tested. The apparatus shall be connected to the pipe at a service tap or special tap location.

The pressure gauge shall be a standard pressure gauge. The dial shall register from 0 – 200 psi and have a dial size of 4 ½ inches with 1 psi increments.

The hydrostatic test, pressure requirement for an acceptable test shall be a maximum pressure drop of 0 psi during the two hour pressure test.

If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met.

Only if several consecutive tests indicate a consistent pressure drop and only after the Contractor has made numerous attempts to resolve the problem, acceptable to the Engineer, may the Contractor request in writing and the Engineer consider the use of the leakage test. The leakage test may be performed by the Contractor to determine the magnitude of the leak. However, meeting the leakage allowance shall not automatically be considered acceptance, in lieu of the pressure test, for the section being tested. Final acceptance shall be at the discretion of the Engineer.

When allowed, the leakage test shall be performed in accordance with AWWA C-600, Section 4.1.5, 4.1.6 and the line will be accepted as per Section 4.1.7.

3.05 ELECTRICAL CONDUCTIVITY TESTS

A. The contractor shall perform a conductivity test within one week upon completion of pressure testing on the pipe to establish that electrical thawing may be carried out in the future. Conductivity testing must be carried out in the Engineer's presence and be approved before acceptance.

B. The system (pipeline, valves, fittings and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic pressure test and while the line is at normal operation pressure. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by the Engineer.

C. A direct current of 350 amperes +/- 10% shall be passed through the pipeline for five minutes. The current flow through the pipe shall be measured continuously on an ammeter and shall remain steady without interruption or excessive fluctuation throughout the five-minute test period.

D. Insufficient current or intermittent current or arcing, indicated by large fluctuations of the ammeter needle, shall be evidence of defective contact in the pipeline. The cause shall be

isolated and corrected. Thereafter, the section in which the defective test occurred shall be re-tested as a unit and shall meet the requirements.

E. After the test, the hydrant shall be shut off and a cap loosened to allow the hydrant to drain. Tighten the cap after drainage is complete.

3.06 CLEANING

A. Upon completion of the installation of the water piping and appurtenances, remove excess materials, equipment, temporary structures, and debris resulting from the construction work.

END OF SECTION

SECTION 33 30 00

SANITARY SEWER

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
- **1.** Sanitary sewer pipe.
- **2.** Televising.

1.02 CODES

A. All work shall comply with the most current requirements of the Minnesota Department of Health, the Minnesota Plumbing Code published by the Minnesota Department of Labor and Industry Codes Division, latest edition.

1.03 REFERENCES

A. Minnesota Plumbing Code published by the Minnesota Department of Health, latest edition.

B. ASTM A48, Specification for Gray Iron Castings.

C. ASTM C443, Standard Specifications for Joints for Concrete Pipe and Manholes.

D. ASTM C478, Specification for Pre-cast Reinforced Concrete Manhole Sections.

E. ASTM C923; Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

F. ASTM D3034, Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

G. ASTM D3212, Specification for Joints for Drains and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

H. ASTM F477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

I. ASTM F949, Specification for Polyvinyl Chloride (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.

1.04 DELIVERY, STORAGE AND HANDLING

A. Inspect the materials delivered to the site for damage and store the materials with a minimum of handling. The materials shall be kept under cover and out of the direct sunlight. Do not store the materials directly on the ground. Keep the inside of the pipes and fittings free from dirt and debris.

1.05 QUALITY ASSURANCE

A. Quality assurance personnel shall be at the project site on an intermittent basis during the storm sanitary sewer system placement.

1.06 SUBMITTALS

A. The Contractor shall submit for approval complete shop drawings and details for all structures, pipes, castings, fittings, and accessories. Submittal shall include all the manufacturer's product data, certifications, dimensions, sizes, types, and installation requirements.

1.07 SITE CONDITIONS

A. The existing underground utilities, as shown on the plans, are located in accordance with available data, but the locations may vary and cannot be guaranteed. The exact locations shall be determined by the Contractor as the work proceeds. The excavation work shall be done carefully so as to avoid damaging the existing utilities.

B. The Contractor shall provide for the protection, temporary removal and replacement, or relocation of said obstructions as required for the performance of the work required in these contract documents. No extra payment will be made for this work.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPE

A. All pipe shall be new and unused.

B. Polyvinyl chloride (PVC) pipe, ASTM D1785 Schedule 40.

2.05 PIPE BEDDING MATERIAL

A. The pipe bedding shall consist of clean pit-run sand or fine gravel, free from deleterious matter and rocks over 1 inch in diameter.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. Shape the bottom of the trench to give substantially uniform circumferential support to the lower fourth of each pipe allowing for pipe bedding material. Pipe laying shall proceed up-grade with the groove (bell) ends in the up-grade direction. Adjust the tongues in grooves to produce a uniform space. Lay each pipe true to line and grade to form a close concentric joint with the adjoining pipe. Blocking or wedging between tongues and grooves will not be permitted. As the work progresses, clean the interior of the pipe free of dirt and extraneous materials.

B. Keep the trenches free from water until the pipe jointing is completed. Do not lay the pipe when conditions of the trench or the weather are unsuitable for such work. Keep the open ends of the pipe and fittings securely closed at all times when the work is not in progress.

C. The bedding material shall be placed uniformly over the trench bottom to a depth of not less than 3 inches. The bedding shall be shaped to provide uniform support to the lower fourth of the pipe for its entire length. Depressions shall be made in the bedding material to accommodate the joints. The pipe bedding material shall be carried to 6 inches above the tip of the pipe. The remaining trench backfill material shall be on-site material similar in composition to the surrounding subsoils.

3.02 JOINT CONSTRUCTION

A. Make joints with rubber gaskets. Clean and dry the surfaces to receive lubricants, cements, or adhesives. Affix gaskets to the pipe not more than 24 hours prior to the installation of the pipe. Protect the gaskets from sun, wind, dust or other deleterious agents at all times.

B. Before the installation of the pipe, inspect gaskets and remove and replace loose or improperly attached gaskets. Align each pipe section with the previously installed pipe section and pull the joint together.

C. If the gasket becomes loose while pulling the joint, and can be seen through the exterior joints, recessed to within one inch of closure, remove the pipe, and remake the joint.

3.04 FIELD QUALITY CONTROL

A. Check each straight run of pipe for gross deficiencies by holding a light in the manholes. The light shall show a practically full circle through the pipe when viewed from the adjoining end of the line.

B. Leakage testing shall be performed on sewer lines and service connections by the Contractor at his own expense. Testing may be either Hydrostatic or Air Test Method in accordance with the City Engineers Association of Minnesota standard specifications and the Minnesota Plumbing Code.

END OF SECTION

SECTION 33 40 00

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
- **1.** Storm sewer pipe.
- **2.** Precast concrete manhole sections.
- **3.** Castings.
- **4.** Adjusting rings.
- **5.** Flared end sections.
- **6.** Chimney Seals
- **7.** Draintile

1.02 REFERENCES

A. Minnesota Plumbing Code published by the Minnesota Department of Labor and Industry Codes Division, latest edition.

B. ASTM A48; Specification for Gray Iron Castings.

C. ASTM A929; Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dipped Process for Corrugated Steel Pipe

D. ASTM A536; Standard Specification for Ductile Iron Castings

E. ASTM C76; Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

F. ASTM C443; Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.

G. ASTM C478; Specification for Pre-cast Reinforced Concrete Manhole Sections.

H. ASTM C923; Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

I. ASTM D3034; Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

J. ASTM D3212; Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

K. ASTM F1336; Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings

L. AASHTO M294; Specification for Corrugated Polyethylene Pipe (12” to 48”).

M. AASHTO M36; Corrugated Steel Pipe, Metallic Coated, for Sewers and Drains

N. AASHTO MP7; Specification for Corrugated Polyethylene Pipe (54" to 60").

1.03 QUALITY ASSURANCE

A. Quality assurance personnel shall be at the project site on an intermittent basis during the storm drainage system placement.

1.04 DELIVERY, STORAGE AND HANDLING

A. Inspect the materials delivered to the site for damage and store the materials with a minimum of handling. The materials shall be kept under cover and out of the direct sunlight. Do not store the materials directly on the ground. Keep the inside of the pipes and fittings free from dirt and debris.

1.05 SUBMITTALS

A. The Contractor shall submit for approval complete shop drawings and details for all structures, pipes, castings, fittings, and accessories. Submittal shall include all the manufacturer's product data, certifications, dimensions, sizes, types, and installation requirements.

1.06 SITE CONDITIONS

A. The existing underground utilities, as shown on the plans, are located in accordance with available data, but the locations may vary and cannot be guaranteed. The exact locations shall be determined by the Contractor as the work proceeds. The excavation work shall be done carefully so as to avoid damaging the existing utilities.

B. The Contractor shall provide for the protection, temporary removal and replacement, or relocation of said obstructions as required for the performance of the work required in these contract documents. No extra payment will be made for this work.

PART 2 PRODUCTS

2.01 STORM SEWER PIPE

A. All pipe shall be new and unused.

B. Reinforced concrete pipe: ASTM C76, Class III

C. Polyvinyl chloride (PVC) pipe: ASTM D1785 Schedule 40

D. High density polyethylene (HDPE) pipe: ASTM F2306.

2.02 PRECAST CONCRETE MANHOLE SECTIONS

A. Precast concrete manhole risers, base sections, and tops: ASTM C478.

B. Waterstop grout ring connections: ASTM C923.

C. Boot connections: ASTM C923.

D. Reinforced Plastic Steps: MnDOT STD Plate 4180J.

2.03 GASKETS

A. Gaskets and pipe ends for rubber gasket joints: ASTM C443.

B. Elastomeric seals (gaskets) for joining plastic pipe: ASTM D3212.

C. Rubber gaskets for joints between manhole sections: ASTM C443.

D. Gaskets for PVC sewer fittings: ASTM F1336.

E. Rubber gaskets for structure to pipe connections: ASTM C923.

2.04 CASTINGS – PRECAST CONCRETE SECTIONS

A. Precast concrete manhole covers, grates, and boxes: Cast iron, ASTM A48, Class 35B.

B. Uniform quality, free of blowholes, shrinkage, distortion, and other defects.

C. The product numbers are as manufactured by Neenah Foundry Company and are shown on the Plans. Standard castings differing in non-essential details may be acceptable if approved by the Engineer.

2.05 ADJUSTING RINGS

A. Precast concrete adjusting rings; MnDOT STD Plate 4010H.

B. High Density Polyethylene (HDPE) adjusting rings; MnDOT TM 02-21-TS-06.

2.06 FLARED END SECTIONS

A. Flared end material shall match joining pipe material.

B. Precast concrete apron; MnDOT STD Plate 3100G and 3110G.

C. High density polyethylene (HDPE); ASTM D3350-213320C, Hancor Hi-Q or equal.

D. All flared end sections shall have galvanized steel trash guards, unless noted otherwise.

2.09 CHIMNEY SEAL

A. Infi-shield Uni-band external sealing system or approved equal.

2.11 PIPE BEDDING MATERIAL

A. The pipe bedding shall consist of clean pit-run sand or fine gravel, free from deleterious matter and rocks over 1 inch in diameter.

2.12 DRAINTILE

A. Polyvinyl Chloride (PVC) Pipe, ASTM 2729.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. Shape the bottom of the trench to give substantially uniform circumferential support to the lower fourth of each pipe allowing for pipe bedding material. Pipe laying shall proceed up-grade with the groove (bell) ends in the up-grade direction. Adjust the tongues in grooves to produce a uniform space. Lay each pipe true to line and grade to form a close concentric joint with the adjoining pipe. Blocking or wedging between tongues and grooves will not be permitted. As the work progresses, clean the interior of the pipe free of dirt and extraneous materials.

A. Keep the trenches free from water until the pipe jointing is completed. Do not lay the pipe when conditions of the trench or the weather are unsuitable for such work. Keep the open ends of the pipe and fittings securely closed at all times when the work is not in progress.

B. The bedding material shall be placed uniformly over the trench bottom to a depth of not less than 3 inches. The bedding shall be shaped to provide uniform support to the lower fourth of the pipe for its entire length. Depressions shall be made in the bedding material to accommodate the joints. The pipe bedding material shall be carried to 6 inches above the top of the pipe. The remaining trench backfill material shall be on-site material similar in composition to the surrounding subsoils.

C. The last three sections of pipe not entering a manhole are to be fastened together with an anchor bolt system. Install a flared end section matching the pipe material. Provide temporary or permanent energy dissipation with 24-hours.

3.02 JOINT CONSTRUCTION

A. Make joints with rubber gaskets or approved primer and glue. Clean and dry the surfaces to receive lubricants, cements, or adhesives. Prepare joints not more than 24 hours prior to the installation of the pipe. Protect the joints from sun, wind, dust or other deleterious agents at all times.

B. Before the installation of the pipe, inspect joints and remove and replace loose or improperly attached joints and fittings.

C. If the joints becomes loose while installing or backfilling the pipe, remove the pipe, and remake the joint.

3.03 MANHOLE CONSTRUCTION – PRECAST CONCRETE

A. For pre-cast concrete construction provide a smooth finish to the inside joints of pre-cast concrete manholes and catch basins.

B. Provide a hole greater in diameter than the pipe at pipe entrances to the pre-cast concrete structures. Install watertight connector in the annular space between the pipe and pre-cast concrete manhole.

C. Lay sections of the structures in a full mortar bed. Keep the masonry materials and mortar at a temperature above freezing until the mortar has set up sufficiently to prevent damage by freezing.

D. The mortar shall be composed of 1 part Portland cement and 3 parts of washed and screened sand with sufficient water to make a workable mix.

E. The top 8 inches of the structures shall be made of concrete rings 2 inches thick. Lay the concrete adjusting rings in a full bed of mortar 1/4 inch to 3/4 inch thick.

F. Set the manhole or catch basin frames and lids / grates flush with the existing elevations shown on the Plans. Place the frames upon a full bed of mortar and shim to the correct elevation with suitable concrete wedges and mortar. Install external chimney seal.

3.05 FIELD QUALITY CONTROL

A. Type of pipe and size will be verified during installation.

B. Installation methods and techniques will be reviewed, to ensure pipe is not damaged during placement.

C. Check each straight run of pipe for gross deficiencies by holding a light in the manhole or catch basin. The light shall show a practically full circle through the pipe when viewed from the adjoining end of the line.

D. Leakage testing shall be performed on new lines within 10 feet of buildings and water lines by the Contractor at his own expense. Testing may be by Air Test Method in accordance with the Minnesota Plumbing Code or the Hydrostatic Test Method in accordance with the City Engineers Association of Minnesota standard specifications

END OF SECTION