ADDENDUM #1

Addendum #	Addendum #1	**Date Issued**	05/26/2026
Project Name | Job #	Buffalo Manor Apartment Complex		20245211
Bid Date | Time	June 4, 2026		2:00 pm (CST)

THIS ADDENDUM AMENDS AND BECOMES PART OF THE CONTRACT DOCUMENTS FOR EAPC PROJECT 20245211 DATED 05/26/2026, RESPECTIVELY. EACH BIDDER SHALL ACKNOWLEDGE RECEIPT OF THIS ADDENDUM BY MARKING THE ADDENDUM NUMBER AND DATE ON THE BID FORM.

CLARIFICATIONS

1. Energy Heels at garage walls are not needed.
2. Estimated value of project is $11,000,000.
3. Anticipated construction start date is September 1, 2026.
4. Estimated substantial completion time is 365 days. Completion date will be 1 year from date of notice to proceed.
5. Garage exterior walls will be sheet rocked.
6. Garage party walls go up to the deck on one side.
7. Garage siding (6” horizontal and 6” vertical) and frieze board should match that of the apartment building.
8. Fire treated plywood is not required on garage roof.
9. Garage portal frames are not required.
10. Provide wood trim at all knock down door frames, no metal snap trim.

SPECIFICATIONS

Section #	SPECIFICATION NAME	REVISION
00 0110	Table of Contents	REPLACE this Section with the attached.
00 2000	Information Available to Bidders Geotechnical Report	ADD this Section, attached.
10 5723	Closet and Utility Shelving	Basis of design: ClosetMaid Pro ShelfTrack Adjustable Wire System
21 1300	Fire Suppression Sprinkler	Updated 2.5 Pipe and Fittings to Include CPVC Pipe and Fittings

ADD these Sections, attached:

31 0500 - COMMON WORK RESULTS FOR EARTHWORK

31 1100 - CLEARING AND GRUBBING
31 1413 - SOIL STRIPPING AND STOCKPILING
31 2300 - EXCAVATION AND FILL
31 2313 - SUBGRADE PREPARATION
31 2319 - DEWATERING
31 2333 - TRENCHING AND BACKFILLING
31 2336 - STRUCTURAL EXCAVATION AND FILL
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33 0110.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEM
33 0112 - INSPECTION AND TESTING OF WATER UTILITIES
33 0500 - COMMON WORK RESULTS FOR UTILITIES
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33 0561 - CONCRETE MANHOLES
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33 1419 - VALVES AND HYDRANTS FOR WATER UTILITY
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33 4416 - SUBDRAINAGE PIPING
33 4211 - STORMWATER GRAVITY PIPING
33 4231 - STORMWATER AREA DRAINS AND INLETS

DRAWINGS

G001	COVER SHEET 1. Civil sheets added to index
G003	ARCHITECTURAL SITE PLAN 1. Maintenance garage location added 2. Trash enclosure plan added 3. Trash enclosure wall section added
G004	GARAGE PLANS, SECTIONS & ELEVATIONS 1. Detail 2/G004 updated 2. Detail 6/G004 added
	SITE BOUNDARY DESCRIPTIONS
C100	EXISTING CONDITIONS & DEMOLITION 4. Added sheet
C200	TEMPORARY EROSION CONTROL 1. Added sheet
C201	PERMANENT EROSION CONTROL 1. Added sheet
C300	UTILITY PLAN – STORM SEWER 1. Added sheet
C301	UTILITY PLAN – SANITARY SEWER & WATER 1. Added sheet
C400	GRADING PLAN 1. Added sheet
C500	PAVING PLAN 1. Added sheet
C700	DETAILS 1. Added sheet
C701	DETAILS 1. Added sheet
L101	PLANTING PLAN 1. Added sheet
L102	PLANTING DETAILS 1. Added sheet

A501	UNIT PLANS AND INTERIOR ELEVATIONS 1. Clarification of materials. Added notes
A502	UNIT PLANS AND INTERIOR ELEVATIONS 1. Clarification of materials. Added notes
A503	UNIT PLANS AND INTERIOR ELEVATIONS 1. Clarification of materials. Added notes
A504	ENLARGED FLOOR PLANS AND INTERIOR ELEVATIONS 1. Clarification of materials. Added notes
A901	FIRST FLOOR FINISH PLAN 1. Added material under Interior/ Exterior Paintings
F201	FIRST FLOOR FIRE PROTECTION PLAN 1. Updated Fire Protection Riser Detail
E100	ELECTRICAL SITE PLAN 1. Adjusted garage lighting fixture height and added 3 fixtures.

PRIOR APPROVALS

Subject to meeting all of the requirements of the plans and specifications, the following items are approved for bidding:

Section	Item	Approved Manufacturer/Product
07 5300	EPDM Membrane, Insulation Insulation, Cover Board	Johns-Manville 60 mil NR EPDM J-M Polyiso ENRGY 3, Protector HD
08 3343	Overhead Coiling Smoke Curtain	Cookson ERF10
08 5413	Fiberglass Windows	Pella Impervia
09 3013	Ceramic Tiling	Mosa, USA- Core
09 5113	Acoustical Panel Ceilings	USG, Ceiling System
23 2123	Hydronic Pumps	Wilo
23 5216	Condensing Boilers	Aerco BMK
23 8126	Split System Air Conditioners	Lennox

ATTACHMENTS

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END OF SECTION 00 0110

SECTION 00 2000 - INFORMATION AVAILABLE TO BIDDERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes Existing Reports and Surveys.

B. Available Project information has been furnished by Owner to Architect/Engineer for use in designing this Project.
   1. Each Bidder shall be fully familiar with available Project information, which has been prepared for Owner by separate consultants.
   2. Available Project information is offered solely for reference and shall not be considered part of Contract Documents.
   3. Data contained in Documents prepared by Owner's separate consultants is believed to be reliable; however, Owner and Architect/Engineer do not guarantee their accuracy or completeness.
   4. In preparing their Bids, Bidders shall consider and evaluate data contained in available Project information as well as Contract Documents prepared by Architect/Engineer

C. Related Requirements:
   1. Document 00 1000 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

1.3 SUBSURFACE EXPLORATION REPORT

A. A copy of the Report of Geotechnical Explorations with respect to this building site is attached to the end of this Section.
   1. Title: Geotechnical Evaluation Report, Jamestown Beyond Shelter - Phase 1
   2. Project: B2503399
   3. Prepared For: BSI Jtown Land, LLC
   4. Date: June 6, 2025
   5. Prepared by: Braun Intertec Corp.

B. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of the Architect.

C. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.

D. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

1. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction may need to be made, with resulting changes to Contract price and or Contract Time.

1.4 TOPOGRAPHIC SURVEY

A. The Construction Plans include topographic survey information prepared for the Owner. This survey identifies grade elevations prepared primarily for use of Architect/Engineer in establishing new grades and identifying natural watershed The Contractor shall verify existing conditions. Substantial variations from this plan are not expected, nor shall they be the basis for a contract price change without the approval of both the Architect and Owner.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 00 2000

Geotechnical Evaluation Report

Jamestown Beyond Shelter – Phase 1
SW Quadrant of 11th Avenue SW and 25th Street SW
Jamestown, North Dakota

Prepared for

BSI Jtown Land, LLC

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

Kate Staley, PE
Project Engineer
Registration Number: PE-27401
June 6, 2025

Project B2503399
Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
526 10th Street NE, Suite 300
West Fargo, ND 58078

Phone: 701.232.8701
Fax: 952.995.2020
Web: braunintertec.com

June 6, 2025 Project B2503399

Christopher Miller
BSI Jtown Land, LLC
1393 25th Avenue S
Fargo, ND 58103

Re: Geotechnical Evaluation
Jamestown Beyond Shelter – Phase 1
SW Quadrant of 11th Avenue SW and 25th Street SW
Jamestown, North Dakota

Dear Mr. Miller:

We are pleased to present this Geotechnical Evaluation Report for the first phase of the Jamestown Beyond Shelter Project. Boring results indicate existing fill soils to a maximum depth of 6.5 feet, underlain by medium to very stiff glacial till soils. A potentially perched water table was encountered in several borings approximately 7.5 to 10 feet below existing grades, corresponding to a sand layer. We believe that conventional foundations and slab on grade floors may be used to support the building after minor site preparation work is performed.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Kate Staley at 701.355.5419 or at kstaley@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Kate Staley, ME, PE
Project Engineer

Charles (Wes) Dickhut, MS, PE
Associate Director, Principal Engineer

AA/EOE

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Appendix

Soil Boring Location Sketch
Fence Diagram
Log of Boring Sheets ST-01 through ST-08
Descriptive Terminology of Soil
Laboratory Testing Results

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the design and construction of the first of three buildings proposed for the Jamestown Beyond Shelter project, located in the southwest quadrant of 11th Avenue SW and 25th Street SW in Jamestown, North Dakota.

Limited information was available concerning the project's construction. The first phase of the project will include the construction of a residential building and four parking garage structures. The residential building will be a slab-on-grade three-story building with an approximate footprint of 10,000 square feet. Table 1 provides project details. Assumed loading is based on our past experience with Beyond Shelters.

Table 1. Building Description

Aspect	Description
Below grade levels	None
Above grade levels	Three
Lowest level floor elevation	1488 (Assumed)
Column loads (kips)	100 (Assumed)
Wall loads (kips per lineal foot)	5 (Assumed)
Nature of construction	Steel or wood frame
Tolerable building settlement	1 inch (Assumed)

The figure below shows an illustration of the proposed site layout.

Figure 1. Site Layout

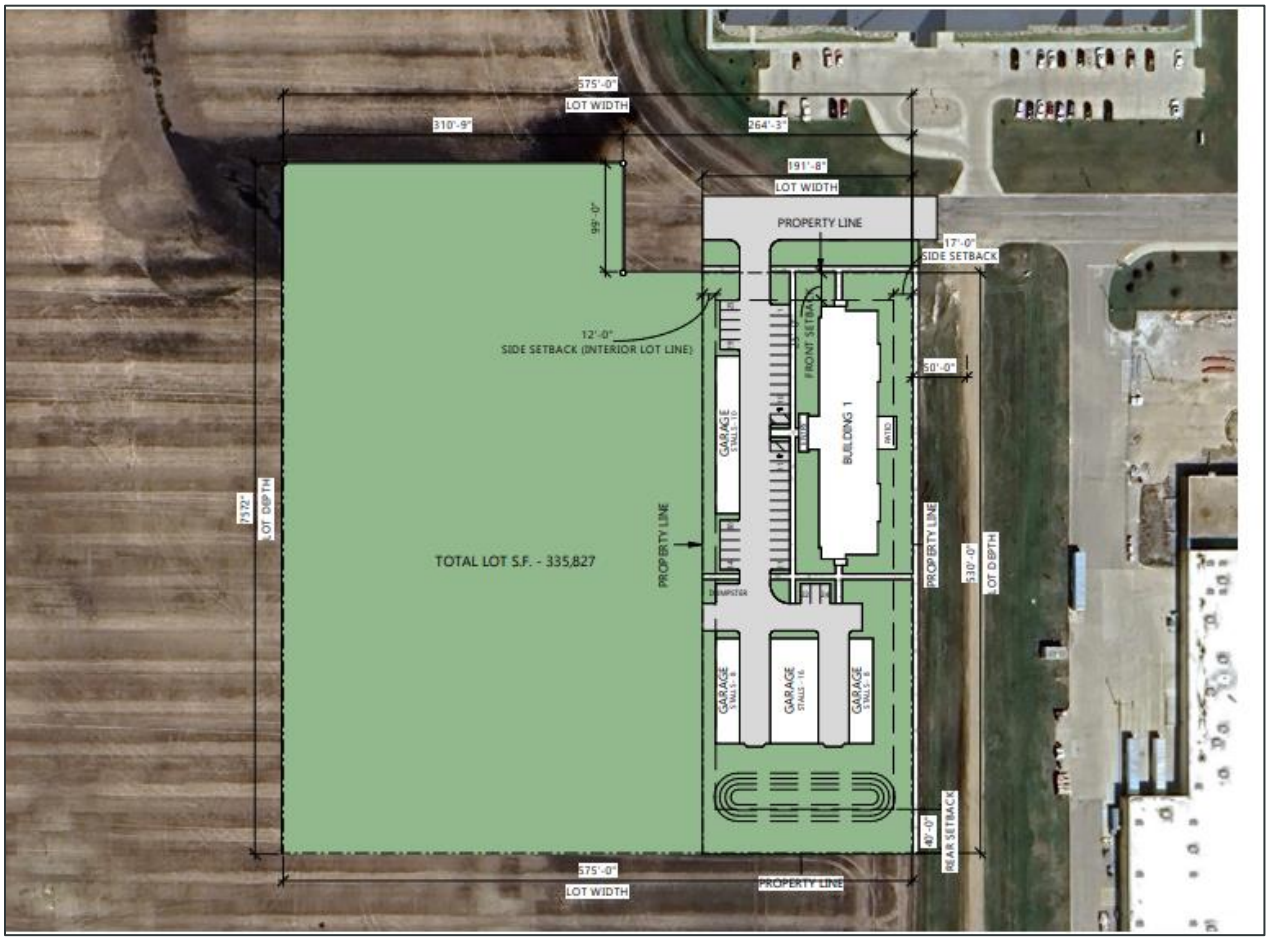


Figure provided by Beyond Shelter, Inc. April 17, 2025.

A.2. Site Conditions and History

Based on our review of publicly available aerial imagery the site has historically been and is currently an agricultural field. The site slopes gently downward to the east; total change in grade as measured across the borings is on the order of three to four feet. We learned during the utility notification process of a water main and easement in the northern part of the site that caused the buildings to be shifted slightly to the south from their originally proposed locations.

A.3. Purpose

The purpose of our geotechnical evaluation is to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for the design and construction of the proposed Beyond Shelter.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Aerial imagery of the site obtained from Google Earth and the North Dakota Department of Water Resources (NDDWR)'s Historical Map and Aerial Photography Dissemination Service to evaluate past site development.
- Database of water wells housed by the NDDWR as part of their Map Service, to help determine the groundwater level of the project area.
- *Geology and Ground Water Resources of Stutsman County, Part 1 – Geology,* North Dakota Geological Survey Bulletin 41 by Harold A. Winters. North Dakota Geological Survey, 1963. Used to aid in our understanding of the site geology.
- Preliminary Site Plans provided by Beyond Shelter, Inc. on April 17, 2025, detailing the preliminary proposed building layout.
- Communications with Mr. Christopher Miller of Beyond Shelter, Inc., regarding the proposed development.

In addition to the provided sources, we have used several publicly available sources of information.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses, and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB213764 to Mr. Christopher Miller, dated April 18, 2025, and authorized on April 23, 2025. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. We acquired the surface elevations and locations with GPS technology. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performing eight standard penetration test (SPT) borings, denoted as ST-01 to ST-08, to nominal depths of 11 to 26 feet below grade across the site.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.
- Perform engineering analysis related to site preparation and foundation design.
- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation and the design of foundations and floor slabs.

We performed this geotechnical evaluation concurrently with a Phase I Environmental Assessment (ESA) which was submitted separately. The project team should review the Phase I ESA report in conjunction with this geotechnical evaluation report to understand both the geotechnical and environmental aspects of the site and how they may impact one another.

B. Results

B.1. Geologic Overview

Based on the geologic information, the area consists of glacial deposited sediment, mainly glacial till. The glacial deposits typically consist of unbedded, unsorted mixtures of clay, sand, and pebbles. The glacial till may contain cobbles or boulders.

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Boring Results

Table 2 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 2.

Table 2. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil, Topsoil fill	CL	---	▪ Brown. ▪ Generally about 1 foot thick. ▪ Moisture condition generally dry.
Fill	CL	3 to 14 BPF	▪ Not encountered in ST-01. ▪ Moisture condition generally moist. ▪ Extended to depths of 4 to 6 ½ feet at boring locations. ▪ Generally lean clay with varying amounts of sand and gravel.
Glacial deposits	CL	6 to 24 BPF	▪ Intermixed layers of glacial outwash and till. ▪ Glacial till consisting of lean clay with varying amounts of sand and gravel. ▪ Glacial outwash consisting of silty sand and poorly graded sand with silt, fine to coarse grained, with varying amounts of gravel. ▪ Variable amounts of gravel; may contain cobbles and boulders. ▪ Moisture condition generally moist or wet.
	SM, SP-SM	5 to 23 BPF**	

*Abbreviations defined in the attached Descriptive Terminology sheets.

**ST-03 terminated in SP-SM with a blow count of 50/4”

For simplicity in this report, we define existing fill to mean existing, uncontrolled, or undocumented fill.

B.3. Groundwater

Table 3 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details.

Table 3. Groundwater Summary

Location	Surface Elevation	Measured or Estimated Depth to Groundwater (ft)	Corresponding Groundwater Elevation (ft)
ST-02	1487.1	7.5	1480
ST-03	1488.1	10	1478 ½
ST-06	1487.6	7.5	1480 ½
ST-07	1490.5	10	1480 ½

Note: groundwater elevations have been rounded up to the nearest ½ foot.

At the time of our observation, the groundwater surface elevation appeared to be about near 1480 1/2 feet; however this is likely a perched water condition contained in the upper sand strata and seams encountered in several borings. Project planning should expect groundwater will fluctuate in relation to seasonal changes in groundwater.

B.4. Laboratory Test Results

B.4.a. Moisture Contents

Moisture content (MC) tests (per ASTM D2216) were performed on selected samples to aid in our classifications and estimations of the materials' engineering properties. The moisture contents of the fill soils ranged from 15 to 32 percent, glacial till deposits ranged from 14 to 22 percent, and glacial outwash deposits ranged from 11 to 26 percent. The results of the moisture content tests are listed in the "MC" column of the Log of Boring sheets attached in the Appendix.

B.4.b. Moisture Contents and Unit Weights

We performed unit weight tests on selected thin-walled tube samples to assist in our estimation of the materials' engineering properties and aid in our settlement calculations. The results of the tests within the glacial till indicate the materials' have wet densities (WD) ranging from 130 to 131 pounds per cubic foot (pcf), and dry densities (DD) ranging from 108 to 111 pcf. The Log of Boring Sheets list the results of the unit weight tests in the "Tests or Remarks" column.

B.4.c. Atterberg Limit Tests

We performed Atterberg limits tests (per ASTM D4318) on selected samples for classification, evaluation of the range of soil plasticity, and estimation of engineering parameters. The tests indicated the glacial till deposits have LL ranging from 33 to 40 percent, PL ranging from 14 to 16 percent, and PI ranging from 18 to 24 percent. The "Tests or Remarks" column of the Log of Boring sheets shows the results of the Atterberg limits tests.

B.4.d. Sieve Analyses

We performed percent passing the #200 sieve analysis tests (per ASTM D1140) and sieve analysis tests (per ASTM C136) on selected samples to assist in classification and estimation of the soils' engineering properties. The results of the percent passing the #200 sieve and sieve analysis tests indicate the glacial outwash deposits encountered have P200 values ranging from 12 to 44 percent. The "Tests or Remarks" column of the Log of Boring sheets shows the results of percent passing the #200 sieve tests.

B.4.e. Unconfined Compressive Strength Tests

Unconfined compressive strength (Qu) tests (per ASTM D2166) were performed on selected thinwalled tube samples to aid in estimating the soils' undrained shear strength for bearing capacity calculations. The results of the tests within the glacial deposits indicate the soil has an unconfined compressive strength of 1880 pounds per square foot (psf) at an approximate depth of 7 feet, indicating an undrained shear strength of 940 psf; and an unconfined compressive strength of 8520 psf at an approximate depth of 12 feet, indicating an undrained shear strength of 4260 psf. The results of the unconfined compressive tests are listed in the "Tests or Remarks" column on the attached Log of Boring sheets and graphically in the Appendix.

C. Recommendations

C.1. Design and Construction Discussion

C.1.a. Introduction

The soils at the site consist of stiff lean clay glacial till that will provide adequate support for shallow spread footing foundations after removal and replacement of existing fill encountered to depths of 3 to 5 feet below proposed floor level.

C.1.b. Existing Fill

Our borings encountered existing fill to a depth of 3 to 5 feet below proposed floor level of 1488 feet. We have provided recommendations to remove previously placed fill in its entirety within the structural footprint and replacing it. The existing fill generally appears reusable as fill below structural areas and pavements. We have provided recommendations for a limited surficial improvement of the existing fill in pavement areas.

C.1.c. Reuse of On-Site Soils

Any soils with an organic content greater than 3 percent should not be used as backfill or fill below the structure footprint or within the upper 3 feet of the pavement areas. These soils should be used in landscaped areas or hauled off-site.

The on-site soils, anticipated to be predominantly lean clay, can be reused as backfill below the pavement areas. It should be anticipated that these soils will require moisture conditioning (drying) prior to compaction, which may be difficult depending upon the time of year that construction takes place. The lean clays have a low risk to shrink/swell with changes in moisture content.

C.1.d. Groundwater

Waterbearing sands were encountered in several borings at approximate depths of approximately 7 to 10 feet. Excavations for utilities that extend deeper than an elevation of 1480 ½ feet will probably encounter seepage. Excavations for footings are not anticipated to penetrate the waterbearing sands.

C.2. Site Grading and Subgrade Preparation

C.2.a. Building Subgrade Excavations

We recommend removing unsuitable materials from below floor slabs and footings. We define unsuitable materials as existing fill, frozen materials, organic soils, existing structures, existing utilities, and vegetation. We anticipate existing fill extends to depths of approximately 4 to 6 1/2 feet below existing site grades (corresponding to between 3 and 5 feet below proposed floor level).

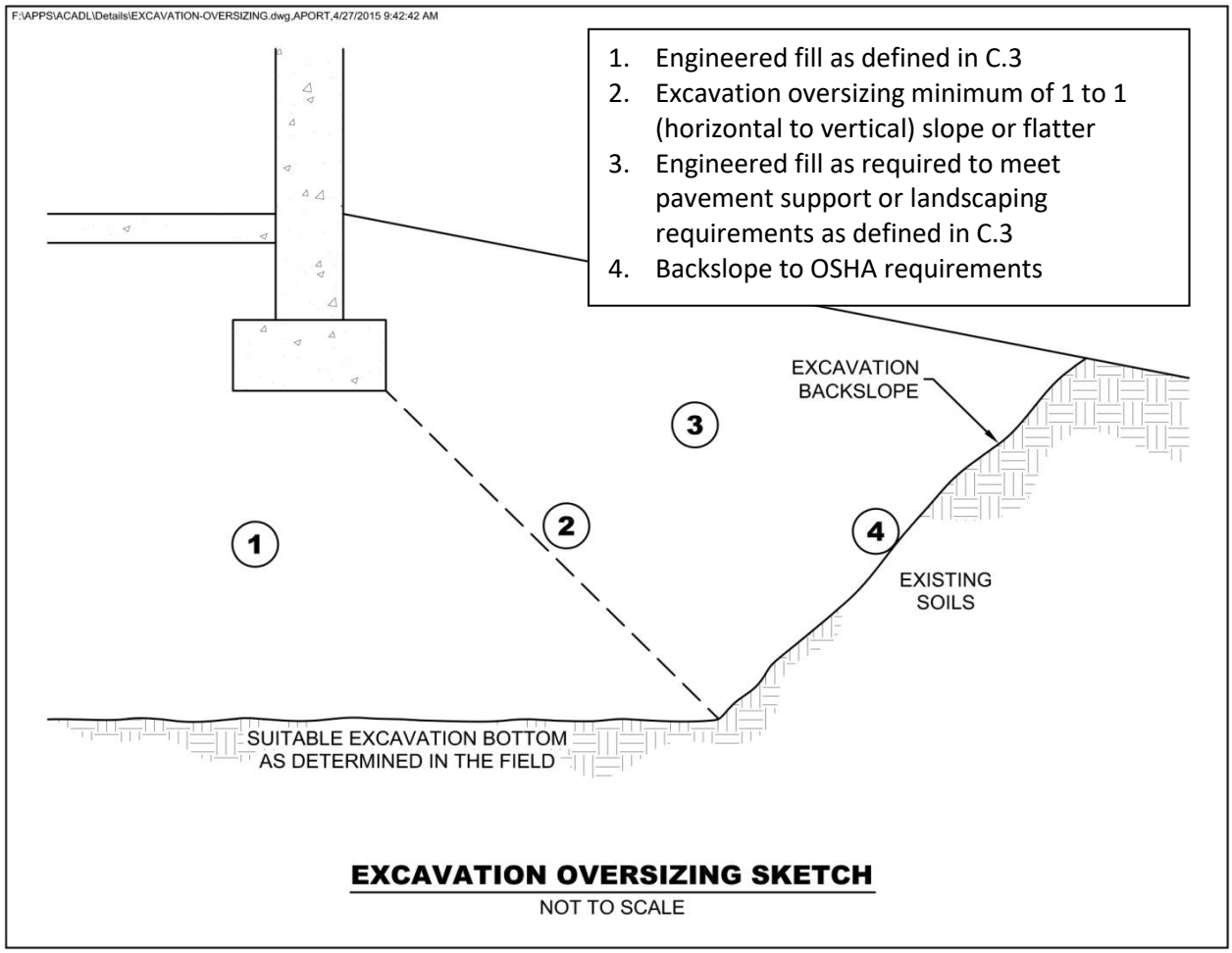
Based on the borings and the assumed floor elevation outlined in Table 1, we do not anticipate soil corrections below the proposed exterior footing bearing levels. Interior footings that are designed to bear at minimum depth would bear within the existing fill unless the soil corrections recommended are performed. A geotechnical representative should observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils.

The contractor should use equipment and techniques to minimize soil disturbance. If soils become disturbed or are wet, we recommend excavation and replacement of the disturbed soils.

C.2.b. Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal: vertical) or flatter. See Figure 2 for an illustration of excavation oversizing.

Figure 2. Generalized Illustration of Oversizing



C.2.c. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist predominantly of existing fill soils. We recommend considering these soils as Type B Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type B soils should have a gradient no steeper than 1H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.d. Excavation Dewatering

We recommend removing groundwater from the excavations. Project planning should include temporary sumps and pumps for excavations in low-permeability soils, such as clays.

C.2.e. Engineered Fill Materials and Compaction

Table 4 below contains our recommendations for engineered fill materials.

Table 4. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
Below foundations, floor slabs, and exterior pavement	Structural fill	CL, SC, SM, SP, SP-SM	100% passing 2-inch sieve	< 3% Organic Content (OC)
Non-frost-susceptible	Non-frost-susceptible fill	GP, GW, SP, SW	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve	< 2% OC
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	Any	100% passing 6-inch sieve	< 10% OC

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

We recommend spreading engineered fill in loose lifts of approximately 6 to 10 inches thick.
We recommend compacting engineered fill in accordance with the criteria presented below in Table 5.
The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 5. Compaction Recommendations Summary

Reference	Minimum Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points	
		< 12% Passing #200 Sieve (typically SP, SP-SM)	> 12% Passing #200 Sieve (typically CL, SM)
Below foundations, floor slabs, and exterior pavement	95	As necessary to facilitate compaction	-1 to +3
Below landscaped surfaces	90		-1 to ±3

*Increase compaction requirement to meet compaction required for structure supported by this engineered fill.

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.2.f. Special Inspections of Soils

We recommend including the site grading and placement of engineered fill within the building pad under the requirements of Special Inspections, as provided in Chapter 17 of the International Building Code, which is adopted into the state building code. Special Inspection requires observation of soil conditions below engineered fill or footings, evaluations to determine if excavations extend to the anticipated soils, and if engineered fill materials meet requirements for type of engineered fill and compaction condition of engineered fill. A licensed geotechnical engineer should direct the Special Inspections of site grading and engineered fill placement. The purpose of these Special Inspections is to evaluate whether the work is in accordance with the approved Geotechnical Report for the project. Special Inspections should include evaluation of the subgrade, observing preparation of the subgrade (surface compaction or dewatering, excavation oversizing, placement procedures and materials used for engineered fill, etc.) and compaction testing of the engineered fill.

C.3. Spread Footings

Table 6 below contains our recommended parameters for foundation design. These recommendations are based on the removal and replacement of existing fill as engineered fill within the footprint of the buildings and the associated oversize area described in Section C.2.

Table 6. Recommended Spread Footing Design Parameters

Item	Description
Maximum net allowable bearing pressure (psf)	2,000
Minimum factor of safety for bearing capacity failure	3.0
Minimum wall footing width (inches)	16
Minimum column footing width (inches)	30

Item	Description
Minimum embedment below final exterior grade for heated structures (inches)	48 for perimeter footings, interior footings may bear immediately below interior slabs
Minimum embedment below final exterior grade for unheated structures or for footings not protected from freezing temperatures during construction (inches)	60
Total estimated settlement (inches)	< 1
Differential settlement	Typically about 2/3 of total settlement*

* Actual differential settlement amounts will depend on final loads and foundation layout. When tying into the existing buildings, the total settlement of this new building will be differential to the existing building. We can evaluate differential settlement based on final foundation plans and loadings.

C.4. Interior Slabs

C.4.a. Subgrade Modulus

We recommend using a modulus of subgrade reaction, k, of 100 pounds per square inch per inch of deflection (pci) to design the slabs. If the slab design requires placing 6 inches of compacted crushed aggregate base immediately below the slab, the slab design may increase the k-value by 50 pci.
We recommend that the aggregate base materials be free of bituminous. In addition to improving the modulus of subgrade reaction, an aggregate base facilitates construction activities and is less weather sensitive.

C.4.b. Moisture Vapor Protection

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or mold to form under floor coverings. If project planning includes using floor coverings or coatings, we recommend placing a vapor retarder or vapor barrier immediately beneath the slab.
We also recommend consulting with floor covering manufacturers regarding the appropriate type, use and installation of the vapor retarder or barrier to preserve warranty assurances.

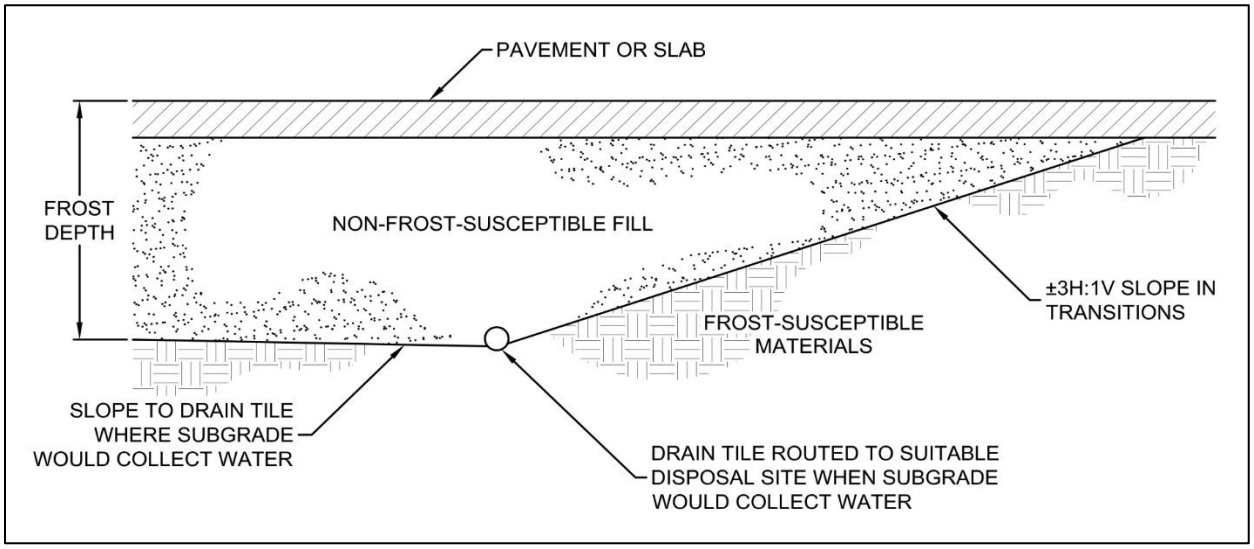
C.5. Frost Protection

We consider the lean clay soils to be moderately frost susceptible. Unfavorable amounts of heaving could occur if these soils become saturated and freeze. Grading to direct surface drainage away from buildings helps limit the potential for saturation and subsequent heaving to occur. Still, even limited amounts of movement can create tripping hazards.

One method to help limit the potential for heaving to occur is to remove frost-susceptible soils present below the overlying slab or pavement area down to bottom-of-footing grades, and replace the excavated material with non-frost-susceptible, engineered fill. We recommend providing drainage at the base of the subcut, as well as gradual transitions from this subcut (3H:1V or flatter gradient). This should be considered at entrances or areas that support sidewalks near entrances.

Figure 3 shows an illustration summarizing some of the recommendations above.

Figure 3. Frost Protection Geometry Illustration



An alternative method to reduce the risk of heaving is to support the slabs on frost-depth footings, and suspend the slabs at least 4 inches above the underlying subgrade soils. With this alternative, we recommend making accommodations for differential frost heave at transition areas.

Over the life of the pavement or slab, cracks may develop, and joints may open up, which will expose the subgrade and allow water to enter the subgrade. This water entering the subgrade increases the likelihood of heave. It will be critical that the owner develop a detailed maintenance program to repair any cracks and joints that may develop during the useful life of the various surface features.
The maintenance program should pay special attention to areas where dissimilar materials abut one another, where construction joints occur and where shrinkage cracks develop.

C.6. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts, and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support, or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a truck-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths. Borings were backfilled with auger cuttings upon their completion.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements. The Appendix also includes a Fence Diagram intended to provide a summarized cross-sectional view of the soil profile across the site.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance and other in-situ testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs.
We performed the tests in general accordance with ASTM procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses, and recommendations from a limited amount of site and subsurface information.

It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation, and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations.
Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

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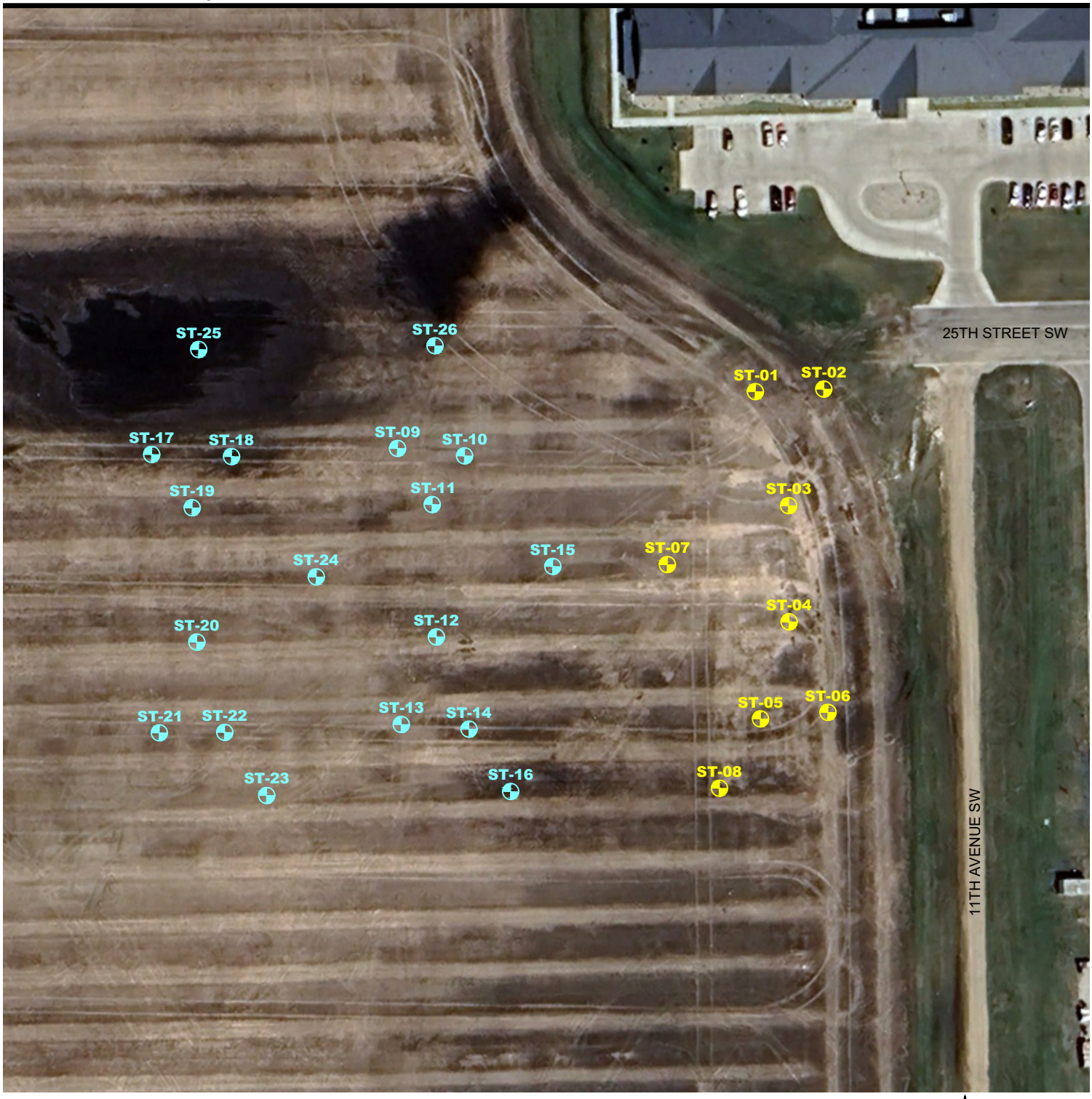

DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

DENOTES APPROXIMATE LOCATION OF PROPOSED STANDARD PENETRATION TEST BORING

N

50' 0 100'

SCALE: 1"=100'

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526 10th Street NE, Suite 300
West Fargo, ND 58078
701.492.5875
braunintertec.com

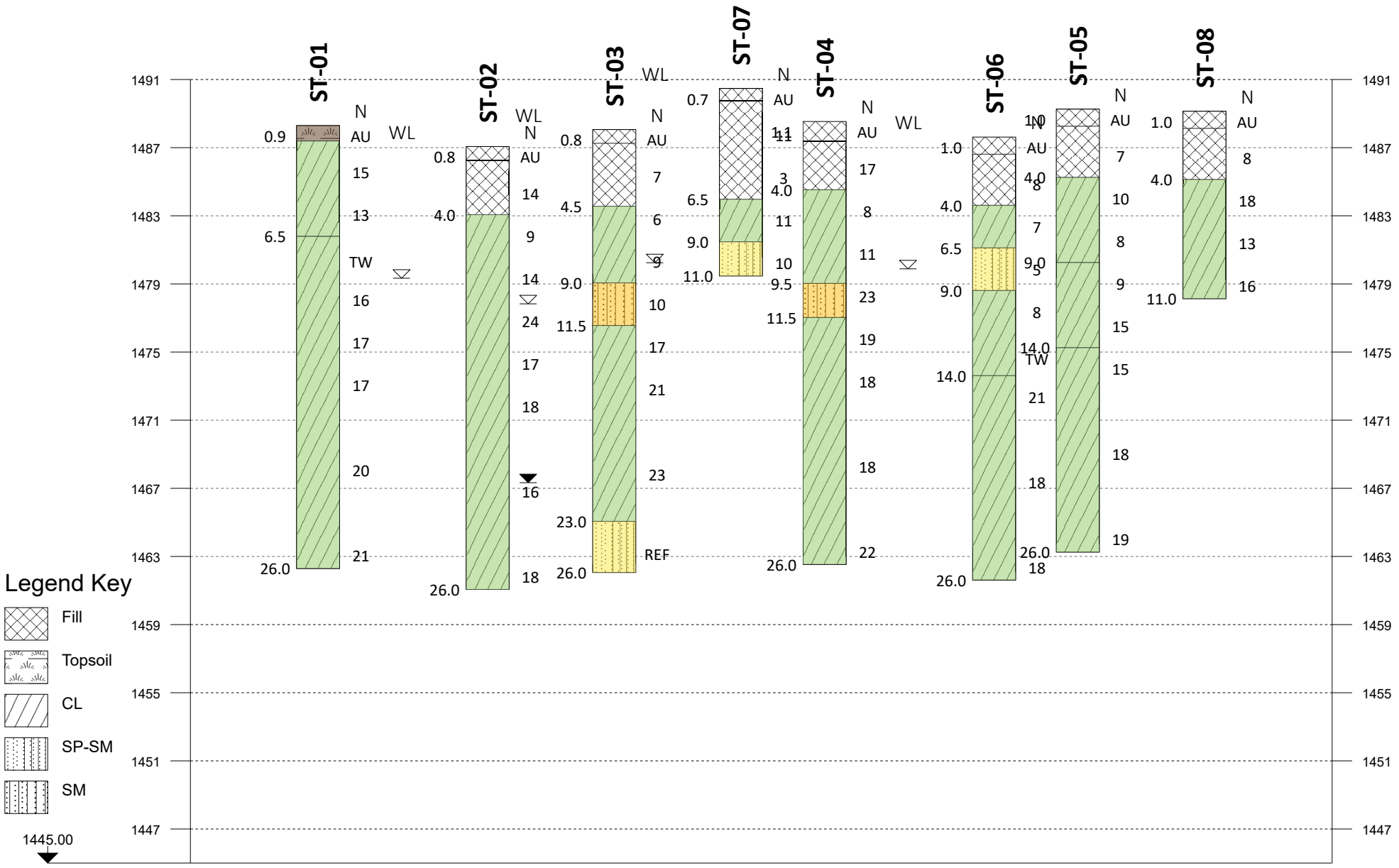
Project No:	B2503399
Drawing No:	B2503399
Drawn By:	MMH
Date Drawn:	4/30/25
Checked By:	KD
Last Modified:	6/6/25

Jamestown Beyond Shelter

Southwest Quadrant of 11th Avenue SW and 255th Street SW

Jamestown, North Dakota

Soil Boring Location Sketch



SECTION LINE 1

Fence Diagram

Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

Project ID: B2503399
Vert. Scale: 1"= 8'
Hor. Scale: NTS
Date: 06/06/2025

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-01**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881947 LONGITUDE: -98.725057
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1488.3 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1487.4		LEAN CLAY (CL), trace Gravel, Sand, and roots, brown, dry (TOPSOIL)		AU			
0.9		LEAN CLAY (CL), trace Gravel, Sand, and mineralization, brownish gray, moist, stiff (GLACIAL TILL)		5-7-8 (15) 11"		22	
		Sand and Silt lenses below 4 1/2 feet	5	5-6-7 (13) 12"		19	
1481.8							
6.5		SANDY LEAN CLAY (CL), trace Gravel, brown, moist, very stiff, iron oxide staining (GLACIAL TILL)		TW 12"		20	LL=33, PL=15, PI=18 DD=108 pcf WD=130 pcf q_u=0.94 tsf
			10	5-6-10 (16) 14"		18	
		Sand lenses to 11 feet		6-7-10 (17) 13"		18	
			15	5-7-10 (17) 15"		18	
			20	5-8-12 (20) 16"		19	
			25	7-7-14 (21) 18"		19	
1462.3							
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water not observed while drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-02**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881949 LONGITUDE: -98.724861
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1487.1 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1486.3		LEAN CLAY (CL), trace Gravel, Sand, and roots, brown, dry (TOPSOIL FILL)		AU			
0.8		FILL: LEAN CLAY (CL), trace Sand and Gravel, brownish gray, moist		5-7-7 (14) 12"		15	
1483.1							
4.0	▽	SANDY LEAN CLAY (CL), trace Gravel, brownish gray, moist, stiff to very stiff, iron oxide staining (GLACIAL TILL)	5	4-4-5 (9) 14"			
		Wet 2-inch Clayey Sand seam 7 1/2 feet		4-6-8 (14) 10"		20	
		Sand lenses and seams to 13 1/2 feet	10	7-10-14 (24) 13"			
				6-7-10 (17) 12"		18	
			15	7-8-10 (18) 13"			
			20	5-6-10 (16) 15"			
			25	6-7-11 (18) 14"			
1461.1							
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water observed at 7.5 feet while drilling. Water not observed at end of drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-03**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881722 LONGITUDE: -98.724969
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1488.1 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1487.3		LEAN CLAY (CL), trace Sand, trace roots, brown, dry (TOPSOIL FILL)		AU			
0.8		FILL: LEAN CLAY (CL), trace Sand, dark brown, moist		7-4-3 (7) 12"		32	
1483.6							
4.5		SANDY LEAN CLAY (CL), trace Gravel, brownish gray, moist, medium to stiff, iron oxide staining (GLACIAL TILL)	5	3-3-3 (6) 8"		15	
1479.1				5-4-5 (9) 10"			
9.0	▽	SILTY SAND (SM), fine to medium-grained, brown, wet, loose (GLACIAL OUTWASH)	10	5-5-5 (10) 12"		26	P200=44%
1476.6							
11.5		SANDY LEAN CLAY (CL), trace Gravel, brownish gray, moist, very stiff (GLACIAL TILL)		5-8-9 (17) 14"		18	
			15	6-10-11 (21) 15"			
	▼		20	7-10-13 (23) 14"			
1465.1							
23.0		POORLY GRADED SAND with SILT (SP-SM), fine to coarse-grained, trace Gravel, gray, wet, very dense (GLACIAL OUTWASH)	25	28-50/4" (REF) 10"			
1462.1							
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water observed at 10.0 feet while drilling. Water observed at 20.5 feet at end of drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-04**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881494 LONGITUDE: -98.724975
START DATE: 04/21/25 END DATE: 04/21/25
SURFACE ELEVATION: 1488.5 ft
DRILLER: B.Hatle LOGGED BY: K.Dragos
RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1487.4		LEAN CLAY (CL), trace Sand, trace roots, brown, dry (TOPSOIL FILL)		AU			
1.1		FILL: LEAN CLAY (CL), trace Sand, brownish gray, moist		5-7-10 (17) 8"		19	LL=37, PL=14, PI=23
1484.5							
4.0		SANDY LEAN CLAY (CL), trace Gravel, trace mineralization, brownish gray, moist, medium to stiff (GLACIAL TILL)	5	3-4-4 (8) 10"		19	
				5-5-6 (11) 12"			
1479.0							
9.5		SILTY SAND (SM), fine to coarse-grained, trace Gravel, brownish gray, moist, medium dense, iron oxide staining (GLACIAL OUTWASH)	10	8-12-11 (23) 15"		15	P200=41%
1477.0							
11.5		SANDY LEAN CLAY (CL), trace Gravel, brownish gray, moist, very stiff, iron oxide staining (GLACIAL TILL)		7-7-12 (19) 14"			
			15	5-7-11 (18) 15"			
			20	6-8-10 (18) 10"			
			25	54-9-13 (22) 13"			
1462.5							
26.0		END OF BORING Boring then backfilled with auger cuttings					Water not observed while drilling.
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-05**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881305 LONGITUDE: -98.725063
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1489.3 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1488.3		LEAN CLAY (CL), trace Gravel, Sand, and roots, brown, dry (TOPSOIL FILL)		AU			
1.0		FILL: LEAN CLAY (CL), trace Sand, dark brown, moist		5-4-3 (7) 10"			
1485.3							
4.0		LEAN CLAY with SAND (CL), trace Gravel and mineralization, brown with gray, moist, medium to stiff (GLACIAL TILL)	5	5-5-5 (10) 12"		18	
				4-4-4 (8) 10"			
1480.3							
9.0		SANDY LEAN CLAY (CL), trace Gravel and mineralization, brown with gray, moist, stiff, iron oxide staining (GLACIAL TILL)	10	3-5-4 (9) 11"		21	
				6-7-8 (15) 12"			
1475.3							
14.0		SANDY LEAN CLAY (CL), trace Gravel, brown, moist, stiff to very stiff (GLACIAL TILL)	15	5-6-9 (15) 13"		20	
			20	5-8-10 (18) 12"			
			25	6-6-13 (19) 14"			
1463.3							
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water not observed while drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-06**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881315 LONGITUDE: -98.724870
START DATE: 04/21/25 END DATE: 04/21/25
SURFACE ELEVATION: 1487.6 ft
RIG: 7520
METHOD: 3 1/4" HSA
SURFACING: Field
WEATHER: Clear
DRILLER: B.Hatle
LOGGED BY: K.Dragos

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1486.6		LEAN CLAY (CL), trace Sand, trace roots, brown, dry (TOPSOIL FILL)		AU			
1.0		FILL: LEAN CLAY (CL), trace Sand, dark brown, moist		8-5-3 (8) 10"		32	
1483.6							
4.0		SANDY LEAN CLAY (CL), brown, moist, medium (GLACIAL TILL)	5	3-3-4 (7) 11"		14	
1481.1							
6.5	▽	POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, brown, wet, loose (GLACIAL OUTWASH)		9-3-2 (5) 14"		11	P200=12%
1478.6							
9.0		SANDY LEAN CLAY (CL), brown, moist, medium (GLACIAL TILL)	10	4-4-4 (8) 12"		22	
				TW 24"		18	LL=40, PL=16, PI=24 DD=111 pcf WD=131 pcf
1473.6							
14.0		SANDY LEAN CLAY (CL), trace Gravel, mineralization, brownish gray, moist, very stiff (GLACIAL TILL)	15	6-9-12 (21) 14"			q_u=4.26 tsf
			20	7-8-10 (18) 16"		19	
			25	6-7-11 (18) 14"			
1461.6							
26.0		END OF BORING Boring then backfilled with auger cuttings	30				Water observed at 7.5 feet while drilling. Water not observed at end of drilling.

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-07**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881612 LONGITUDE: -98.725320
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1490.5 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1489.8		LEAN CLAY (CL), trace Sand, trace roots, brown, dry (TOPSOIL FILL)		AU			
0.7		FILL: LEAN CLAY (CL), trace Sand, trace Gravel, dark brown, moist		6-5-6 (11) 13"		20	LL=33, PL=14, PI=19
			5	1-2-1 (3) 2"		23	
1484.0							
6.5		SANDY LEAN CLAY (CL), trace Gravel, trace mineralization, brown with gray, moist, stiff (GLACIAL TILL)		6-5-6 (11) 13"			
1481.5							
9.0	▽	POORLY GRADED SAND with SILT (SP-SM), fine to coarse-grained, trace Gravel, brown with gray, wet, loose (GLACIAL OUTWASH)	10	4-5-5 (10) 12"		13	P200=12%
1479.5							Water observed at 10.0 feet while drilling.
11.0		END OF BORING					Water not observed at end of drilling.
		Boring then backfilled with auger cuttings	15				
			20				
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2503399
Geotechnical Evaluation
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 25th St. SW
Jamestown, North Dakota

BORING: **ST-08**
LOCATION: Captured with RTK GPS.
DATUM: WGS 84
LATITUDE: 46.881170 LONGITUDE: -98.725185
START DATE: 04/21/25 END DATE: 04/21/25
DRILLER: B.Hatle LOGGED BY: K.Dragos
SURFACE ELEVATION: 1489.1 ft RIG: 7520 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Clear

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1488.1		LEAN CLAY (CL), trace Sand, trace roots, brown, dry (TOPSOIL FILL)		AU			
1.0		FILL: LEAN CLAY with SAND (CL), trace Gravel, trace mineralization, brown with gray, moist		4-3-5 (8) 10"		25	
1485.1							
4.0		SANDY LEAN CLAY (CL), trace Gravel, brown, moist, stiff to very stiff		8-8-10 (18) 11"		21	
			5	7-5-8 (13) 7"			
			10	6-8-8 (16) 14"			
1478.1							
11.0		END OF BORING Boring then backfilled with auger cuttings					Water not observed while drilling.
			15				
			20				
			25				
			30				

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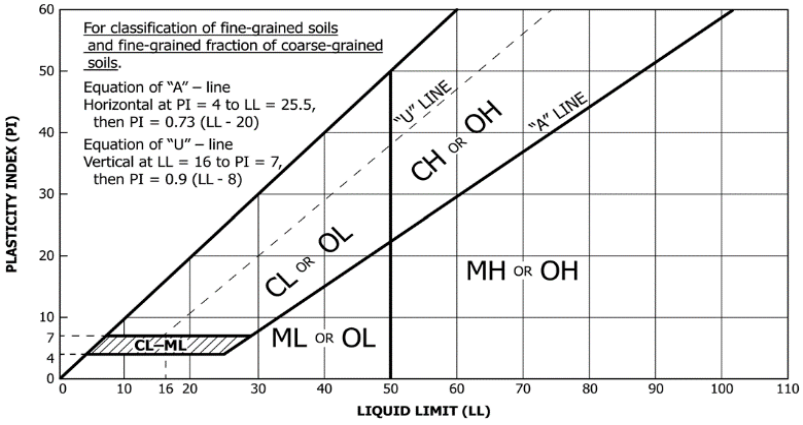
Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Sample Symbols

Standard Penetration Test
Modified California (MC)
Auger
Grab Sample
Rock Core
Thinwall (TW)/Shelby Tube (SH)
Texas Cone Penetrometer
Dynamic Cone Penetrometer

5/2021

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Unconfined Compression

ASTM D2166

Report Date: 05/16/2025

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

BSI Jtown Land, LLC
1393 25th Avenue South
Fargo, ND 58103

Project:

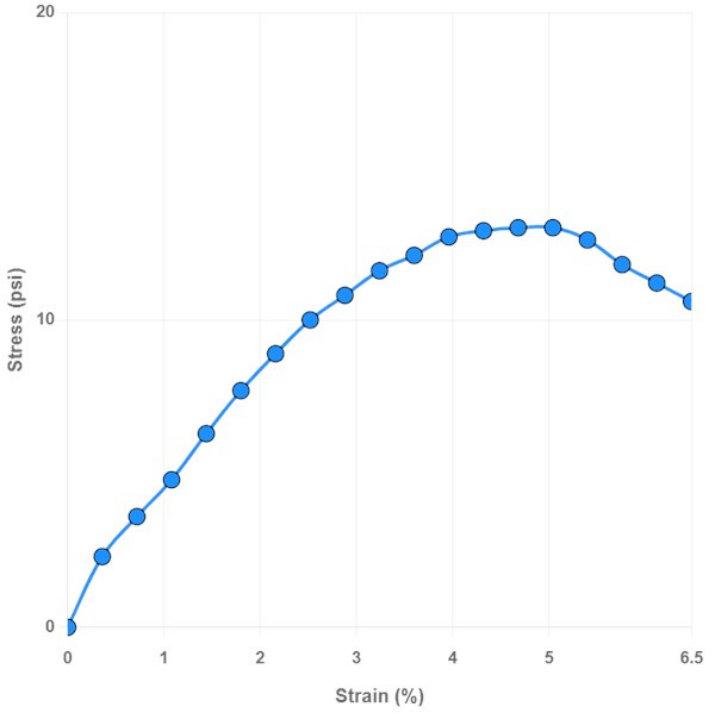
B2503399
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 255th St. SW
Jamestown, ND 58401

Sample Information

Sample Number:	655557	**Alternate ID:**	4 TWT
Sampling Method:	Thinwall Tube ASTM D1587	**Depth (ft):**	8
Boring Number:	ST-01	**Sampled By:**	Drill Crew
Location:	Native Soil		
Location Details:	ST-01, 7-9'		
Sample Date:	04/21/2025		
Received Date:	05/12/2025	**Lab:**	2908 Morrison Ave. Suite 3, Bismarck, ND
Tested Date:	05/16/2025	**Tested By:**	Austin, Jon

Laboratory Data

Specimen Type:	Intact
Average Diameter (in):	2.847
Average Length (in):	5.558
Height to Diameter Ratio:	1.95
Wet Density (pcf):	129.6
Moisture Specimen:	Entire sample after shear
Moisture Content (%):	20.2
Dry Density (pcf):	107.8
Average Strain Rate (%/min):	1.26
Strain At Failure (%):	4.68
Unconfined Compressive Strength (psi):	13.1
Unconfined Compressive Strength (tsf):	0.94
Shear Strength (tsf):	0.47



Soil Classification: CL SANDY LEAN CLAY

General

Uncertainty was not taken into account in determining whether the test results meet the requirements. The results included in this report relate only to the items inspected or tested. Sampled per project specifications or industry standards. Also, this report is for the exclusive use of the addressed parties. We assume no responsibility to other parties regarding this report. The information indicated in this report shall not be reproduced, except in full, without prior written approval.

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Unconfined Compression

ASTM D2166

Report Date: 05/16/2025

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

BSI Jtown Land, LLC
1393 25th Avenue South
Fargo, ND 58103

Project:

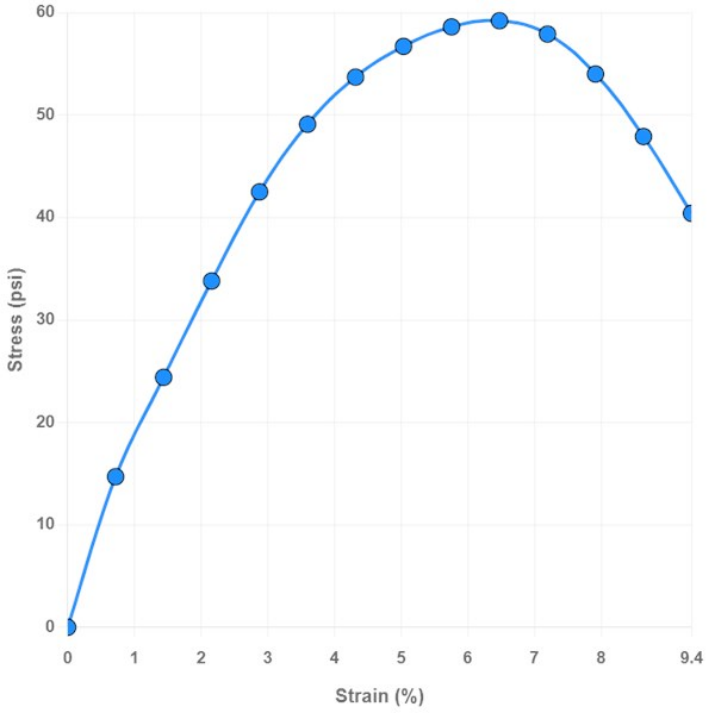
B2503399
Jamestown Beyond Shelter
SW Quadrant of 11th Ave. SW and 255th St. SW
Jamestown, ND 58401

Sample Information

Sample Number:	655559	**Alternate ID:**	42 TWT
Sampling Method:	Thinwall Tube ASTM D1587	**Depth (ft):**	13
Boring Number:	ST-06	**Sampled By:**	Drill Crew
Location:	Native Soil		
Location Details:	ST-06, 12-14'		
Sample Date:	04/21/2025		
Received Date:	05/12/2025	**Lab:**	2908 Morrison Ave. Suite 3, Bismarck, ND
Tested Date:	05/16/2025	**Tested By:**	Austin, Jon

Laboratory Data

Specimen Type:	Intact
Average Diameter (in):	2.843
Average Length (in):	5.553
Height to Diameter Ratio:	1.95
Wet Density (pcf):	131.1
Moisture Specimen:	Entire sample after shear
Moisture Content (%):	18.0
Dry Density (pcf):	111.1
Average Strain Rate (%/min):	1.26
Strain At Failure (%):	6.48
Unconfined Compressive Strength (psi):	59.2
Unconfined Compressive Strength (tsf):	4.26
Shear Strength (tsf):	2.13



Soil Classification: CL SANDY LEAN CLAY

General

Uncertainty was not taken into account in determining whether the test results meet the requirements. The results included in this report relate only to the items inspected or tested. Sampled per project specifications or industry standards. Also, this report is for the exclusive use of the addressed parties. We assume no responsibility to other parties regarding this report. The information indicated in this report shall not be reproduced, except in full, without prior written approval.

SECTION 10 5723 - CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall mounted wire adjustable closet shelving.

1.2 RELATED REQUIREMENTS

A. Section 00 8000 - Special Conditions - Build America-Buy America.

B. Section 06 1000 - Rough Carpentry: Blocking in walls for attachment of shelving or storage system.

1.3 REFERENCE STANDARDS

A. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

C. Store flat to prevent warpage and bending.

1.7 FIELD CONDITIONS

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for wire shelving systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wire Storage Shelving:
   1. ClosetMaid Corporation; Adjustable Wire Shelving - SHELFTRACK: www.closetmaidpro.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 WIRE STORAGE SHELVING SYSTEMS

A. Applications: Provide shelving in all closets as indicated below.
   1. Bedroom Closets:
      a. Wall-to-wall shelf with integral hanger rod, not less than 12 inches deep.
   2. Coat Closets:
      a. Wall-to-wall shelf with integral hanger rod, not less than 12 inches deep.
   3. Linen and Pantry Closets:
      a. Wall-to-wall shelves spaced at 13 inch vertically, not less than 16 inches deep.
   4. Storage Closets:
      a. Wall-to-wall, or configuration as indicated on drawings.
      b. Storage shelf with integral hanger rod, close-mesh cross wire spacing, not less than 16 inches deep.
   5. Provide shelving in other locations as indicated in drawings.

B. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with components and connections required to produce a rigid structure that is free of buckling and warping.
   1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
   2. Coating: PVC or epoxy, applied after fabrication, covering surfaces.
   3. PVC Coating: 9 to 11 mils thick.
   4. Epoxy Coating: Nontoxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
   5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch.
   6. Close-Mesh Shelves: Cross deck wires spaced at 1/2 inch.
   7. Shelf and Rod Units: Integral hanging rod at front edge of shelf.
   8. Corner Units: Same wire spacing as standard mesh shelves; provide wherever shelves meet at right angles.
   9. Color: As selected by Architect from shelving manufacturer's full line.

C. Mounting Hardware for Wire Shelving: Provide manufacturer's standard adjustable mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.
   1. Provide support brackets at 36" o.c., except at storage closets, which shall be at 24" o.c.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect areas to receive shelving or storage system, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

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

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

3.2 INSTALLATION

A. Install wire shelving in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wire shelving.

C. Install wire shelving back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

D. Wire Shelving Mounting Heights:
   1. Single Shelf Units: Install at heights indicated in drawings.
   2. Accessible Shelving: Install shelves at heights that meet ICC A117.1-2017, and other accessibility requirements, as applicable.
      a. Single Shelf Units: Install shelf at 48 inches, maximum, above floor.
      b. Stacked Shelf Units: Install shelves at 48 inches, maximum, and 15 inches, minimum, above floor.
   3. Other Shelves: See drawings.

3.3 CLEANING

A. Clean surfaces after installation.

3.4 PROTECTION

A. Protect installed work from damage.

B. Remove protective coverings and touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION 10 5723

SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Dry-pipe sprinkler system.

C. System design, installation, and certification.

D. Fire department connections.

1.2 RELATED REQUIREMENTS

A. Equipment, piping, fittings & accessories covered in this specification shall conform to the Build America Buy America Act, Manufacturer letter/statement confirming compliance with Build America Buy America must be provided.

B. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

D. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

1.3 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

F. ITS (DIR) - Directory of Listed Products; Current Edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 1963 - Standard for Fire Hose Connections; 2019.

I. UL (DIR) - Online Certifications Directory; Current Edition.

J. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements for additional provisions.
2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
3. Sprinkler Wrenches: For each sprinkler type.

F. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.6 QUALITY ASSURANCE

A. Comply with UL (DIR) requirements.

B. Designer Qualifications: Design system under direct supervision of a NICET Certified or Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience and approved by manufacturer.

E. Equipment and Components: Provide products that bear UL (DIR) label or marking.

F. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Anvil International: www.anvilintl.com/#sle.
   2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   3. Viking Corporation: www.vikinggroupinc.com/#sle.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas as noted on plans..

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Provide fire department connections as indicated on plans.

E. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

F. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners.

2.3 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Enamel, color white .
   4. Escutcheon Plate Finish: Chrome plated.
   5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type with guard in areas subject to damage (Gyms, etc.).
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Enamel, color white .
   4. Escutcheon Plate Finish: Enamel, color white .
   5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Dry Sprinklers: Exposed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Storage Sprinklers: Pendant type with guard.
1. Response Type: Standard.
2. Coverage Type: Standard.
3. Finish: Chrome plated.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

F. Guards: Finish to match sprinkler finish. Provide in areas subject to damage (Gyms, etc.)

G. Flexible Drop System: Stainless steel, multiple use, open gate type.
1. Application: Use to properly locate sprinkler heads in the center of ceiling grids.
2. Include all supports and bracing.
3. Provide braided type tube as required for the application.
4. Manufacturers:

2.4 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Externally resettable.
4. Replaceable internal components without removing valve from installed position.
5. Manufacturers:
a. Victaulic Company; Series 768 - NXT: www.victaulic.com/#sle.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end with tamper switches.

C. Test Connections:
1. Inspector's Test Connection:
a. Provide test connections approximately 6 ft above floor for each or portion of each sprinkler system equipped with an alarm device, located at the most remote part of each system.
b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
c. Supply discharge orifice with same size as corresponding sprinkler orifice.
d. Limit vertical height of exterior wall penetration to 2 ft above finished grade.

D. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

F. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.

a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 and local fire department threads. Brass caps with gaskets, chains, and lugs.
b. Configuration: Horizontal.
c. Finish: Brass or bronze.
d. Signage: Raised or engraved lettering 1 inch minimum indicating system type "Fire Department Connection".

G. Supervisory Switches: Provide tamper switches on each valve in system.

2.5 PIPE AND FITTINGS

A. All steel piping in this article is suitable for 175-psig (1200-kPa) minimum working pressure.

B. Thinwall Steel Pipe (Wet Pipe): ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

C. Schedule 10, Black-Steel Pipe (Wet Pipe): ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), plain end.

D. CPVC Plastic Pipe: ASTM F 442, UL listed, 175-psig (1207-kPa) rating, made in NPS (DN) for sprinkler service. Include "Listed" and "CPVC Sprinkler Pipe" marks on pipe.

E. CPVC Plastic Pipe Fittings: ASTM F 438 for 3/4-1 1/2" NPS (DN20 to DN40) and ASTM F 439 for 2-inch NPS (DN50), UL listed, 175-psig (1207-kPa) rating, for sprinkler service. Include "listed" and "CPVC Sprinkler marks on fittings

F. Schedule 10, Hot dipped galvanized Pipe (Dry Pipe): ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250), plain end. All dry system fittings to be listed galvanized with tri-seal gaskets on grooved piping.

G. Steel Pipe Hot dipped galvanized pipe (Dry Pipe): ASTM A 135/A 135M or ASTM A 795/A 795M, threadable, Schedule 40. Pipe ends may be factory or field formed to match joining method. All dry system fittings to be listed galvanized.

H. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

I. Malleable- or Ductile-Iron Unions: UL 860.

J. Cast-Iron Flanges: ASME 16.1, Class 125.
1. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
2. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick ASME B16.21, nonmetallic and asbestos free or EPDM rubber gasket.
a. Class 125 and Class 250, Cast-Iron, Flat-Face Flanges: Full-face gaskets.
b. Class 150 and Class 300, Ductile-Iron or -Steel, Raised-Face Flanges: Ring-type gaskets.

K. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 175-psig (1200-kPa) minimum.
2. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

L. Steel Pressure-Seal Fittings: UL 213, FM Global-approved, 175-psig (1200-kPa) pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

M. Description: System of support brackets and covers made to protect sprinkler piping.

N. Brackets: Glass-reinforced nylon.

2.6 DRY SYSTEM AIR COMPRESSOR & REFRIGERATED AIR DRYER

A. Compressor & refrigerated air dryer (sized by fire spirnkler contractor): Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

B. Electrical Characteristics: cordinate final power requirements with electrical contractor for air dryer (120/1) & dry system air compressor (480/3).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator.

D. Provide approved double check valve assembly at sprinkler system water source connection.

E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

F. Locate outside alarm gong on building wall.

G. Place pipe runs to minimize obstruction to other work.

H. Place piping in concealed spaces above finished ceilings.

I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

K. Flush entire piping system of foreign matter.

L. Install guards on sprinklers where indicated.

M. Hydrostatically test entire system.

N. Require test be witnessed by Fire Marshal.

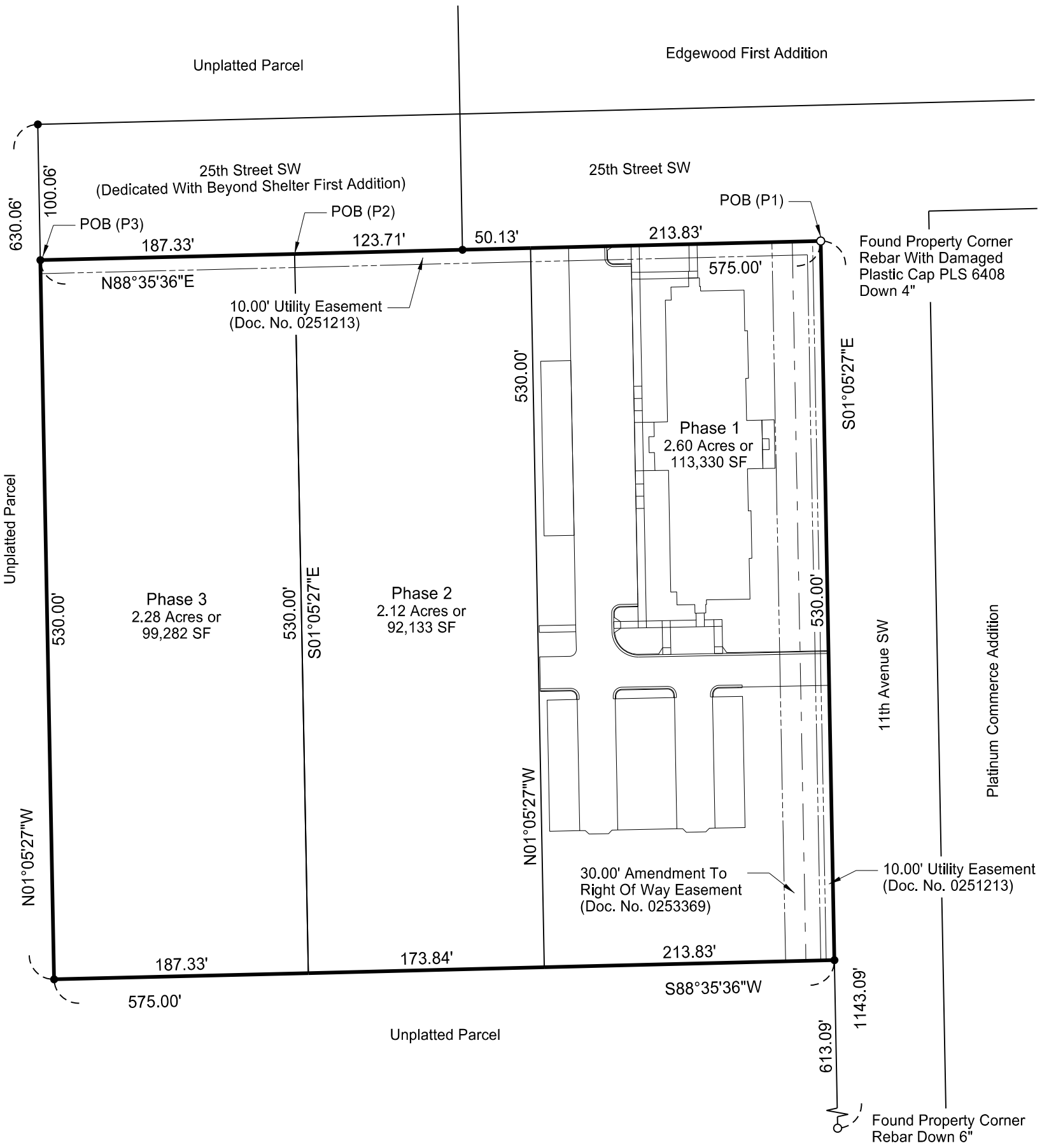
3.2 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
   1. NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
   1. Sprinkler system design shall be approved by authorities having jurisdiction.
      a. The margin-of-safety requirement may not be required by authorities having jurisdiction. Retain "Margin of Safety for Available Water Flow and Pressure" Subparagraph below to require the application of a margin of safety in the Contractor's design.
      b. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
         1) Sprinkler Occupancy Hazard Classifications:
         2) Building Service Areas: [Ordinary Hazard, Group 1]
         3) Electrical Equipment Rooms: [Ordinary Hazard, Group 1]
         4) General Storage Areas: [Ordinary Hazard, Group 1]
         5) Mechanical Equipment Rooms: [Ordinary Hazard, Group 1]
         6) Office and Public Areas: [Light Hazard]
         7) Classrooms: [Light Hazard]
         8) Attic: [Light Hazard]
   2. Minimum Density for Automatic-Sprinkler Piping Design:
      a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (4.1 mm/min. over 139-sq. m) area.
      b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. (6.1 mm/min. over 139-sq. m) area.
      c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. (8.1 mm/min. over 139-sq. m) area.
   3. Maximum Protection Area per Sprinkler: According to UL listing.
   4. Maximum Protection Area per Sprinkler:
      a. Office Spaces: 225 sq. ft. (20.9 sq. m).
      b. Storage Areas: 130 sq. ft. (12.1 sq. m).
      c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
      d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
      e. Other Areas: According to NFPA 13 recommendations.

END OF SECTION 21 1300

Buffalo Manor - Phase 1-3 Boundary Descriptions
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota



LEGEND

- Found - Monument As Described
- Found - Plastic Cap PLS 4358
- Parcel Boundary
- Lot Boundary
- Easement Boundary
- Easement Centerline
- Proposed Structure and/or Edge of Surface
- Survey or Plan Tie Line

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SCALE IN FEET

INTERSTATE ENGINEERING

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Project No. 26-07-049

Exhibit A
Sheet 1 of 2

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Buffalo Manor - Phase 1-3 Boundary Descriptions
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota

PHASE 1 BOUNDARY DESCRIPTION

A tract of land within Lot 1, Block 1 of Beyond Shelter First Addition, being with the southwest quarter of Section 2, T139N, R64W of the Fifth Principal Meridian, City of Jamestown, Stutsman County, North Dakota more particularly described as follows:

Beginning [POB (P1)] at the northeast corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S01º05'27"E along the east boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 530.00 feet to the southeast corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S88º35'36"W along the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 213.83 feet; thence N01º05'27"W a distance of 530.00 feet to a point on the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N88º35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 213.83 feet to the Point Of Beginning [POB (P1)].

Said tract of land contains 2.60 acres or 113,330 square feet, more or less.

PHASE 2 BOUNDARY DESCRIPTION

A tract of land within Lot 1, Block 1 of Beyond Shelter First Addition, being with the southwest quarter of Section 2, T139N, R64W of the Fifth Principal Meridian, City of Jamestown, Stutsman County, North Dakota more particularly described as follows:

Commencing at the northwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N88º35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet to the Point Of Beginning [POB (P2)]; thence continuing N88º35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 123.71 feet to an intermediate corner on the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence continuing N88º35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 50.13 feet; thence S01º05'27"E a distance of 530.00 feet to a point on the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S88º35'36"W along the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 173.84 feet; thence N01º05'27"W a distance of 530.00 feet to the Point Of Beginning [POB (P2)].

Said tract of land contains 2.12 acres or 92,133 square feet, more or less.

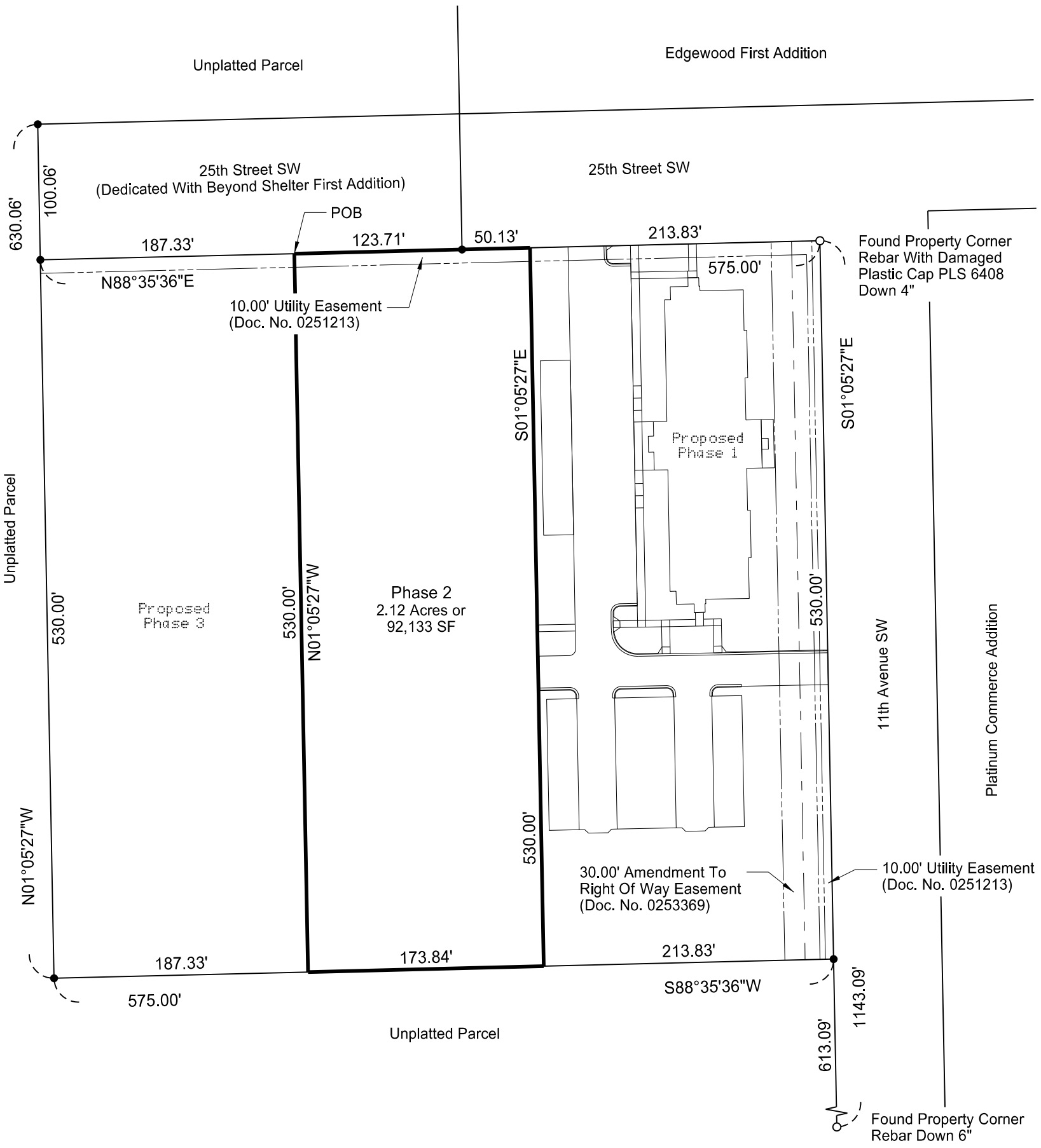
PHASE 3 BOUNDARY DESCRIPTION

A tract of land within Lot 1, Block 1 of Beyond Shelter First Addition, being with the southwest quarter of Section 2, T139N, R64W of the Fifth Principal Meridian, City of Jamestown, Stutsman County, North Dakota more particularly described as follows:

Beginning [POB (P3)] at the northwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N88º35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet; thence S01º05'27"E a distance of 530.00 feet to a point on the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S88º35'36"W along the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet to the southwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N01º05'27"W along the west boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 530.00 feet to the Point Of Beginning [POB (P3)].

Said tract of land contains 2.28 acres or 99,282 square feet, more or less.

Buffalo Manor - Phase 2 Boundary Description
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota



LEGEND

- Found - Monument As Described
- Found - Plastic Cap PLS 4358
- Parcel Boundary
- Lot Boundary
- Easement Boundary
- Easement Centerline
- Proposed Structure and/or Edge of Surface
- Survey or Plan Tie Line

N

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SCALE IN FEET

INTERSTATE ENGINEERING

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Project No. 26-07-049

Exhibit A
Sheet 1 of 2

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Buffalo Manor - Phase 2 Boundary Description
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota

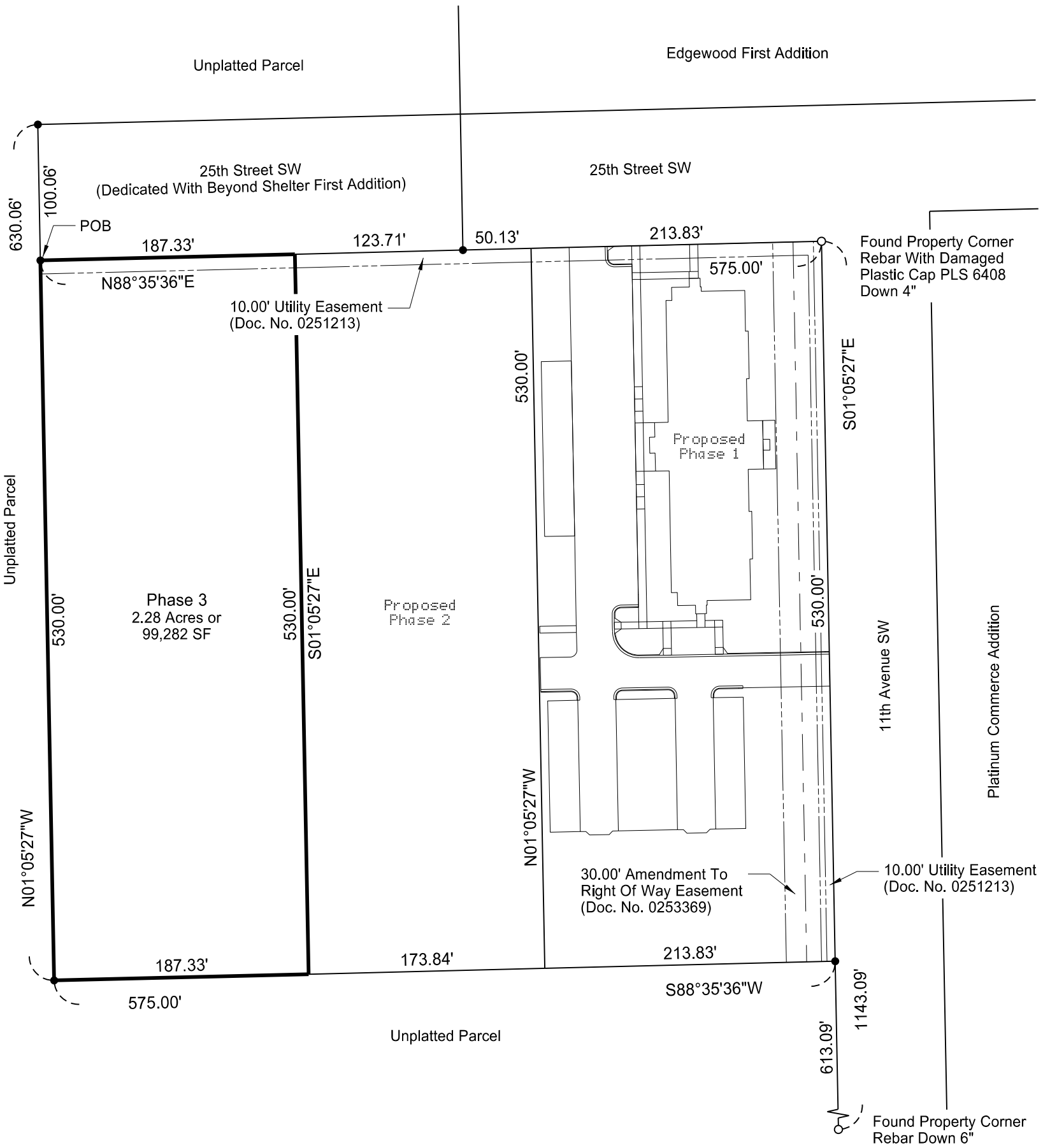
PHASE 2 BOUNDARY DESCRIPTION

A tract of land within Lot 1, Block 1 of Beyond Shelter First Addition, being with the southwest quarter of Section 2, T139N, R64W of the Fifth Principal Meridian, City of Jamestown, Stutsman County, North Dakota more particularly described as follows:

Commencing at the northwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N88°35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet to the Point Of Beginning; thence continuing N88°35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 123.71 feet to an intermediate corner on the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence continuing N88°35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 50.13 feet; thence S01°05'27"E a distance of 530.00 feet to a point on the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S88°35'36"W along the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 173.84 feet; thence N01°05'27"W a distance of 530.00 feet to the Point Of Beginning.

Said tract of land contains 2.12 acres or 92,133 square feet, more or less.

Buffalo Manor - Phase 3 Boundary Description
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota



LEGEND

- Found - Monument As Described
- Found - Plastic Cap PLS 4358
- Parcel Boundary
- Lot Boundary
- Easement Boundary
- Easement Centerline
- Proposed Structure and/or Edge of Surface
- Survey or Plan Tie Line

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SCALE IN FEET

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Project No. 26-07-049

Exhibit A
Sheet 1 of 2

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Buffalo Manor - Phase 3 Boundary Description
Within Lot 1, Block 1 of Beyond Shelter First Addition
Jamestown, North Dakota

PHASE 3 BOUNDARY DESCRIPTION

A tract of land within Lot 1, Block 1 of Beyond Shelter First Addition, being with the southwest quarter of Section 2, T139N, R64W of the Fifth Principal Meridian, City of Jamestown, Stutsman County, North Dakota more particularly described as follows:

Beginning (POB) at the northwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N88°35'36"E along the north boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet; thence S01°05'27"E a distance of 530.00 feet to a point on the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence S88°35'36"W along the south boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 187.33 feet to the southwest corner of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)]; thence N01°05'27"W along the west boundary of Lot 1, Block 1 of Beyond Shelter First Addition (Document No. 0251213, recorded September 18, 2025)] a distance of 530.00 feet to the point of beginning.

Said tract of land contains 2.28 acres or 99,282 square feet, more or less.

SECTION 31 0500 – COMMON WORK RESULTS FOR EARTHWORK

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes work common to earthwork, grading, excavation and fill and all appurtenances thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AASHTO T99	Standard Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
ASTM D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3} or 600 kN-m/m ^{3})
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil In-Place by the Sand-Cone Method
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	Standard Test Method for In-Place density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

Section 31 11 00	Clearing And Grubbing
Section 31 14 13	Soil Stripping And Stockpiling
Section 31 22 19	Finish Grading
Section 31 23 00	Excavation And Fill
Section 31 23 13	Subgrade Preparation
Section 31 23 19	Dewatering
Section 31 23 23.23	Flowable Fill
Section 31 23 33	Trenching And Backfilling
Section 31 23 36	Structural Excavation And Fill
Section 31 25 00	Erosion And Sediment Controls
Section 31 50 00	Excavation Support And Protection
Section 32 05 00	Common Work Results For Exterior Improvements
Section 33 05 00	Common Work Results For Utilities

31.1.04 SUBMITTALS

A. Refer to Related Work sections for applicable submittals required in these Contract Documents if not included herein.

PART 2 PRODUCTS

31.2.01 TYPE 1 BEDDING

A. Type 1 Bedding shall consist of sand, sandy gravel, or gravel having a maximum ¾-inch size, and shall be placed from four (4) inches below the bottom of the pipe, around the pipe, and six (6) inches above the top of the pipe for flexible pipe systems. If the pipe system is rigid (i.e., concrete), the bedding shall be brought up to the springline of the pipe. Type 1 bedding shall have a maximum plasticity index of 6, as determined by ASTM D 4318.

31.2.02 TYPE 2 BEDDING

A. Type 2 Bedding shall be used as directed by the Engineer to replace unsuitable material encountered in the trench bottom. Type 2 bedding shall be placed from the bottom of the Type 1 bedding material to a depth required to adequately support the pipe. Type 2 bedding shall be supplied and meet the following gradations:

Sieve Opening	% Passing
3”	100
No. 4	0-25
No. 8	0-10

31.2.03 ON-SITE EMBANKMENT

A. Fill and backfill materials are to consist of natural soils free from organic matter, frozen material, refuse, construction debris, or other man-made items. The Contractor shall obtain approval of the Engineer for all fill before placing and use only the fill from designated borrow areas.

31.2.04 STRUCTURAL BACKFILL

A. Structural backfill shall be in accordance with SECTION 31 23 36 – STRUCTURAL EXCAVATION AND FILL included within these Specifications.

PART 3 EXECUTION

31.3.01 GENERAL

A. These general construction requirements apply to all site grading, structure excavation, utility excavation and earthwork.

B. Until expiration of the guarantee period, the Contractor shall assume full responsibility and expense for all backfill settlement and shall refill and restore the work as directed to maintain an acceptable surface condition, regardless of location.

C. When a geotechnical report is provided, and the provisions contained within the geotechnical report are more stringent than those contained in this Section, the provisions of the geotechnical report shall govern.

31.3.02 REMOVALS

A. All surface objects, trees, stumps, roots and other obstructions that are not designated to remain shall be cleared and disposed of in accordance with SECTION 31 11 00 – CLEARING AND GRUBBING of these Specifications.

B. The removal of surface improvements (pavement, curb and gutter, walks) shall be held to a minimum, and shall be in accordance with SECTION 32 05 05 – SELECTIVE DEMOLITION FOR EXTERIOR IMPROVEMENTS of these Specifications. All materials to be removed and means of replacement shall be subject to the approval of the Owner's Representative where said removals are not detailed on the Drawings.

1. Any surface or sub-surface objects not designated for removal including irrigation systems, landscaping, and structures that are damaged or destroyed shall be replaced by the Contractor.

31.3.03 LIMITS OF CONSTRUCTION

A. The Contractor shall limit the operation of their equipment to those areas shown on the Drawings or as directed by the Owner's Representative to be construction areas.

B. The indiscriminate operation of equipment outside of designated construction areas will not be permitted.

31.3.04 CONTINUITY OF EXISTING TRAFFIC

A. The Contractor shall not interrupt or change existing traffic, delivery, or parking without prior written approval from the Owner's Representative. When interruption is required, coordinate schedule with the Owner agency to minimize disruptions. When working in public right-of-way, obtain all necessary approvals and permits from applicable agency.

B. When Contractor's activities impede or obstruct traffic flow, Contractor shall provide traffic control devices, signs, and flaggers in accordance with other Contract Documents and the current version of the MUTCD, or as shown on the Drawings. A Traffic Control Plan shall be submitted in accordance with Submittal Procedures, And Traffic Control.

31.3.05 PROTECTION AND CONTINUITY OF EXISTING UTILITIES

A. The Contractor shall protect and maintain continuity of existing utilities per of these Specifications.

B. The Contractor shall verify the locations of any water, drainage, gas, sewer, electric, telephone/communication, fuel, steam lines or other utilities and site features which may be encountered in any excavations or other sitework. All lines shall be properly underpinned and supported in a manner approved by the utility owner to avoid disruption of service.

C. The Contractor shall not interrupt or change existing utilities without prior written approval from the Owner's Representative, affected utilities, and users. Notify all users impacted by outages a minimum of 48 hours in advance of outage. Notification shall be

provided in writing and describe the nature and duration of outages and provide the name and number of Contractor's foreman or other contact.

D. Any service connections encountered which are to be removed shall be cut off at the limits of the excavation and capped in accordance with the requirements of applicable codes and any specifications governing such removals.

31.3.06 DUST CONTROL

A. The Contractor shall be responsible for dust control in accordance with their SWPPP.

31.3.07 STORMWATER/EXCAVATION WATER MANAGEMENT

A. The Contractor shall be responsible for control measures to prevent damage from flooding, erosion, and sedimentation to on-site and off-site areas, and follow all requirements described in SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROLS of these Specifications.

B. The Contractor shall control grading around structures, pitch ground to prevent water running into excavated areas. Pits, trenches within building lines, and other excavations shall be maintained free of water. Contractor shall provide trenching, pumping, and other facilities required.

C. The Contractor shall notify Engineer if springs or running water are encountered in excavation and provide discharge by trenches, drains, or pumping to a point outside of excavation. The Contractor shall provide information to Engineer of points and areas that water will be discharged and method of discharge.

31.3.08 SURPLUS MATERIAL AND BORROW

A. The Contractor shall inform and satisfy themselves as to the character, quantity, and distribution of material to be excavated.

B. Material in excess of that required for permanent work and/or materials deemed by the Owner's Representative to be unsuitable for use, with the exception of topsoil, shall be disposed of off-site at a location provided by the Contractor unless a disposal site is noted on the Drawings.

C. Borrow material, if required, shall be provided by the Contractor at no additional expense to the Owner.

1. The Contractor shall notify the Owner's Representative sufficiently in advance of opening any borrow areas so that the borrow material can be tested by the Contractor's Quality Control laboratory before being used.

2. Sufficient time for testing the borrow material shall be allowed.

D. Borrow sites shall be obtained by the Contractor unless an Owner-provided borrow site is shown on the Drawings.

E. Borrow sites and excess soil disposal sites, where shown on the Drawings, must be graded to drain, must not impede an existing drainage, and must be re-seeded unless written agreements with the borrow site owner are obtained stating otherwise.

F. Private or off site borrow and excess soil disposal sites shall be restored to the satisfaction of the landowner.

31.3.09 UNDERCUTTING

A. Undercutting shall be performed where rock or soft, spongy, unstable, or other similarly unsuitable material is encountered in the excavation.

B. Where such materials are encountered, they shall be removed to a depth as directed by the Owner's Representative.

C. Rock shall be removed to a depth of no less than 6 inches below the plan shown grade established for the excavation.

D. Undercut areas shall be backfilled with granular fill or low strength concrete as directed by the Owner's Representative.

31.3.10 COMPACTION

A. Compaction of backfill and embankments shall be obtained by means of tamping rollers, sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers.

B. All such equipment shall be of a size and type sufficient to meet the minimum requirements specified herein.

C. Flooding shall not be considered an acceptable means of obtaining compaction nor shall the use of a backhoe bucket.

D. Permission on the part of the Owner or Owner's Representative to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, existing improvements, or improvements installed under the contract or that the equipment will achieve the required compaction.

E. The Contractor shall be responsible for any damage caused by compaction equipment.

F. Material for mechanically compacted backfill and embankments must be placed in lifts which, prior to compaction, do not exceed the thickness as specified in the Related Work sections herein.

1. Lifts to be compacted with hand-directed mechanical tampers must not exceed a thickness of four (4) inches prior to compaction.

G. A minimum of six (6) inches of backfill material must be placed over the top of a pipe before operating vibratory or sheepsfoot type compaction equipment.

1. This material must be compacted using hand-directed mechanical tampers.

H. Mechanical equipment must be compatible with the material being placed.

I. Each layer shall be evenly spread, moistened, or dried, if necessary, and then tamped or rolled until the specified relative compaction has been attained.

J. Compaction adjacent to all foundations, footings, manholes, catch basins, valve boxes, curb boxes, end of sewer services and similar structures shall be performed by the use of hand-directed mechanical tampers with lifts not exceeding that specified above.

K. Each layer of backfill or embankment shall be compacted to the density specified below.

1. The material shall be compacted at a moisture content of no less than 3 percentage points above or below the optimum moisture of the Standard Proctor as defined by ASTM D698.

The locations below shall refer to future as well as present uses. Requirements for minimum density may also be contained in a geotechnical report. If there is a discrepancy, the more restrictive shall apply.

MINIMUM DENSITY EXPRESSED AS A PERCENTAGE OF STANDARD PROCTOR

LOCATION	PROCTOR (ASTM D698)
Unimproved areas (eg. Lawns, etc.)	90%
Surface Improved Areas (parking lots, streets, walks) (Greater than 1' below finished pavement	95%
Surface Improved Areas (parking lots, streets, walks) (Less than 1' below finished pavement	95%
Embankments	95%
Structures (buildings, manholes, floors, basins, etc.)	95%
Lagoon and earthen basin floors (lined and unlined)	98%

31.3.11 TESTING

A. The Contractor shall be responsible for obtaining and providing to the Engineer, test results showing the moisture-density relationships (Standard Proctor) of representative samples of the materials to be used in all embankment and backfill construction including excavated material, engineered fill, and borrow material. The Contractor will provide additional Proctor analysis when so directed by the Engineer or at the Contractor sole discretion when soil conditions appear to have changed. The Proctor analysis must be completed prior to compaction testing being accepted. The Contractor, at the Contractor's sole risk may test the compaction of trenches, streets, and roads prior to the completion of a Proctor analysis, realizing that the Engineer has the right to reject the work and require that compaction efforts be re-done until the compaction meets the requirements of the specification.

B. Testing shall be performed by an independent testing laboratory in accordance with the requirements of ASTM D698.

C. The following Quality Control tests shall be made by the Contractor to determine the Contractor's compliance with the specifications: *(Some tests may not apply to the work to be completed during this project)*.

1. Proctor analysis and in-place density tests for trench compaction for all underground utilities installed by the Contractor.

2. In-place density test of sub-grade backfill, sub-base, base, and asphalt paving courses.

3. Gradation, liquid limit, and plasticity index tests of sub-base, base and surfacing aggregates. Tests of sub-base and base course materials shall be made from material in place. Tests of plant mix aggregates shall be made from samples obtained from the hot bins of the hot plant. Tests of concrete aggregates shall be made from samples at the mixer site.

4. Stripping tests, volume swell tests, fracture tests, wear tests, and soundness tests shall be made prior to or during the Contractor's crushing operations.

D. Acceptance and rejection of materials will be determined from tests made of the various courses complete and in-place in the field. While the Engineer may, during the course of construction, make tests at the source or point of production; it is the responsibility of

the Contractor to conduct Quality Control Testing with an independent third-party testing firm to control and test his production operations in such a manner that the materials produced will meet the specification requirements. The Owner reserves the right to reject a third-party testing firm for previous substandard work or inexperienced staff.

31.3.12 CLEANUP

A. Cleanup of the site shall be completed before final acceptance of the work can be made.

B. Cleanup shall include the removal and disposal of all unsuitable materials.

C. All equipment shall be removed from the site.

D. The site shall be left in a manner so as to present a clean and neat appearance.

E. Utility Cleanup:

1. All surplus waste materials remaining after completion of the backfilling operations shall be disposed of in an acceptable manner within 24 hours after completing the backfill work on each particular pipeline section.

2. Disposal at any location within the project limits shall be as specified, or as approved by the Owner's Representative; otherwise, disposal shall be accomplished outside the project limits at a location provided by the Contractor.

3. The backfilling and surplus or waste disposal operations shall be a part of the work required under the utility installation items, not as work that may be delayed until final cleanup.

4. Utility lines and trench backfill shall be tested in accordance with the provisions of DIVISION 33 – UTILITIES and SECTION 31 23 33 – TRENCHING AND BACKFILL.

31.3.13 GUARANTEE

A. The Contractor shall repair or replace as necessary any damage to the work caused by settlement that occurs within the time established in the contract documents.

B. Said repairs shall be made at no cost to the Owner.

END OF SECTION

SECTION 31 1100 – CLEARING AND GRUBBING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes clearing and grubbing including the disposal of materials for all areas within the limits required for the construction shown on the Drawings, specified herein or as directed by the Owner's Representative.

31.1.02 REFERENCES

A. Reserved

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00 COMMON WORK RESULTS FOR EARTHWORK

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 GENERAL

A. Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the Owner's Representative is unsuitable to remain exposed in the construction areas.

B. The Contractor shall employ methods of removal which do not endanger life or damage to adjacent vegetation or property.

C. The materials cleared from the site shall be disposed of by the Contractor off site at their own expense.

D. The areas to be cleared shall include all areas within construction limits and where otherwise designated on the Drawings.

E. All spoil materials removed by clearing and grubbing shall be disposed of at a landfill or site that accepts such material.

1. Burning will be at the Contractor's discretion and must be in compliance with all Federal and State and Local laws and regulations relative to building fires at the site.

2. If burning of the trees, brush and burnable debris is used as a method of disposal, the Contractor shall dispose of the remaining ash material off site at their own expense.

3. The material left over after burning, waste concrete, asphalt, stones, rocks and other non-organic material may not be buried on the site.

4. The Contractor shall be required to locate a disposal area outside the property limits at their own expense.

5. The Contractor shall obtain and file with the Owner's Representative, permission in writing from the property owner for use of private property for this purpose.

6. All off-site disposals shall be in compliance with all Federal, State and Local laws.

7. No blasting shall be permitted.

8. The removal of existing utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the Drawings.

F. Whenever a telephone or telegraph pole, gas pipeline, conduit, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall notify the proper local authority or owner and attempt to secure prompt action, in accordance with contract documents of these Specifications.

G. The Contractor shall clear the staked or indicated area of all objectionable materials.

H. Stumps must be removed by digging, cutting, or grinding to a minimum depth of 36-inches below subgrade elevation. Adjacent roots must be removed to the same depth. All stump shavings, twigs, and other organic debris must be removed.

1. Topsoil must be placed, compacted lightly, and raked smoothly in locations where stumps and roots have been removed.

I. Trees unavoidably falling outside the specified limits must be cut up, removed, and disposed of in a satisfactory manner.

J. In order to minimize damage to trees that are to be left standing, trees shall be felled toward the center of areas being cleared.

K. The Contractor shall preserve and protect from injury all trees and plants not to be removed.

L. In no case shall debris be incorporated into the subgrade, left on the project site, or moved to adjacent properties.

END OF SECTION

SECTION 31 1413 – SOIL STRIPPING AND STOCKPILING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes stripping and stockpiling soil including topsoil from areas to be excavated for trenching and backfilling, excavation and backfill, or site grading and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

1. Reserved

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

Section 31 05 00	Common Work Results For Earthwork
Section 31 25 00	Erosion And Sediment Controls

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 GENERAL

A. Topsoil within the limits of excavation or embankment shall be salvaged prior to excavation or embankment by excavating the topsoil and stockpiling the material at designated locations as shown on the Drawings or as designated by the Owner in a manner that will facilitate measurement, minimize sediment damage, and not obstruct natural drainage.

31.3.02 TOPSOIL STRIPPING

A. Topsoil shall be stripped to a depth of no less than six (6) inches from all areas where excavation is to take place.

B. The full depth of topsoil shall be stripped in areas where embankment is to be placed.

C. Stripped topsoil exceeding the quantity required under the Contract shall be disposed of at the Contractor's expense.

31.3.03 TOPSOIL STOCKPILES

A. Stockpiles shall be placed and maintained to provide erosion and sediment control in accordance with SECTION 31 25 00 – EROSION AND SEDIMENT CONTROLS of these Specifications.

B. Imported topsoil shall be hauled to the site and stockpiled in locations designated by the Owner.

C. The Contractor shall not remove topsoil from the site without written approval from the Owner.

D. The Contractor shall restore all topsoil stockpile areas to their original condition upon placement of the stockpiled topsoil.

31.3.04 SOIL STOCKPILES

A. Stockpiles shall be placed and maintained to provide erosion and sediment control in accordance with SECTION 31 25 00 – EROSION AND SEDIMENT CONTROLS of these Specifications.

B. The Contractor shall restore all soil stockpile areas to their original condition upon placement of the stockpiled soil.

END OF SECTION

SECTION 31 2219 – FINISH GRADING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes finish grading and seed bed preparation for areas receiving topsoil, and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 GENERAL

A. All work involved in the finishing operations, as specified herein and as otherwise required by the Contract, will be compensated for as part of the payment for Contract items related to earthwork and no additional compensation will be made therefor.

B. Earthwork finishing and topsoil covering operations shall be conducted concurrently with the grading and backfilling operations so as to permit completion of erosion control items at the earliest practicable time.

C. The prescribed elevation for any point on the grading surface where measurement is made shall be as determined from the grades shown on the Drawings or as directed by the Owner's Representative within the following tolerances:

1. When the grading is being prepared for placement of an Aggregate Wearing Course or is being finished for acceptance of the grading construction, the elevation of the finished surface shall not vary by more than 0.10 foot from the prescribed elevation at any point where measurement is made.

2. When the grading is being prepared for placement of an Aggregate Base course, the elevation of the finished surface at the time the next layer is placed, shall not vary by more than 0.05 foot above or 0.10 foot below the prescribed elevation at any point where measurement is made.

3. When the grading is being prepared for placement of a bituminous or concrete base, stabilized base, or surface course, the elevation of the finished surface at the time the next layer is placed, shall not vary by more than 0.05 foot from the prescribed elevation at any point where measurement is made.

4. Topsoil areas must be fine graded to the extents, grades and elevations specified. Note areas to receive organic mulch or seed and adjust grades accordingly. Do not place topsoil until the designated areas are prepared and all construction work in the area is completed.

31.3.02 TOPSOIL FINISH GRADING

A. The subgrade in areas to receive topsoil must be scarified to a depth of 8 inches.

B. Any stones larger than 1 inch in any dimension, roots, plants, sod, clay lumps, and other extraneous materials harmful to plant growth must be removed and disposed offsite.

C. At the time the topsoil covering is placed, the subsoil shall be in a loose, friable condition for a uniform depth of at least 3 inches, and there shall be no erosion rills or washouts in the grading areas exceeding 3 inches. To achieve this condition scarification of the subsoil will be required as directed by the Owner's Representative wherever the subsoil has been compacted by equipment operation or has become dried out and crusted, and where necessary to obliterate erosion rills.

END OF SECTION

SECTION 31 2300 – EXCAVATION AND FILL

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes work for excavation and filling or backfilling to the specified lines, grades and cross sections as shown in the Contract Documents.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AASHTO T99	Standard Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5-lb (2.5kg) Rammer and 12-inch (305mm) Drop
ASTM D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ^{3} or 600 kN-m/m ^{3})

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of Related Work are specified and included in other sections of these Specifications.

SECTION 31 05 00 COMMON WORK RESULTS FOR EARTHWORK

31.1.04 SUBMITTALS

A. Laboratory test results of fill materials must be submitted to the Engineer.

B. Shop drawings and product data shall be submitted in accordance with submittal procedures.

PART 2 PRODUCTS

31.2.01 ON-SITE EMBANKMENT

A. Fill and backfill materials are to consist of natural soils free from organic matter, frozen material, refuse, construction debris or other man-made items. Obtain approval of the Engineer for all fill before placing and use only the fill from designated borrow areas.

31.2.02 IMPORTED BORROW MATERIALS (FOR EMBANKMENTS IN-PLACE)

A. If required, the Contractor shall obtain borrow soil for embankments from borrow option sources onsite or areas off the project site. Imported borrow shall be furnished at Contractor expense unless otherwise specified. Engineer approval of borrow areas is required. Imported borrow is to meet the requirements of On-Site Embankment as included herein.

PART 3 EXECUTION

31.3.01 EXCAVATION

A. Excavations shall be made to the specified lines and grades without causing rutting, pumping or other disturbance to underlying materials.

B. Excavation made outside the specified grade limits is not measured for payment in the Excavation or Embankment In-Place quantities.

1. The Contractor shall restore sub-excavated areas as directed by the Engineer. The Contractor shall correct subgrade disturbance by removing the disturbed soil and replacing and compacting to reach at least 95% of the maximum laboratory dry density determined by AASHTO T99 or ASTM D698.

2. The Contractor shall correct subgrade disturbance before placing overlying fill, backfill, base course or other courses. Disturbed soils may be replaced with imported material approved by the Engineer and compacted to 95% of maximum laboratory dry density determined by AASHTO T99 or ASTM D698.

C. The subgrade shall be maintained to drain at all times. Side ditches or gutters from cuts to embankments shall be constructed to prevent erosion damage to embankments.

D. The Contractor shall construct and maintain temporary drainage where existing surface drainage, sewers, or under-drainage are disturbed during the work until permanent drainage facilities are completed. The Contractor shall protect and preserve all existing drains, sewers, subsurface drains, conduits, gas lines, and other underground structures which may be affected by the work. All damage to these facilities or structures resulting from the work shall be repaired to the satisfaction of the Engineer.

E. The Contractor shall excavate to minimize foundation soil and/or subgrade soil exposure to erosion, drying or infiltrating moisture. The Contractor shall excavate to provide drainage away from foundation/subgrade soils and minimize the potential for surface runoff to enter the foundation/subgrade soils.

F. The Contractor shall grade all intersecting streets and approaches within the project limits as specified or as directed using suitable materials on the surfaces to produce smooth riding and satisfactory approaches to the intersections.

31.3.02 EMBANKMENT PLACEMENT

A. General

1. The Contractor shall place fill materials (embankment) to the specified lines and grade in uniform layers not exceeding 8 inches in loose thickness. Once placed, each layer shall be moistened or aerated, mixed, and compacted as specified. Clay soils shall be worked to maximum 2-inch nominal size before compacting. Fill placement shall not begin until the subgrade construction has been approved by the Engineer. Fill shall not be placed on wet or frozen areas. Heavy equipment for spreading or compacting fill shall not be operated within 4 feet of structures.

2. If grading operations are suspended due to weather, the entire area shall be bladed until it is smooth, free of depressions and ruts, and crowned to drain water.

B. Rocks in Embankment

1. Individual rocks up to 24 inches in its longest dimension may be placed in the embankment when they are evenly distributed and are spaced to allow placing and compacting of soil between the rocks.Rocks exceeding 4 inches in its longest dimension must not be placed in the top 1 foot of the finished grade.

C. Compaction

1. Compaction shall be performed in accordance with SECTION 31 05 00 – GENERAL WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.03 SUB-EXCAVATION/REPLACEMENT BELOW SUBGRADE

A. Sub-excavation/replacement below subgrade shall be performed in accordance with the Geotechnical Report of these Specifications.

31.3.04 TESTING

A. Testing shall include but not be limited to, Field Density Testing and Laboratory Maximum Density and Optimum Moisture.

B. Testing shall be performed in accordance with the provisions lined out in SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications. Subgrade density testing shall be done a minimum of one density test per 3000 SY per 6” lift.

END OF SECTION

SECTION 31 2313 – SUBGRADE PREPARATION

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes subgrade preparation for areas to receive aggregate base or surface course and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00 COMMON WORK RESULTS FOR EARTHWORK

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 GENERAL

A. Any unstable sections of subgrade discovered after excavation must be repaired per the requirements of the Geotechnical Report of these Specifications.

B. After unstable sections of the subgrade have been repaired, and after any existing base or surface courses required to be removed have been removed, subgrade preparation as described below may be performed.

1. The Contractor shall compact and shape the subgrade for its full width as may be necessary to produce, at the time the base or surface course or topsoil is placed, the required density and stability in the upper zone of the subgrade and to produce the required grade and cross section.

a. This upper zone of the subgrade must be re-compacted to the requirements of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK included in these Specifications.

b. The "required grade and cross section" will consist of a smooth subgrade surface conforming to the prescribed elevations for the particular subgrade being prepared, prior to constructing an additional course thereon.

c. Technical Provisions

i. Reserved.

2. The Contractor shall scarify, dry the material, or apply water as may be necessary to obtain the required density and stability to the depth shown in the plans.

a. The "required stability" will be such that when any material for base or surface courses is deposited on the subgrade, no rutting or displacement of the surface will occur.

3. All deleterious material must be removed.

4. All rocks that interfere with the trimming equipment must be removed.

5. The prescribed elevation for any point on the subgrade surface where measurement is made will be as determined from the grades shown on the Drawings or as directed by the Owner's Representative within the following tolerances:

   a. When the subgrade is being prepared for placement of an Aggregate Wearing Course or is being finished for acceptance of the grading construction, the elevation of the finished surface must not vary by more than 0.10 foot from the prescribed elevation at any point where measurement is made.

   b. When the subgrade is being prepared for placement of an Aggregate Base course, the elevation of the finished surface at the time the next layer is placed must not vary by more than 0.05 foot above or 0.10 foot below the prescribed elevation at any point where measurement is made.

   c. When the subgrade is being prepared for placement of a bituminous or concrete base, stabilized base, or surface course, the elevation of the finished surface at the time the next layer is placed must not vary by more than 0.05 foot from the prescribed elevation at any point where measurement is made.

31.3.02 TESTING

A. The Contractor shall retain the services of an independent testing company to test the subgrade in accordance with SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

B. Proof-rolling:

1. All subgrade areas of sufficient length and width to allow the passing of proof-roll equipment are subject to proof-roll testing as determined by the Engineer.

2. Definitions:

   a. Deflection: Vertical movement under load, including both elastic and plastic deformation.

   b. Pumping: Recoverable vertical heave of the soil created by the test load.

3. Proof-Roll Vehicle:

   a. Tri-axle truck (only two rear axles with surface contact allowed).

   b. 24-Ton minimum gross vehicle weight.

   c. Tire size and pressure per manufacturer's specifications.

4. Execution:

   a. The surface must be compacted with a smooth-drum compactor immediately before proof-rolling.

   b. All surfaces must be covered completely with a single pass of the proof-roll vehicle, driving forward with observation at the rear axles.

   c. Operating speed must not exceed 3 mph.

5. Evaluation Criteria:

    a. New Construction: 1-inch deflection. No pumping. No surface cracking.

    b. Reconstruct or Stabilized Subgrade: 0.5-inch deflection. No pumping. No surface cracking.

6. Remediation:

    a. Areas not passing the required evaluation criteria must be reworked per the requirements of this Section or removed and repaired per the requirements the Geotechnical Report of these Specifications.

    b. Roller marks and irregularities must be repaired prior to the installation of the base course.

C. Subgrade Preparation will not be paid more than once for any given area, regardless of how many times the area is re-worked due to failing tests.

END OF SECTION

SECTON 31 2319 – DEWATERING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes dewatering for earthwork, utility, and structural excavations and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 GENERAL

A. Drainage and dewatering shall be the responsibility of the Contractor.

B. The Contractor shall be responsible for investigating and becoming familiar with all site conditions that may affect the Work including surface water, potential flooding conditions, level of groundwater, and time of year the work is to be done.

C. The Contractor shall be responsible for obtaining all permits required for dewatering and disposal of the water.

D. The Contractor shall maintain the site in a fashion that will provide positive surface drainage to the basins and prevent surface water from flowing into excavations.

E. Surface flows shall be directed in a manner so as to minimize the flow across soils which, when exposed, may be eroded and carried into storm sewers or wetlands or other protected waters.

F. At no time during construction shall the Contractor affect existing surface or subsurface drainage patterns of adjacent property. Any damage to adjacent property resulting from the Contractor's alteration of surface or subsurface drainage patterns shall be repaired by the Contractor at no additional cost to the Owner.

G. Ample equipment shall be provided by the Contractor to remove and dispose of all water entering excavations at all times during the course of the work.

H. Dewatering shall not cease until such time the backfilling has progressed to where buoyancy of the fill or structure or pipe will not affect the alignment or integrity of the work.

I. The Contractor shall be responsible for any damage arising from the disposal of water.

J. Excavations for utilities shall be dewatered to an elevation that is at least one foot below the invert of the pipe, or as stated in the geotechnical report whichever is more conservative.

K. Excavations for other structures shall be dewatered to an elevation that is at least two feet beneath the bottom of the structure, or as stated in the geotechnical report whichever is more conservative.

L. Water removed from excavations may not be disposed into the sanitary sewer system.

M. The Contractor shall remove all temporary water control facilities when they are no longer needed or at the completion of the Project.

N. The costs of dewatering and drainage including permit fees shall be included in the price bid for the work requiring the dewatering and no direct compensation shall be made therefor.

END OF SECTION

SECTION 31 2333 – TRENCHING AND BACKFILL

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes earthwork for the trenching and backfilling for pipelines and appurtenances and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for in accordance with submittal procedures of these Specifications.

PART 2 PRODUCTS

A. Trenching and Backfilling shall be constructed of the materials as shown on the Drawings, and as described herein. The respective materials shall conform to the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

PART 3 EXECUTION

31.3.01 GENERAL

A. Trenching operations shall proceed only so far in advance of the utility installation as will satisfy the needs for coordination of work and permit advance verification of unobstructed line and grade as planned.

B. Where interference with existing structures is possible or in any way indicated, and where necessary to establish elevation or direction for connections to in-place structures, the excavating shall be done at those locations in advance of the main operation so actual conditions will be exposed in sufficient time to make adjustments without resorting to extra work or unnecessary delay.

C. Any surface or sub-surface objects not designated for removal including irrigation systems, landscaping, and structures that are damaged or destroyed shall be replaced by the Contractor at no expense to the Owner.

31.3.02 TOPSOIL

A. Topsoil shall be stripped and stockpiled in accordance with the provisions of SECTION 31 14 13 – SOIL STRIPPING AND STOCKPILING of these Specifications.

B. Topsoil shall be spread and finish graded in accordance with SECTION 31 22 19 – FINISH GRADING of these Specifications.

31.3.03 DEWATERING

A. Dewatering shall be performed in accordance with the provisions of SECTION 31 23 19 – DEWATERING of these Specifications.

31.3.04 SURPLUS MATERIAL AND BORROW

A. Surplus and unacceptable material shall be disposed of in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

B. Borrow shall be obtained for the sources and be of the quality specified in SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.05 UNDERCUTTING

A. Undercutting shall be performed in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.06 ROCK EXCAVATION

A. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and un-stratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the Engineer. Trees shall be supported during excavation by any means previously reviewed by the Engineer.

B. It is expected that nearly all excavation can be accomplished using conventional equipment. For general excavation, a D9R Caterpillar tractor with a single shank ripper, or equivalent equipment, is considered conventional equipment, if it can rip at a production rate of at least 300 bank cubic yards per hour. For trench excavation, a 336F Caterpillar excavator with a medium stick and a rock ripping bucket, or equivalent equipment, is considered conventional equipment, if it can excavate at a production rate of at least 30 bank cubic yards per hour. If material is encountered which the Contractor believes cannot be excavated by conventional equipment, the Engineer shall be immediately notified. The Contractor shall provide performance tests of the specified conventional or equivalent equipment. If the Engineer confirms in writing that the specified conventional equipment cannot perform at the production rates specified, the excavation shall be considered rock excavation.

C. Whenever ledge rock is encountered the Contractor shall strip from the same all overlying earth and he shall then notify the Engineer that rock is ready for measurement. The Engineer may then take levels upon the surface of the rock or he may at his discretion defer measurement until after the excavation is completed. In any event, the Contractor shall not refill any trench where rock is encountered until he is notified by the Engineer that measurement has been made. He will not be allowed any payment for any rock claimed unless the same shall have been measured as herein provided. The rock shall be excavated to a depth of six (6) inches below the bottom of the pipe and the trench shall be refilled to the proper grade with pipe bedding material.

D. All rock found in the trench having greater diameter than eight (8) inches shall not be used as backfill but shall be disposed of as directed by the Engineer.

31.3.07 PROTECTION

A. Protection of excavations for utilities and appurtenances shall be performed in accordance with the provisions of SECTION 31 50 00 – EXCAVATION SUPPORT AND PROTECTION of these Specifications.

31.3.08 COMPACTION

A. Compaction of embankments shall be performed in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.09 ALIGNMENT AND GRADE

A. Trench excavating shall be to a depth that will permit preparation of the foundation with bedding material a minimum of four (4) inches below the required grade and installation of the pipeline and appurtenances at the prescribed line and grade, except where alterations are specifically authorized.

1. Trench widths shall be sufficient to permit the pipe to be laid and joined properly and the backfill to be placed and compacted as specified.

2. Extra width of trench shall be provided as necessary to permit convenient placement of sheeting and shoring, to accommodate placement of appurtenances, and as required by OSHA for safety reasons.

B. Excavations shall be extended below the bottom of structure as necessary to accommodate any required granular foundation material.

1. All excavation below grade shall be to a minimum width equal to the outside pipe diameter plus two feet subject to a minimum width of 30 inches.

C. Where no other grade controls are indicated or established for the pipeline, the excavating and foundation preparations shall be such as to provide the minimum cover over the top of the pipe as specified or shown on the Drawings.

D. Trench widths shall allow for at least six inches of clearance on each side of the joint hubs.

1. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet, subject to the considerations for alternate pipe loading set forth below.

2. The width of the trench at the ground surface shall be held to a minimum to prevent unnecessary destruction of the surface structures.

3. The maximum allowable trench width at the level of the top of pipe may be exceeded only by approval of the Engineer, after consideration of pipe strength and loading relationships.

4. Any alternate proposals made by the Contractor shall be in writing, giving the pertinent soil weight data and proposed pipe strength alternate, at least seven days prior to the desired date of decision.

5. Approval of alternate pipe designs shall be with the understanding that there will be no extra compensation allowed for any increase in material or construction costs.

6. If the trench is excavated to a greater width than that specified, the Engineer may direct the Contractor to provide a higher class of bedding and/or a higher strength pipe than that required by the Drawings or Specifications in order to satisfy design requirements, without additional compensation therefor.

31.3.10 FOUNDATION PREPARATION

A. Foundation preparations shall be conducted as necessary to produce a stable foundation and provide continuous and uniform pipe bearing between bell holes.

1. The initial excavating or backfilling operations shall produce a subgrade level slightly above finished grade as will permit hand shaping to finished grade by trimming of high spots and without the need for filling of low spots to grade.

2. Final sub-grade preparations shall be such as to produce a finished grade at the center line of the pipe that is within 0.03 foot of a straight line between pipe joints and to provide bell hole excavation at each joint as will permit proper joining of pipe and fittings.

B. In excavations made below grade to remove rock or unstable materials, the backfilling to grade shall be made with placement of granular bedding material or low strength concrete or as ordered by the Engineer and no additional compensation will be made therefor.

1. Placement of the backfill shall be in relatively uniform layers not exceeding 8 inches in loose thickness.

2. Each layer of backfill shall be compacted thoroughly, by means of approved mechanical compaction equipment, as will produce uniform pipe support throughout the full pipe length and facilitate proper shaping of the pipe bed.

C. Care shall be taken during final sub-grade shaping to prevent any over-excavation. Should any low spots develop, they shall only be filled with approved material, which shall have optimum moisture content and be compacted thoroughly, without additional compensation provided to the Contractor.

D. The finished sub-grade shall be maintained free of water and shall not be disturbed during pipe lowering operations except as necessary to remove pipe slings.

E. All costs of excavating below grade and placing foundation or bedding aggregates as required shall be included in the bid prices for pipe items to the extent that the need for such work is indicated in the Contract provisions and the Proposal does not provide for payment therefor under separate contract items.

31.3.11 BEDDING AND BACKFILL

A. All utility excavations shall be backfilled to restore pre-existing conditions as the minimum requirement, and fulfill all supplementary requirements indicated in the Drawings and Specifications.

B. The backfilling operations shall be started as soon as conditions will permit on each section of the utility so as to provide continuity in subsequent operations and restore normal public service as soon as practicable on a section-by-section basis.

C. All backfilling operations shall be pursued diligently, with proper and adequate equipment, as will assure acceptable results.

D. Granular bedding shall be placed in the trench from the bottom of the excavation (minimum four (4) inches below the bottom of the pipe) to a minimum elevation six (6) inches above the top of the pipe. If the pipe system is rigid (i.e. concrete) the top of the bedding shall be brought up to the springline of the pipe. This zone is referred herein as the pipe bedding zone.

1. Granular bedding shall extend the full width of the trench throughout the full depth of the bedding.

2. Granular bedding shall conform to the requirements of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

3. Within the pipe bedding zone the placement of stones, boulders, chunks, etc. greater than 8 inches in any dimension shall not be allowed.

4. Compaction of materials placed within the pipe bedding and encasement zones shall be accomplished with portable or hand equipment methods, so as to achieve thorough consolidation under and around the pipe and avoid damage to the pipe.

E. The backfilling above the bedding zone shall be accomplished with the use of suitable materials selected from the excavated materials to the extent available and practical.

1. Suitable material shall be defined as a mineral soil free of foreign materials (rubbish, debris, etc.), frozen clumps, oversize stone, rock, concrete or bituminous chunks, and other unsuitable materials, that may damage the pipe installation, prevent thorough compaction, or increase the risks of after settlement unnecessarily.

2. Material selection shall be such as to make the best and fullest utilization of the excavated material taking into consideration particular needs of different backfill zones.

3. Material containing stone, rock, or chunks of any sort shall only be utilized where and to the extent there will be no detrimental effects.

F. Above the pipe bedding zone material, the use of heavy roller type compaction equipment shall be limited to safe pipe loading.

G. Backfill materials shall be carefully placed in uniform loose thickness layers not to exceed eight (8) inches spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline.

H. Each layer of backfill material shall be compacted effectively, by approved mechanical or hand methods, until there is no further visual evidence of increased consolidation or the density of the compacted layer conforms to the density requirements specified herein.

I. Compaction of the in-place layer shall be completed acceptably before placing material for a succeeding layer thereon.

J. The manner of placement, compacting equipment and procedure effectiveness shall be subject to approval of the Owner's Representative.

31.3.12 FLOWABLE FILL

A. Flowable Fill, when specified, shall be in accordance with the provisions of SECTION 31 23 23.33 – FLOWABLE FILL of these Specifications.

31.3.13 TESTING

A. The Contractor shall retain the services of an independent testing company to test the base course as specified below.

B. All areas that fail any of the required tests shall be corrected at the Contractor's expense.

1. The Contractor shall have the areas retested to demonstrate that adequate compaction has been obtained.

2. The Contractor shall bear the cost of retesting and no reimbursement shall be made therefor.

C. The tests shall be conducted at random locations determined by the testing company.

D. Proctor tests shall be conducted to determine the maximum dry density of the material as necessary. No additional payment shall be made to the Contractor for the proctor tests.

E. Density and Moisture:

1. Unless otherwise noted on the Drawings or geotechnical report, the density and moisture content of the backfill shall be tested at a minimum frequency as listed. The Contractor must conduct a minimum of one moisture and density test for each layer of compacted aggregate or native material. A layer of compacted material is defined by a thickness of 12 inches and a maximum length of 400 lineal feet.

2. Unless otherwise noted on the Drawings or geotechnical report, the density and moisture of the backfill shall comply with the requirements of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK.

31.3.01 CORRECTIONS

A. Re-excavation and backfilling required to repair defective utilities shall be conducted in accordance with the provisions of this Section.

B. Any soils density testing on said re-excavation and backfill shall be conducted at the Contractor's expense.

C. All additional materials required and repairs to surface improvements shall be furnished without additional cost to the Owner.

END OF SECTION

SECTION 31 2336 – STRUCTURAL EXCAVATION AND FILL

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes excavation and backfill necessary for the construction of structures and all work included thereto as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 31 14 00	SOIL STRIPPING AND STOCKPILING
SECTION 31 22 19	FINISH GRADING
SECTION 31 23 19	DEWATERING
SECTION 31 50 00	EXCAVATION SUPPORT AND PROTECTION

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for in accordance with submittal procedures of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Structure backfill shall be constructed of the materials as shown on the Drawings. The respective materials shall conform to the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

PART 3 EXECUTION

31.3.01 GENERAL

A. The work shall be constructed to the lines, grades, and cross sections as shown on the Drawings or as directed by the Owner's Representative.

B. Excavations and backfill shall be finished to provide a smooth, uniform surface.

C. Surfaces shall be sloped to drain away from the structure and slope rounding shall be employed to provide a gentle transition between the backfill and natural grade.

D. Dewatering shall not be conducted by pumping from inside footings, structural floorslabs, or other structure foundation limits without written approval by the Engineer.

E. Care shall be taken when excavating the foundations to avoid disturbing the supporting materials. Excavation by either hand or careful backhoe soil removal may be required in excavating the last few inches of material to obtain the subgrade of any item.

F. Any over-excavated subgrades shall be brought back to subgrade elevations, as indicated on the Drawings, by the Contractor at the Contractor's expense in the following manner:

G. For over-excavations of two (2) inches or less, either backfill and compact with approved granular materials, backfill with one-half (1/2) inch crushed rock, or fill with concrete at the time of the appurtenant structure concrete pour.

H. For over-excavations greater than two (2) inches, backfill and compact with an approved granular material.

I. Excavation shall be unclassified and shall consist of the removal of whatever substance or material is encountered.

31.3.02 UNSUITABLE MATERIAL

A. Poor foundation material for any of the Work shall be removed by the Contractor with no additional cost to the Owner.

B. Unsuitable foundation materials include the following:

1. Saturated by either surface or subsurface flows

2. Frozen for any reason

3. Disturbed by the Contractor's work or caused to become unacceptable for foundation material purposes by means of Contractor's equipment, manpower, or methods of work.

31.3.03 TOPSOIL

A. Topsoil shall be stripped and stockpiled in accordance with the provisions of SECTION 31 14 13 – SOIL STRIPPING AND STOCKPILING of these Specifications.

B. Topsoil shall be spread and finish graded in accordance with SECTION 31 22 19 – FINISH GRADING of these Specifications.

31.3.04 SURPLUS MATERIAL AND BORROW

A. Surplus Material shall be disposed of in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

B. Borrow shall be obtained for the sources and be of the quality specified in SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.05 UNDERCUTTING

A. Undercutting of structure excavation shall not be allowed unless rock or unsuitable materials are encountered.

B. Undercutting shall be performed in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.06 COMPACTION

A. Compaction of embankments shall be performed in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK of these Specifications.

31.3.07 CLEARANCE

A. The excavation for structures shall be of sufficient size so as to leave at least 12 inches of clearance between the outer surface of the structure or footing and the embankment or sheathing or shoring.

1. Where the structure bears on granular fill material that has been placed above the subgrade, the bottom of the excavation shall be oversized laterally one foot in each direction for each foot of granular fill material beneath the bearing elevation of the foundation.

31.3.08 EQUIPMENT

A. Structure excavation shall be performed with a backhoe or similar piece of equipment to minimize construction traffic over the foundation soils.

31.3.09 GEOTECHNICAL TESTING AND INSPECTION

A. The Contractor shall provide 48 hours' notice of when an area will be ready for geotechnical testing.

B. Geotechnical testing shall be under the direct supervision of a professional geotechnical engineer licensed in the state in which the work is being performed.

C. The geotechnical engineer shall inspect and test the subgrade.

D. Fill material shall be tested every vertical foot of backfill with one test per 200 square feet of area.

E. Structure backfill shall be compacted to 100% percent of standard proctor maximum density as determined by ASTM D698 unless noted otherwise.

F. All areas with inadequate compaction shall be corrected at the Contractor's expense.

1. The Contractor shall have the areas retested to demonstrate that adequate compaction has been obtained.

2. The Contractor shall bear the cost of retesting and no reimbursement shall be made therefor.

31.3.10 PROTECTION

A. The Contractor shall protect the subgrade and placed fill materials from frost and other damage at no additional cost to the Owner.

1. The Contractor shall cover the subgrade and bearing fill materials with insulation any time there is a possibility of frost.

B. Dewatering

1. Dewatering shall be performed in accordance with the provisions of SECTION 31 23 19 DEWATERING of these Specifications.

C. All sub-drainage, damp-proofing, waterproofing, foundation insulation and other similar work shall be installed by the Contractor and accepted by the Owner's Representative prior to backfilling.

1. The Contractor shall expose any areas where work has been covered by backfilling but not witnessed by the Owner's Representative prior to backfilling as directed by the Owner's Representative.

2. The cost of excavation and backfilling to expose covered work for which the Contractor did not provide an opportunity for review by the Owner's Representative shall be borne by the Contractor

D. Contractor is responsible to protect adjacent structures, utilities, and other improvements at no additional cost to the Owner.

E. Any damage resulting from the Contractor's performance of the work shall be corrected at no additional expense to the Owner.

END OF SECTION

SECTION 31 2500 – EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work under this Specification shall include all temporary erosion control measures including, but not necessarily limited to, silt fence, bale checks, erosion control blankets, and interim mulch as may be necessary to control soil erosion and sedimentation.

B. The work shall include furnishing all materials, labor, and equipment required for the construction and maintenance of erosion and sediment control devices as shown on the Plans or as directed by the Engineer.

C. The work shall also include all inspections and reports as required by the storm water discharge permit for construction activities.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 31 22 19	FINISH GRADING
SECTION 31 23 13	SUBGRADE PREPARATION
SECTION 32 92 00	TURF AND GRASSES

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for in accordance with submittal procedures of these Specifications.

PART 2 PRODUCTS

31.2.01 FIBER ROLLS

A. Fiber rolls shall consist of material conforming to the requirements of the ND/DOT Section 261.

31.2.02 SILT FENCE

A. Silt fence shall be machine sliced

B. Posts

1. Posts shall be a Steel T-Post with welded plate
2. Posts shall be no less than 5 feet long.
3. Metal posts shall be a minimum weight of 1.26 lbs./ft.

C. The geotextile fabric shall be free of flaws such as tears or other defects. Any geotextile fabric which becomes damaged shall be replaced. The geotextile fabric shall meet or exceed the following requirements:

1. Type: Woven Monofilament

2. Grab Strength (ASTM D 4632): 130 lbs.
3. Apparent Opening Size (ASTM D 4751): #30 - 40 sieve range
4. Width: 36 inches
5. U.V. Stability (ASTM D 4355, 500 hrs): 70% min
6. Permittivity (minimum, ASTM D 4491): 1.0/sec

31.2.03 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be in compliance with ND/DOT Specifications Section 255.

B. Staples for anchoring the erosion control blankets shall be in compliance with ND/DOT Specifications Section 856.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor is responsible for the preparation of the Storm Water Pollution Prevention Plan and for submittal to the State.

B. The Contractor shall make note that this project is subject to North Dakota Department of Health Water Quality authorization. The Contractor shall pay the application fee and all additional annual fees necessary until the termination of the permit has been granted by the State. The Contractor is responsible for securing and administering the permit and installation and maintenance of the erosion control structures. All Storm Water Management and Erosion Control for this Project shall comply with the requirements set forth in the General Permit.

C. The Contractor shall comply with all requirements and conditions of the General Permit and the Storm Water Pollution Prevention Plan (SWPPP). Failure to do so will result in the issuing of an order to suspend work in addition to the potential fines that may be assessed by the State.

D. The General Permit for Storm Water Discharges Associated with Construction Activities, NOI, SWPPP, NOT, and the most recent fee schedule can be found on the internet at the following location:

https://deq.nd.gov/WQ/2_NDPDES_Permits/7_Stormwater/StW.aspx

The Contractor’s responsibilities regarding maintenance of erosion control structures, after final project acceptance, will be limited to the areas disturbed by the construction for this Project only. The Contractor will not be responsible for erosion control beyond the disturbed areas of this Project due to adjacent construction or any other construction activities not associated with this Project. It is the Contractor’s responsibility to document the extent of disruption due to construction activities directly related to this Project. The documentation should include pictures with a date stamp that is concurrent with the date of final project acceptance

E. Temporary erosion control measures such as bale checks and silt fences shall be coordinated with the site work and turf establishment.

F. No site work will be permitted until ALL necessary temporary erosion control measures are completed and in place in order to prevent excessive soil erosion and subsequent siltation from entering wetlands, streams or storm sewers.

G. The construction of erosion control measures shall not relieve the Contractor of the responsibility for preventing or minimizing the potential for erosion or siltation.

H. The Contractor shall be responsible for all damages and clean up and the costs therefore, resulting from erosion of the soils and any siltation which may occur, regardless of the temporary erosion control measures taken.

I. Inspections of the temporary erosion control measures and reports thereof, shall be made in accordance with the storm water discharge permit for construction activities.

31.3.02 INTERIM MULCH

A. During the periods when seeding and sodding are not permitted, the Contractor shall shape the areas to their final configuration, loosen the soil as necessary, apply interim mulch and anchor the mulch as required by their SWPPP Permit.

B. The furnishing and anchoring of interim mulch shall be included in the work for which erosion control is required and no additional compensation shall be made therefor.

C. Once seeding can proceed, the Contractor shall prepare the topsoil as specified for SECTION 32 92 00 – TURF AND GRASSES.

31.3.03 INSTALLATION REQUIREMENTS

A. Bale checks shall be countersunk or entrenched into the soil to a depth of 4 inches below the surrounding soil.

B. Each bale shall be anchored to the ground with two 2 inch by 2 inch wood stakes or reinforcing bars.

C. The stakes or bars shall be embedded into soil at least 10 inches.

D. The bales shall be placed on edge and butted tight against each other.

E. The length of a bale check dam which crosses a ditch, swale or drainway shall be such that the crest of the bale check dam at its lowest point is lower than the ground level at the ends of the check dam so as to prevent runoff from flowing around the ends of the bale check dam.

F. Silt fence shall be constructed on fence posts which are spaced no more than 6 feet and embedded no less than 2 feet.

G. The geotextile fabric shall be secured to the upstream face of the posts.

H. The geotextile fabric shall be embedded in an anchor trench along the upstream side of the silt fence.

I. The anchor trench shall be 6 inches deep by 6 inches wide and shall extend the full length of the silt fence.

J. The geotextile fabric shall line both sides and the bottom of the anchor trench.

K. The anchor trench shall be backfilled with the excavated material which shall be firmly compacted into place.

L. Erosion Control Blankets

1. Erosion control blankets shall be installed on all slopes steeper than 3:1(H:V), at culvert ends, upstream and downstream, without rip rap protection and at locations shown on the Plans.
2. Erosion control blankets shall be installed within 24 hours after seeding, fertilizing, and mulching has been completed.
3. The blanket shall be rolled out in the direction perpendicular to the slope.
4. The blankets shall be spread out without stretching.
5. The blanket installation shall begin at the base of the slope.
6. The subsequent courses of blanket shall overlap the lower blanket by no less than 10 inches. Strip ends shall also overlap by 10 inches.
7. The aggregate end of the blanket strip along the top of the slope shall be buried in a vertical slot in the soil.
8. No less than 12 inches of blanket shall be buried in this slot.
9. Along channels anchor slots measuring one foot deep by one foot wide shall be excavated across the width of the channel.
10. The erosion control blanket shall be laid into the bottom of this slot.
11. A cover flap of blanket will be placed against the upstream face of the slot.
12. The slot shall be backfilled, seeded, mulched and the cover flap folded over the trench.
13. Anchor slots shall be spaced at intervals not to exceed 50 feet.
14. All joints and edges of the blankets shall be stapled at 3-foot intervals or less.
15. Staples placed at joint ends shall not exceed 18 inches.

31.3.04 MAINTENANCE

A. It shall be the Contractor's responsibility to maintain all erosion control measures and to inspect same after each rainfall event.

B. All displaced bale checks shall be replaced, and silt fences shall be repaired where sagging or other damage has occurred.

C. The Contractor shall review the temporary erosion control measures and make revisions as necessary in order to minimize damage due to future rainfalls.

D. Temporary erosion control measures shall be fully maintained until they are removed. The cost of maintenance of temporary erosion control shall be included in the price bid for the work for which erosion control is required and no additional compensation will be made therefor.

31.3.05 REMOVAL OF TEMPORARY EROSION CONTROL

A. Temporary erosion control devices shall remain in place until the permanent measures (turf establishment) have become established as determined by the Engineer.

B. All areas disturbed by the removal of temporary erosion control measures shall receive the same turf establishment as the areas adjacent thereto.

END OF SECTION

SECTION 31 3700 – RIPRAP

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification includes installation of riprap and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AASHTO T99	Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate and Impact in the Los Angeles Machine
AASHTO T104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 00 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 31 22 19	FINISH GRADING
SECTION 31 23 13	SUBGRADE PREPARATION
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

31.1.04 SUBMITTALS

A. Shop drawings shall be submitted for the riprap in accordance with submittal procedures of these Specifications. The following information shall be supplied:

B. Gradation reports showing, at a minimum, the percent passing the critical sieves for the riprap class as shown in Table 256-01 “Riprap Gradations” of the ND/DOT Specifications

C. For Quarry Stone:

1. Name and location of the supply pit
2. Report of the LA Abrasion as determined by AASHTO T96
3. Soundness (Sodium Sulfate) test results as determined by AASHTO T104

PART 2 PRODUCTS

31.2.01 GENERAL

A. Unless otherwise specified on the Drawings, the riprap shall be Grade II in conformance with the gradation requirements of Table 256-01 “Riprap Gradations” of the ND/DOT Specifications.

31.2.02 FIELD STONE

A. If field stone is used, it shall not consist of sandstone, shale, or soft limestone. It shall be free from cracks and flaws that could cause splitting or breakup and shall be easily abraded or crushed.

31.2.03 QUARRY STONE

A. If quarry stone is used, it shall not consist of sandstone, limestone, or stone of sedimentary origin. The quarry stone shall meet the requirements of Table 256-02 of the ND/DOT Specifications.

31.2.04 GROUT

A. Where noted on the Drawings, grout consisting of 1 part Portland Cement and 2 parts sand by volume shall be used.

PART 3 EXECUTION

31.3.01 PLACEMENT

A. Stones shall be placed on sloped areas beginning at the toe of the slope.

B. The stones shall be set to obtain an even outer surface and a uniform appearance.

C. Do not drop riprap stones from a height greater than 3 feet. Stones greater than 250 pounds shall be placed with no free-fall.

D. The stones shall be placed to achieve contouring without rolling them along the surface.

E. The stones shall be placed evenly over the riprap area without material segregation or deviating from the designed slope and grade by greater than 6 inches.

31.3.02 GROUT

A. The riprap shall be dampened before applying grout.

B. The grout shall be recessed 1 to 3 inches below the top of the riprap.

END OF SECTION

SECTION 31 5000 – EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes shoring and protection of excavations and all work included thereto as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

OSHA	Occupational Safety and Health Act Requirements
MUTCD	Federal Highway Administration Manual on Uniform Traffic Control Devices

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00 COMMON WORK RESULTS FOR EARTHWORK

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

31.3.01 PROTECTION

A. The Contractor shall take all necessary precautions for the protection of the work and the safety of the public.

1. All barricades and obstructions shall be illuminated at night by flashing signal lights which shall be kept burning from sunset to sunrise.
2. Barricades shall be painted to increase their visibility.
3. Suitable signs shall be so placed as to show in advance where construction, barricades or detours exist.
4. All barricades and traffic control shall conform to the Federal Highway Administration Manual on Uniform Traffic Control Devices.

B. The Contractor shall at all times conduct his work as to insure the least possible obstruction to traffic and inconvenience to the general public and to insure the protection of persons and property.

C. No road or street shall be closed to the public except with the permission of the proper authority.

D. Any police or other traffic control shall be arranged for by the Contractor and be at their expense.

E. Fire hydrants on or adjacent to the work shall be kept accessible to fire-fighting equipment at all times.

F. No valves on existing utilities shall be operated without permission from the proper authority.

G. Temporary provisions shall be made by the Contractor to insure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed.

H. All costs of furnishing, placing, maintaining, and removing barricades, fences, and appurtenances shall be included in the unit price bid for Traffic Control which the protection is being provided and no separate compensation will be made therefor.

31.3.02 SHORING AND EXCAVATION SUPPORT

A. All excavations shall be sheeted, shored, and braced as will meet all requirements of the applicable safety codes and regulations; comply with any specific requirements of the Contract; and prevent disturbance or settlement of adjacent surfaces, foundations, structures, utilities, and other properties.

B. Any damage to the work under contract or to adjacent structures or property caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to failure or lack of sheeting, shoring, or bracing or through negligence of fault of the Contractor in any manner shall be repaired at the Contractor's expense and without delay.

C. It shall be the Contractor's responsibility to provide for safe working conditions for all excavations in strict conformance with safety regulations.

1. Damages or injury resulting from settlement, slides, cave-ins, water pressure, pedestrian, or vehicular involvement shall be the responsibility of the Contractor and all damages shall be repaired at the Contractor's expense.

2. Where the depth of an excavation requires the slopes or shoring system to be designed by an Engineer retained by the Contractor, the Contractor shall furnish a copy of the Engineer’s design to the Owner.

3. The Contractor shall bear all costs for shoring and slope design.

D. The Contractor shall assume full responsibility for proper and adequate placement of sheeting, shoring and bracing, wherever and to such depths that soil stability may dictate the need for support to prevent displacement.

E. Bracing shall be so arranged as to provide ample working space and so as not to place stress or strain on the in place structures to any extent that may cause damage.

F. Sheeting, shoring and bracing materials shall be removed only when and in such manner as will assure adequate protection of the in-place structures and prevent displacement of supported grounds.

1. Sheeting and bracing shall be left in place only as required by the Drawings or Specifications or ordered by the Owner’s Representative.

2. Otherwise, sheeting and bracing shall be removed as the backfilling reaches the level of respective support.

3. Wherever sheeting and bracing is left in place, the upper portions shall be cut and removed to an elevation of three feet or more below the established surface grade as the Owner’s Representative may direct.

G. All costs of furnishing, placing, removing sheeting, shoring, and bracing materials, including the value of materials left in place as required by the Contract, shall be included in the prices bid for which the protection is being provided and no separate compensation will be made therefor.

H. When any sheeting, shoring, or bracing materials are left in place by written order of the Owner’s Representative, in the absence of specific requirements of the Contract to do so, payment will be made for those materials as an Extra Work item, including waste material resulting from upper cut-off requirements.

END OF SECTION

SECTOIN 32 0500 – COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes work common to exterior site improvements including but not limited to pavements, curb and gutter, sidewalks, retaining walls, and all work included thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. References made in DIVISION 32 – EXTERIOR IMPROVEMENTS to the NDDOT Specifications shall be taken to mean the North Dakota Department of Transportation's Standard Specifications for Road and Bridge Construction, 2024 Edition unless otherwise specified.

B. The referenced sections and appurtenant sections thereto of the NDDOT Specifications shall be considered as a part of this Specification.

C. Provisions of the NDDOT Specifications are subject to modification by these Specifications.

D. All Quality Control testing noted by the NDDOT Specifications to be performed by the Construction Representative shall be performed by the independent testing laboratory retained by the Contractor.

1. The costs of said testing shall be borne by the Contractor.

E. Contractor shall conform to applicable codes for marking handicapped parking and include signs and pavement markings.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 05	SELECTIVE DEMOLITION FOR EXTERIOR IMPROVEMENTS
SECTION 32 05 19	GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS
SECTION 32 11 13	SUBGRADE MODIFICATIONS
SECTION 32 11 23	AGGREGATE BASE COURSES
SECTION 32 12 13	PREPARATORY COATS
SECTION 32 12 16	ASPHALT PAVING
SECTION 32 12 36.13	ASPHALTIC SEAL AND FOG COATS
SECTION 32 12 53	MILLINGS
SECTION 32 15 00	AGGREGATE SURFACING
SECTION 32 16 13	CURBS AND GUTTERS
SECTION 32 16 23	SIDEWALKS AND DRIVEWAYS
SECTION 32 17 23	PAVEMENT MARKINGS
SECTION 32 31 13	CHAINLINK FENCES AND GATES
SECTION 32 92 00	TURF AND GRASSES

31.1.04 SUBMITTALS

A. Refer to Related Work sections for applicable submittals required in these Contract Documents if not included herein.

B. Shop drawings and product data shall be submitted for in accordance with SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Refer to Related Work sections for applicable product details if not included herein.

B. When a geotechnical report is provided within the specifications, and the provisions contained within the geotechnical report are more stringent than those contained in this Section, the provisions of the geotechnical report shall govern.

PART 3 EXECUTION

31.3.01 GENERAL

A. These general construction requirements apply to all exterior site improvement work.

B. The limits of construction are shown on the Drawings or shall be established by the Owner's Representative.

1. The Contractor shall confine construction operations within these limits.

2. All surface objects, trees, stumps, roots, and other obstructions that are not designated to remain shall be cleared and disposed of as specified.

C. The removal of surface improvements (pavement, curb and gutter, walks) shall be held to a minimum.

1. All materials to be removed and means of replacement shall be subject to the approval of the Owner's Representative where said removals are not detailed on the Drawings.

2. All materials that are removed shall be disposed of offsite at a location provided by the Contractor.

3. All pavements, walks, or curb and gutter that are to be removed shall be sawn full depth to provide a neat and true edge.

31.3.02 TESTING

A. The Contractor shall be responsible for obtaining test results showing the moisture-density relationships (Standard Proctor) of representative samples of the materials to be used in all embankment and backfill construction including excavated material, engineered fill and borrow material. Testing shall be performed by an independent testing laboratory in accordance with the requirements of ASTM D698.

B. The Contractor shall be responsible for obtaining and providing to the Owner's Representative Job Mix Formulas, Marshall Field Stability tests, graded extractions, and laboratory analysis for bituminous pavement mixtures of each type used on the Project.

C. The Contractor shall be responsible for obtaining and providing to the Owner's Representative concrete cylinder tests for all concrete placed for improvements on the Project.

D. The Contractor shall be responsible for obtaining and providing to the Owner's Representative stripping tests, volume swell tests, fracture tests, wear tests, and soundness tests prior to or during the Contractor's crushing operations.

31.3.03 CLEANUP

A. Cleanup of the site shall be completed before final acceptance of the work is made. Cleanup shall include the removal and disposal of all unsuitable materials. All equipment shall be removed from the site. The site shall be left in a manner so as to present a clean and neat appearance.

B. All surplus waste materials remaining after completion of the exterior site improvements shall be disposed of in an acceptable manner within 24 hours after completing the work on each area of the site.

1. Disposal at any location within the project limits shall be as specified, or as approved by the Owner's Representative; otherwise, disposal shall be accomplished outside the project limits at a location provided by the Contractor.

2. The waste disposal operations shall be a part of the work required under the exterior site improvement work, not as work that may be delayed until final cleanup.

END OF SECTION

SECTION 32 0505 – SELECTIVE DEMOLITION FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

32.1.01 DESCRIPTION

A. This Specification includes all site demolition work necessary for the construction as shown on the Drawings and as specified herein.

B. Site Demolition may include but is not necessarily limited to salvage or removal of the following:

1. Sidewalks
2. Curb and gutter
3. Bituminous pavements and driveways
4. Concrete pavements and driveways
5. Gravel parking lots and driveways
6. Light poles and their foundations
7. Pipe and fittings
8. Valves and valve boxes
9. Drainage structures
10. Fence
11. Trees, shrubs, and other plantings
12. Retaining walls
13. Railings and guard rails
14. Mailboxes and flag poles
15. Signs and signposts
16. Sanitary sewer structures
17. Buildings

32.1.02 REFERENCES

A. Reserved.

32.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

32.1.04 SUBMITTALS

A. Submittals shall be in accordance with SUBMITTAL PROCEDURES.

B. The Contractor shall submit a proposed schedule of operation, coordination for shutoff,

capping and continuation of utility services as required.

C. The Contractor shall submit a detailed sequence of site demolition and removal work to ensure an uninterrupted progress of Owner's on-site operations.

D. Prior to demolition work, the Contractor shall submit photographs of exterior improvements in areas adjacent to areas of site demolition work.

E. The Contractor shall submit proposed methods of security where demolition work will breach existing security measures.

32.1.05 QUALITY ASSURANCE

A. All site demolition and disposal work shall be performed in compliance with applicable requirements of governing agencies having jurisdiction, and according to the Drawings and as specified herein.

B. The Contractor shall ensure safe passage of persons and vehicles around areas of demolition.

1. Operations shall be conducted so as to prevent damage to adjacent buildings, structures, utilities, and other exterior improvements and injury to persons.

32.1.06 JOB CONDITIONS

A. The Owner assumes no responsibility for the actual condition of structures and existing exterior improvements which are to be removed or salvaged.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

32.3.01 GENERAL

A. The Contractor shall furnish all equipment, labor, materials, and tools necessary to remove and salvage or dispose of the structures, utilities above and below ground, and exterior improvements or portions thereof as shown on the Drawings and as specified herein.

32.3.02 PROTECTION

A. Prior to the removal of any wall, beam, column, or cutting of any openings, the Contractor shall examine the existing structure and, when required, shall protect the structure by shoring, bracing, or underpinning.

B. The Contractor will protect all pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires and other surface structures affected by construction activities in connection with performance of the contract together with grass, shrubs, yards, or pastures crossed or adjacent to the work from damage or disturbance. If removed or otherwise damaged, the Contractor shall restore to the original condition or better as determined by the Engineer. All replacement of such structures shall be made with new materials conforming to these Specifications or as approved by the Engineer. Unless

listed as a pay item, all cost and work required for replacement will be the Contractor's sole expense.

C. The Contractor shall protect existing paved surfaces from damage during construction. Keep equipment off paved surfaces unless absolutely necessary. Tracked equipment shall be provided with suitable pads or sufficient surface protection to avoid damage.

D. The Contractor shall have barricades and traffic control in place prior to commencement of demolition on public rights-of-way or other areas open to the public.

E. Barricades and other protection measures shall be in place prior to the commencement of demolition to protect entry into the work area by anyone other than the necessary workers.

F. The Contractor shall be responsible for disconnecting existing utilities such as electrical power or gas from items that are to be removed or salvaged.

G. The Contractor shall utilize lockout/tag-out procedures to prevent utilities from becoming re-activated during and after removal or salvage operations.

H. The Contractor shall be responsible for all damage to streets, roads, curb, sidewalk, valley gutters, highways, railways, ditches, shoulders, embankments, culverts, bridges, or other public or private property or facility that may be damaged by moving, hauling, or otherwise transporting equipment, materials, or crew to or from the work. The Contractor shall make, without delay, satisfactory and acceptable arrangements with the owner of the damaged property concerning its repair or replacement or payment of costs incurred in connection with said damage.

32.3.03 EXPLOSIVES

A. The use of explosives shall not be permitted.

32.3.04 SALVAGE

A. All material, improvements and equipment designated to be salvaged shall be removed with care, cleaned, and stored at the site in an area designated by the Owner.

1. All salvaged materials and equipment shall remain the property of the Owner.

B. Any pipe, fitting, or valve may be reused, at the Contractor's option, subject to the approval of the Owner's Representative.

1. Any item reused shall be cleaned of all foreign material, be of sound condition, be in good working order, and be of the same size, material and type as shown.

2. Reused items shall be repainted to match the adjacent work.

32.3.05 REMOVAL

A. All materials designated for removal shall become the property of the Contractor and shall be disposed of off-site in a manner satisfactory to the owner(s) of the property on which the material is being disposed and all governing agencies.

B. Copies of all agreements with property owners and permits from governing agencies

shall be furnished to the Owner's Representative.

C. Concrete cutting shall extend to the nearest joint when there is a joint within two (2) feet of the minimum required cut.

D. The allowable limit of curbing removal as a result of utility service installations is up to ten (10) lineal feet for each utility service installation that crosses beneath an existing curb, subject to Engineer discretion according to existing conditions. Removals outside the allowable limits will be at the Contractor's expense.

E. The allowable limit of sidewalk removal as a result of utility service installations is up to a ten (10) foot length by the existing sidewalk width for each utility service installation that crosses beneath an existing sidewalk, subject to Engineer discretion according to existing conditions. Removals outside the allowable limits will be at the Contractor's expense.

F. The allowable limit of pavement removal as a result of open cut trench utility installations is up to a twelve (12) foot width along the length of the utility beneath existing pavement, subject to Engineer discretion according to existing conditions. Removals outside the allowable limits will be at the Contractor's expense.

32.3.06 DISPOSAL

A. All materials that are removed shall be disposed of off-site at a location provided by the Contractor.

32.3.07 OPENINGS

A. New openings shall be neatly cut or drilled to prevent face chipping or spalling.

B. All damaged areas shall be repaired to the satisfaction of the Owner's Representative.

32.3.08 PATCHING CONCRETE

A. All concrete that has been marred, damaged, cracked or defaced as a result of site demolition shall be repaired by the Contractor at no expense to the Owner.

B. The Contractor shall repair concrete surfaces as follows (subject to Engineer's discretion):

1. Saw cut to a depth of not less than 1 inch and remove concrete.

2. Remove exposed reinforcing only where noted or directed by the Owner's Representative.

3. Apply a latex bonding agent to the cut surface.

4. Patch with a non-shrink, nonmetallic grout finished to match the existing surface unless noted otherwise.

32.3.09 ANCHORS

A. All embedded anchors of removed items shall be cut flush with existing surfaces to remain.

32.3.10 PIPE

A. All abandoned pipes shall, at a minimum, be plugged at every open end with a watertight seal or filled entirely with flowable fill as shown on the Drawings or as directed by the Owner's Representative.

B. Asbestos cement (AC) pipe set for removal shall be performed in accordance with SECTION 02 82 33 – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL of these Specifications.

32.3.11 SIGNS AND MAIL BOXES

A. Existing Signs

1. Any street marking signs that are within the construction limits shall be removed by the Contractor and stored within the limits of the right of way.

2. Stop signs and yield signs may be removed for short periods of time only if a flag person or persons as required by MUTCD are present to caution and direct traffic.

3. All stop signs and yield signs temporarily removed shall be reinstalled properly prior to removal of flag person(s).

4. All other signs, including street name signs, shall be permanently reinstalled by the Contractor upon completion of the Contract, at locations designated by the Owner's Representative.

B. Mailboxes

1. Mailboxes located within the construction limits that require moving shall be temporarily relocated by the Contractor in such a manner that mail deliveries will not be unduly hampered.

2. Upon completion of construction, the Contractor shall restore any relocated mailboxes to their original location so far as it is practical and in accordance with Federal Postal Regulations.

3. The Contractor shall be responsible for furnishing all necessary materials required to relocate the mailboxes.

C. The cost of removing and reinstalling street signs and mailboxes and providing flag persons when stop signs and yield signs are temporarily removed shall be incidental to the price bid for the work that required the relocation, and no direct payment will be made for such work.

32.3.12 TREES AND SHRUBS

A. Where trees and shrubs are to be removed, the root balls shall be removed as part of the bid item. All trees and shrubs set for removal shall be hauled offsite and disposed of at a location obtained by the Contractor.

32.3.13 CLEANUP

A. All debris, rubble, unusable materials, and items not salvaged shall become the property of the Contractor and shall be removed from the site.

END OF SECTION

SECTION 32 0519 – GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes installation of geosynthetic fabrics and geogrids, and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM D276	Standard Test Methods for Identification of Fibers in Textiles
ASTM D4355	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
ASTM D4759	Standard Practice for Determining the Specification Conformance of Geosynthetics
ASTM D4873	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
ASTM D5261	Standard Test Method for Measuring Mass per Unit Area of Geotextiles
ASTM D6140	Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications
ASTM D6193	Standard Practice for Stitches and Seams
ASTM D6241	Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
ASTM D6637	Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method
ASTM D7737	Standard Test Method for Individual Geogrid Junction Strength

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 31 11 13	SUBGRADE MODIFICATIONS
SECTION 31 23 13	SUBGRADE PREPARATION
SECTION 31 25 00	EROSION AND SEDIMENTATION CONTROLS
SECTION 32 11 23	AGGREGATE BASE COURSES
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 32 12 16	ASPHALT PAVING

SECTION 32 12 13 PREPARATORY COATS
SECTION 32 15 00 AGGREGATE SURFACING

31.1.04 SUBMITTALS

A. Shop drawings and product data must be submitted in accordance with SUBMITTAL PROCEDURES of these Specifications.

1. A manufacturer's certification must be included, certifying that all materials furnished meet applicable standards as specified herein.

B. Submittals for prior approval must be submitted in accordance with contract documents of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Geosynthetic materials must be of the type, class, survivability, etc. as specified on the Drawings.

B. Technical Provisions

1. Reserved.

31.2.02 SEPARATION GEOTEXTILE

A. Technical Provisions

1. Reserved.

2. For separation applications, geosynthetic materials must meet the requirements of Table 858-01 of the 2025 NDDOT Standard Specifications.

31.2.03 STABILIZATION / REINFORCEMENT GEOTEXTILE

A. Geogrid:

1. Geogrid must consist of a biaxial structure which is dimensionally stable, and able to retain its geometry under construction stresses.

2. Material must be inert to commonly encountered chemicals.

3. Technical Provisions

a. Reserved.

b. Geogrid geosynthetic materials must meet the requirements of Table 858-01 of the 2025 NDDOT Standard Specifications.

B. Fabric:

1. Reinforcement fabric must consist of a fabric which is dimensionally stable, and able to retain its geometry under construction stresses.

2. Material must be inert to commonly encountered chemicals.

3. Technical Provisions

a. Reserved.

b. Reinforcement Type R1 geosynthetic materials must meet the requirements of Table 858-01 of the 2025 NDDOT.

c. Riprap fabric Type RR geosynthetic materials must meet the requirements of Table 858-01 of the 2025 NDDOT.

C. Technical Provisions

1. Reserved.

2. For reinforcement applications, geosynthetic materials must meet the requirements of Table 858-01 of the 2024 NDDOT Standard Specifications.

31.2.04 SUBSURFACE DRAINAGE GEOTEXTILE

A. Technical Provisions

1. Reserved.

2. For subsurface drainage applications, geosynthetic materials must meet the requirements of Table 858-02 of the 2023 NDDOT Standard Specifications.

31.2.05 RIPRAP GEOTEXTILE

A. Technical Provisions

1. Reserved.

2. For riprap applications, geosynthetic materials must meet the requirements of Table 858-01 of the 2025 NDDOT Standard Specifications.

31.2.06 PERMANENT EROSION CONTROL GEOTEXTILE

A. Technical Provisions

1. Reserved.

31.2.07 TEMPORARY SILT FENCE GEOTEXTILE

A. Technical Provisions

1. Reserved.

2. For temporary silt fence applications, geosynthetic materials must meet the requirements of Spec 260.03-B of the 2025 NDDOT Standard Specifications.

PART 3 EXECUTION

31.3.01 GENERAL

A. The geosynthetics must be placed on a surface that is smooth and free of stones, sticks, and other debris or irregularities that could damage the geosynthetic and must only be installed after all testing on the surface has been completed.

B. The Contractor shall manually pull the geosynthetics taut to remove wrinkles.

C. Technical Provisions

1. Reserved.

2. The geosynthetics must be installed in accordance with NDDOT Section 709.04 B through G unless otherwise specified herein.

31.3.02 PACKAGING, HANDLING, AND STORING

A. The geosynthetics must be packaged, labeled, handled, and stored in accordance with ASTM D4873.

B. Each geosynthetic roll must be wrapped with a material that will protect the roll, including the ends, from damage due to shipment, water, sunlight, and contaminants.

C. The protective wrapping must be maintained during shipment and storage.

D. The geosynthetics must be stored onsite and elevated off the ground.

31.3.03 SEAMS

A. The Contractor shall overlap seams in accordance with:

1. Technical Provisions

a. Reserved.

b. NDDOT Section 709.04 B through G.

B. In lieu of overlapping, the geosynthetics may be sewn together in accordance with ASTM D6193:

1. The sewing must be done with Kevlar, polypropylene, or polyester thread.

2. A 401 stitch conforming to Federal Standard No. 571(a) must be used for all seams.

3. SSn-2 overlapping "J" seams must be used for all field seams.

4. All seams must be sewn with two parallel stitch lines spaced approximately ¼ inch apart.

5. The outside stitch must be placed 1 inch from the edge of the geosynthetic.

6. Technical Provisions

a. Reserved.

b. The seams must meet the strength requirements for the geosynthetic type as specified in NDDOT Section 858.

31.3.04 PROTECTION

A. The geosynthetics must be covered within 5 days after laydown. Any material that is not covered within 5 days must be removed and replaced.

B. No construction equipment will be allowed to operate on the geosynthetics.

C. Geosynthetic material damaged prior to being covered must be removed and replaced.

END OF SECTION

SECTION 32 0523 – COMMON WORK RESULTS FOR CONCRETE

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes common work results for concrete construction including, but not limited to; curb and gutters, sidewalks, driveways, pavement, valley gutters, and other civil concrete construction complete in place.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A184	Standard Specifications for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A416	Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete
ASTM A615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A666	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Plate, and Flat Bar
ASTM A705	Standard Specification for Age-Hardening Stainless Steel Forgings
ASTM A706	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C140	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C191	Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C287	Standard Specification for Chemical-Resistant Sulfur Mortar
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C333	Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1012	Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic Cement Concrete
ASTM C1107	Standard Specification for Packaged Dry, Hydraulic-Cement Grout
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM D98	Standard Specification for Calcium Chloride
AASHTO M31	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AASHTO M32	Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
AASHTO M55	Standard Method of Test for Steel Welded Wire Reinforcement, Plain, for Concrete
AASHTO M213	Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
AASHTO T260	Standard Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
ACI	American Concrete Institute
AWS	American Welding Society
MIL	Military Specifications

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of Related Work are specified and included in other sections of these Specifications.

SECTION 32 05 25	CONCRETE FORMING
SECTION 32 05 26	CONCRETE ACCESSORIES
SECTION 32 05 27	CONCRETE REINFORCING
SECTION 32 05 28	CAST-IN-PLACE CONCRETE

SECTION 32 05 29	CONCRETE FINISHING
SECTION 32 05 30	CONCRETE CURING
SECTION 32 05 31	GROUTING
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR SITE IMPROVEMENTS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES

31.1.04 SUBMITTALS

A. Shop drawings and product data must be submitted for concrete, reinforcing bars, expansion material, and other pertinent items in accordance with SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Refer to Related Work sections for applicable product details if not included herein.

B. When a geotechnical report is provided within the specifications, and the provisions contained within the geotechnical report are more stringent than those contained in this Section, the provisions of the geotechnical report shall govern.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall thoroughly compact concrete into its final position, assuring that it is thoroughly consolidated around fittings and embedded items. All reinforcement and embedded items must be accurately placed as shown on the plans and must be clean and free from coatings of dried mortar, detrimental rust, scale, oil, or foreign matter.

31.3.02 CONCRETE CONSISTENCY

A. The Contractor shall assure concrete is of such consistency that it will flow around reinforcing steel, but individual particles of the coarse aggregate, when isolated, show a coating of mortar containing its proportionate quantity of sand. The consistency of the concrete will be gauged by the ability of the equipment to properly place the concrete in its final position and not by the difficulty in mixing or transporting. The Contractor shall use the minimum quantity of mixing water necessary to provide workability within the ranges of slump specified.

31.3.03 CONCRETE MIXING

A. Concrete may be mixed at the site or by the ready-mix method.

B. For ready-mix concrete, the Contractor shall comply with requirements of ASTM C94, and as herein specified.

C. The Contractor shall thoroughly mix concrete to assure a uniform distribution of the materials throughout the mass. Concrete must be mixed only in quantities required for immediate use and placed within the time limits specified. Unused concrete in which initial set has begun, must be disposed of. Retempering of concrete is prohibited. Aggregates or bags of cement containing lumps or crusts of hardened material must not be used. Concrete must be mixed in an approved truck mixer meeting the requirements of ASTM C94 herein.

D. The volume of mixed concrete in the mixing drum must not exceed the manufacturer's rating, on the capacity plate.

E. A recording water metering device is always required at the primary point of the batching operation.

F. Mixing time must be recorded. Mixing time will be measured from the time all solid materials are in the drum until discharge of that batch begins.

31.3.04 TRANSPORTING CONCRETE

A. The capacity of the plant and the transportation equipment must ensure delivery at a rate that will permit proper handling, placement, and finishing at the point of delivery. The concrete delivery rate must be maintained to provide for the continuous operation of placing, handling, and finishing concrete as is practical. The interval between delivery of loads must be maintained so that layers or lifts of concrete in place do not harden before succeeding layers or lifts are placed. In general, no lift or layer of concrete can remain exposed for more than 20 minutes before being covered by fresh concrete.

B. Water must not be added to concrete in transit. Water may be introduced into the mixer at the job site under direction of the Engineer if the specified water-cement ratio is not exceeded. Water must be added in accordance with ASTM C94. The drum must revolve continuously after the introduction of the cement and water until the concrete is discharged.

C. No mixed or agitated concrete that has remained in the drum of the truck mixer more than 10 minutes without agitation can be used.

D. The Contractor shall provide a revolution counter on each truck that registers the number of revolutions of the drum.

1. The counter must be mounted such that it can be easily read by both the operator and the Engineer.

31.3.05 NIGHT LIMITATIONS

A. Concreting operations must be ceased when darkness prevents obtaining the specified placing and finishing work. Night operations may be conducted with written approval and when approved artificial lighting is provided.

31.3.06 HOT WEATHER CONCRETING

A. Hot weather is defined as job-site conditions that accelerate the rate of moisture loss or rate of cement hydration of freshly mixed concrete.

B. Hot weather concreting must be performed in accordance with ACI 305.

C. When hot weather concreting is anticipated, the Contractor shall submit a hot weather concreting plan to the Engineer for review and approval. The plan must include detailed procedures, including production, placement, finishing, curing, and protection of concrete.

D. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ANSI/ASTM C94 may be required.

E. The Contractor is solely responsible for concrete placed in hot weather. Should the concrete placed under such conditions prove unsatisfactory in any way, the Engineer may

reject the work although the plans and work were carried out with the Engineer's permission.

31.3.07 COLD WEATHER CONCRETING

A. Cold weather is defined as when the weather forecast predicts air temperatures below 35°F at any time during the specified curing and protection period following concrete placement.

B. Cold weather concreting must be performed in accordance with ACI 306.

C. When cold weather concreting is anticipated, the Contractor shall submit a cold weather concreting plan to the Engineer for review and approval. The plan must include detailed procedures, including production, placement, finishing, curing, temperature monitoring, and protection of concrete.

D. Except by specific written authorization, concreting operations must cease when a descending air temperature in the shade and away from artificial heat falls below 40°F.

E. Before any concrete is placed, all ice, snow, and frost must be removed completely from the formwork receiving the concrete.

F. Heating and Placing Concrete:

1. When concreting is authorized during cold weather, the Contractor must assure that concrete temperature meets ASTM C94.

G. The Contractor is solely responsible for concrete placed in cold weather. Should the concrete placed under such conditions prove unsatisfactory in any way, the Engineer may reject the work although the plans and work were carried out with the Engineer's permission.

31.3.08 TESTING

A. All concrete must be tested by an ACI Grade I or equivalent certified testing technician. Unless otherwise specified, all testing during the on-site placement of the concrete will be subject to acceptance or rejection by the Engineer.

B. The Engineer or their representative shall be given access to the ready-mix production facility for sampling constituent materials during production to assure the materials meet these Specifications and represent those stated on the approved mix design.

C. Testing frequency and other related quality control criteria will be performed by the Contractor in accordance with the provisions of QUALITY CONTROL of these Specifications.

D. The following concrete tests must be performed for all concrete schedules as lined out herein.

E. Standard Slump Test:

1. The Engineer will check the consistency of the concrete by slump test during each day's placement. A slump test will also be made each time that strength specimens are made. Slump tests are performed meeting ASTM C143.

F. Compression Tests:

1. A minimum of three specimens, 6-inch in diameter or 4-inch, must be made and tested for every concrete placement. One set of test cylinders must be molded and tested for every 100 yards of concrete or fraction thereof placed each day. On a

given project, if the total volume of concrete is such that frequency of testing required above would generate less than 5 strength tests for a given class of concrete, tests must be made from at least 5 randomly selected batches or from each batch if fewer than 5 batches are used. These cylinders must be cured under laboratory conditions except that additional test cylinders cured entirely under field conditions may be required by the Engineer to check the adequacy of curing and protection of the concrete.

2. Samples for strength tests must be taken in accordance with ASTM C172.

3. The molding of test cylinders and laboratory curing must be performed in accordance with ASTM C31.

4. Cylinders must be tested in accordance with ASTM C39, using an independent testing laboratory, as approved by the Engineer.

5. Of each of the 3 cylinders taken for a pour, one must be tested for information strength at 7 days and two must be tested for acceptance strength at 28 days. To meet this Specification, average strength of two cylinders from the same sample, tested at 28 days or the specified earlier age, is required for each strength test. Strength level of an individual class of concrete is considered satisfactory if both of the following requirements are met:

   a. The average of all sets of 3 consecutive tests equals or exceeds the specified strength.

   b. No individual strength test (average of two cylinders) falls below specified strength by more than 500 psi (3400 kPa).

6. Field-cured test cylinders must be molded in accordance with ASTM C31 at the same time and from the same samples as laboratory-cured test cylinders. Procedures for protecting and curing concrete must be improved when strength of field-cured cylinders at the test age designated for measuring specified strength is less than 85 percent of that of companion laboratory-cured cylinders. When laboratory-cured cylinder strengths are appreciably higher than the specified strength, field-cured cylinder strengths need not exceed the specified strength by more than 500 psi (3400 kPa) even though the 85 percent criterion is met.

7. The strengths of any specimens cured on the job are to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When the strengths of the job-cured specimens are below those specified above, the Contractor shall improve the procedures for protecting and curing the concrete.

8. When concrete fails to meet the requirements above or when tests of field-cured cylinders indicate deficiencies in protection and curing, the Owner's representative may order tests on the hardened concrete under Chapter 17.3 of ACI-301-84 or order load tests in Chapter 20 of the ACI Building Code (ACI 318-83) for that portion of the structure where the questionable concrete has been placed. In the event the load or core tests indicate that the structure is unsatisfactory, the Contractor shall make all modifications as directed by the Engineer to make the structure sound. If the load or core tests indicate the concrete is satisfactory, all cost of testing shall be paid by Owner.

G. Air Content Tests:

1. The Engineer will during each strength test, check the air content by either the "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173), or "Method of Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete" (ASTM C138).

H. Temperature Tests:

1. Concrete temperature will be measured in accordance with ASTM C1064. Temperature must be tested hourly when air temperature is 40°F and below, and when 80°F and above; and each time a set of compression test specimens is made.

END OF SECTION

SECTION 32 0524 – CONCRETE SCHEDULES

PART 1 GENERAL

31.1.01 DESCRIPTION OF THE WORK

This section consists of concrete schedules to indicate the class of concrete required for the various components of cast-in-place concrete as shown on the Drawings and as specified herein.

31.1.02 RELATED WORK SPECIFIED ELSEWHERE

The following items of related work are specified and included in other sections of this Project Manual:

SECTION 32 05 28 CAST-IN-PLACE CONCRETE

PART 2 PRODUCTS

Concrete shall conform to the following classifications based on the application noted in the following schedule. The requirements for each classification are detailed in SECTION 03 30 00 – CAST-IN-PLACE CONCRETE of this Project Manual.

COMPONENT OR DESCRIPTION	CONCRETE CLASS
Concrete Curb and Gutter	Class AA
Concrete Driveways and Walkways	Class AA
Concrete Paving	Class AA

PART 3 CONSTRUCTION REQUIREMENTS (NOT USED)

END OF SECTION

SECTION 32 0525 – CONCRETE FORMING

PART 1 GENERAL

31.1.01 DESCRIPTION OF THE WORK

A. This Specification consists of concrete forming and all appurtenances thereto required for the placement of cast-in-place concrete as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 23 COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 28 CAST-IN-PLACE CONCRETE

31.1.04 SUBMITTALS

A. Shop drawings and product data must be submitted in accordance with SUBMITTAL PROCEDURES for the following:

1. All materials associated with formwork that will remain embedded or attached to the concrete.
2. Form ties.
3. Form release agents.

PART 2 PRODUCTS

31.2.01 FORMS

A. Forms must be of suitable material and must be of the type, size, shape, quality, and strength to build the structure as designed on the Drawings.

B. The surfaces of forms must be smooth and free from irregularities, dents, sags, and holes.

C. Forms must include 3/4-inch chamfer strips at all corners of the formwork to produce beveled edges on exposed edges unless noted otherwise.

D. Forms must include temporary openings at the base of column and wall formwork and at other locations where necessary to facilitate cleaning and inspection prior to the placement of the concrete.

31.2.02 FORM RELEASE AGENTS

A. Form coating or releasing agent must be a non-oil-based compound completely compatible with the membrane curing compound used and which does not stain concrete.

B. Form release agents for use inside basins containing potable water must be non-toxic, non-staining, and leave no residual on the formed surface.

C. Technical Provisions

1. Reserved.

2. Acceptable products for potable water basins:

a. DEBOND form coating by L & M Construction Chemicals, Inc.

b. MasterFinish RL 211 by BASF Construction Chemicals, LLC.

31.2.03 FORM TIES

A. Form ties must be factory-fabricated, removable, or snap-off metal ties of a design that will not permit form deflection and will not spall concrete upon removal.

1. Solid backing must be provided for each tie. Ties must be fitted with devices that will leave holes in the concrete surface not less than 3/8-inch nor more than 1-inch in diameter and not more than 1-inch deep, except as noted below:

a. That portion of the tie remaining permanently in the concrete must not project beyond the surface of the concrete and must be at least 1-inch back from any concrete surface that will be exposed, painted, damp proofed, or will receive direct applications of plaster.

b. Bolts and rods that are to be completely withdrawn must be coated with a non-staining bond breaker.

c. All form ties must be snapped off beneath the concrete surfaces on all construction.

B. Form ties used for liquid retaining structures must be fitted on both ends with cones which will form a void at least 1-1/2 inches deep at least 1-inch diameter at the surface in order to provide suitable space for dry-patching mortar.

1. In lieu of this, at the Contractor's option, similar recesses may be formed by reaming with power tools as approved immediately after forms are removed.

2. Form ties to be completely removed from the concrete must not be used for liquid containing structures unless the method of sealing of holes is accepted by the Owner’s Representative in writing.

3. The ties used for liquid containing structures must be fitted with integral water seals on the portion remaining within the concrete.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall furnish all equipment, labor, materials, and tools necessary to erect and remove concrete formwork as required for cast-in-place concrete as shown on the Drawings and specified herein.

31.3.02 MATERIALS STORAGE

A. All materials must be stored in a manner which protects them from dampness, damage, and freezing.

31.3.03 COLD WEATHER CONCRETING

A. All concrete forms with which the concrete is to come in contact must be free from frost.

B. The Contractor shall drill holes in the forms and provide thermometer wells 1/2-inch to 1-inch in depth where required by the Owner's Representative to determine the temperature of the concrete.

31.3.04 FORMS

A. Concrete must not be placed until all the forms and reinforcements have been reviewed by the Owner's Representative.

1. The forms must be true to line and grade and must be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports.

2. Flexible or curved metal forms must be used to fit specified curvatures.

3. The Contractor shall bear the responsibility for the adequacy and design of all forms and falsework.

B. The Contractor shall ensure that formwork is held firmly against hardened concrete to prevent offsets or loss of mortar at construction joints and to maintain a flush surface across the joint.

C. The internal ties must be arranged so that, when the forms are removed, no metal will show in the concrete surface or discolor the surface when exposed to weathering.

D. The Contractor shall clean all debris from within the forms just prior to the placement of the concrete.

1. Openings in the forms at the base of columns and walls must be used to accommodate this cleaning.

2. The Contractor shall secure all cleaning access panels in the forms prior to placing the concrete.

E. All forms must be coated with a non-staining form release agent which is to be applied shortly before the concrete is placed.

F. Forms must be constructed so that they can be removed without injuring the concrete or concrete surface.

G. Forms supported by falsework under slabs, beams, girders, arches, and similar construction must not be removed until tests indicate that at least 70% of the design strength of the concrete has developed nor sooner than 5 days after the concrete is cast.

1. The Contractor shall cast additional test cylinders which are to be cured with the same protection as the work they represent per the requirements of SECTION 32 05 23 – COMMON WORK RESULTS FOR CONCRETE of these Specifications.

2. These cylinders will be used for determining when the shoring can be removed.

31.3.05 COORDINATION WITH OTHER TRADES

A. All Subcontractors whose work is related to, embedded in, or supported by the concrete, shall be given ample notice and opportunity to furnish and/or incorporate their work before the closing of the forms and placement of concrete.

31.3.06 CURING AND PROTECTION

A. The forms for slabs and beams must remain in place for the full duration of the curing period unless approved otherwise by the Owner's Representative.

31.3.07 STRIPPING FORMS

A. The Contractor shall remove forms when the concrete is sufficiently set to prevent chipping or spalling. When forms are removed before the curing period has expired, the Contractor shall protect the concrete edges with moist earth or spray edges with curing compound. Forms must be cleaned, oiled, and examined for defects before they are used again.

END OF SECTION

SECTION 32 0526 – CONCRETE ACCESSORIES

PART 1 GENERAL

31.1.01 DESCRIPTION OF THE WORK

A. This Specification consists of concrete accessories including expansion joints, inserts, waterstops, and all appurtenances thereto required for the placement of cast-in-place concrete as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
ASTM D6690	Standard Specifications for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
USACE CRD-C572	Specifications for Polyvinylchloride Waterstop

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 23	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 28	CAST-IN-PLACE CONCRETE

31.1.04 SUBMITTALS

A. Submit shop drawings and product data must be submitted in accordance with SUBMITTAL PROCEDURES for the following:

1. Waterstop materials.
2. Inserts, including product data and structural capacities.
3. Expansion joint materials, if required.
4. Any other accessory materials to be utilized.

PART 2 PRODUCTS

31.2.01 EXPANSION JOINT MATERIAL

A. Expansion Joint Material must be used in expansion joints as shown on the Drawings.

B. Expansion joint material must be of the type shown on the Drawings. Where a type of material is not called out on the Drawings, the Contractor may use any of the types described below.

1. Pre-molded Bituminous Fiber

a. Pre-molded Bituminous Fiber or Bituminous Felt must consist of preformed strips of one (1) continuous piece per joint which have been formed from cane

or other similar fibers of cellular nature securely bound together and uniformly impregnated with an asphaltic binder conforming to ASTM D1751.

2. Flexible Foam Joint Filler

   a. Flexible foam preformed joint filler must be gray in color to closely match the color of the concrete.

   b. Technical Provisions

      i. Reserved.

      ii. Flexible foam joint filler must be Pressure Relief as distributed by W.R. Meadows, Inc., or prior approved equal.

3. Hot-poured Sealant

   a. Expansion joints exposed to the weather must be sealed with a hot-poured "Para Plastic" rubberized asphalt sealing compound conforming to ASTM D6690.

C. Interior expansion joints must be sealed with non-sag caulk of a color to match the concrete.

31.2.02 PREFORMED WATERSTOPS

A. Unless otherwise shown on the Drawings or specified in these Specifications, waterstops must be extruded from virgin polyvinyl chloride plastic resins conforming to:

1. U.S. Army Corps of Engineers waterstop specification CRD-C572, latest edition.

2. All PVC waterstops must be 6 inches wide and 3/8-inch thick and have center bulbs and serrated surfaces unless shown otherwise on the Drawings.

3. The serrations must extend no less than 0.3125-inch from the surface of the waterstop.

B. PVC waterstops may be substituted where moldable waterstops are shown on the plans.

C. PVC waterstops must be prefabricated from the waterstop manufacturer for all joints with the exception of butt splices.

31.2.03 MOLDABLE WATERSTOP/JOINT SEALER

A. Moldable waterstops must be placed at the locations shown on the Drawings.

B. Moldable waterstops must not be substituted for PVC waterstops.

C. Technical Provisions

1. Reserved.

2. Moldable waterstop/joint sealer must be Waterstop-RX as manufactured by American Colloid Company, or prior approved equal.

31.2.04 WALL SLEEVES

A. Wall sleeves must be provided for all penetrations that require a modular mechanical seal.

B. Wall sleeves must be made of PVC or HDPE and must include an integral waterstop.

C. Technical Provisions

1. Reserved.

2. Wall sleeves must be Model PWS as manufactured by Advanced Products and Systems or;

3. Century Line as manufactured by GPT or;

4. prior approved equal.

31.2.05 VAPOR BARRIERS

A. Vapor barriers must be polyethylene sheeting conforming to Commercial Standard, not less than 6 mil thickness.

B. Vapor barriers must be installed under floors to receive a finish covering such as tile or carpet and where shown on the Drawings.

31.2.06 CONCRETE BONDING AGENT

A. A bonding agent must be used on all surfaces where structural topping is to be installed, and any other areas where fresh concrete is to be installed adjacent to or over existing

concrete.

B. All construction joints in water or wastewater containment basins and below-grade basements and dry wells must have a bonding agent applied to the construction joint prior to placing the next lift or section of new concrete.

C. The bonding agent must be mixed and applied according to the manufacturer's recommendations.

D. Technical Provisions

1. Reserved.

2. Bonding agents must be Thorobond, Acryl 60, or prior approved equal.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall furnish all equipment, labor, materials, and tools necessary to construct concrete accessories as required for cast-in-place concrete as shown on the Drawings and specified herein.

31.3.02 MATERIALS STORAGE

A. All materials must be stored in a manner, which protects them from dampness, damage, and freezing.

31.3.03 EXPANSION JOINTS

A. The Contractor shall install pre-formed joint filler between concrete and any fixed structure, such as a buildings, bridges, or utility poles etc. All expansion joint materials must extend the full depth of the concrete. Isolation joints must be placed at radius points, junctions with existing concrete, and opposite to or at expansion joints in adjacent concrete. Contractor shall form cold joints at unions of consecutive pours as shown on the Drawings or directed by the Engineer. The cold joint shall be vertical, the full depth of the concrete, and tooled to a 1/4 - inch radius.

B. Expansion joint filler material must be securely fastened to the surface of existing concrete before subsequent concrete is cast against the joint.

C. Joints must be sealed within fourteen (14) days after they are installed.

31.3.04 WATERSTOPS

A. PVC waterstops that are to be placed in joints must be positioned accurately in accordance with the Drawings and supported against displacement with wire ties prior to placement of concrete.

1. Wire ties must not penetrate the waterstop at any location that is further than one inch from the edge of the waterstop.

B. Concrete surfaces to which moldable waterstops are to be attached must be coated with a primer recommended by the manufacturer.

1. Moldable waterstops must be fastened to the concrete surfaces with concrete nails at 12" intervals.

31.3.05 EMBEDDED ITEMS

A. Inserted items must be true to line and grade and must be mortar-tight and sufficiently secured to prevent displacement during placement of the concrete.

31.3.06 COORDINATION WITH OTHER TRADES

A. All Subcontractors, whose work is related to, embedded on, or supported by the concrete, shall be given ample notice and opportunity to introduce and/or furnish embedded items before closing of the forms and placement of concrete.

END OF SECTION

SECTION 32 0527 – CONCRETE REINFORCING

PART 1 GENERAL

32.1.01 DESCRIPTION

A. This Specification includes work for furnishing and placing reinforcing steel or wire fabric meeting the quality, type, and size specified in the contract.

32.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM A184	Standard Specifications for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A705	Standard Specification for Age-Hardening Stainless Steel Forgings
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
AASHTO M31	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
AASHTO M32	Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
AASHTO M55	Standard Method of Test for Steel Welded Wire Reinforcement, Plain, for Concrete
ACI	American Concrete Institute

32.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications.

SECTION 32 05 23	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 28	CAST-IN-PLACE CONCRETE

32.1.04 SUBMITTALS

A. The Contractor shall submit shop drawings and product data in accordance with SUBMITTAL PROCEDURES for reinforcing steel and accessories.

B. Shop drawings must indicate bending diagrams, assembly diagrams, lap splices, shapes, and details of reinforcing bars and accessories.

C. Reinforcing steel shop drawings must be prepared in accordance with Manual of Standard Practice for Detailing Reinforced Concrete Structures, ACI 315.

D. Bar lengths must be based on dimensions shown on the Drawings, not scaled dimensions.

PART 2 PRODUCTS

32.2.01 BAR REINFORCEMENT

A. Furnished deformed reinforcement steel must meet the requirements of ASTM A615, (AASHTO M31) or ASTM A705, Grade 40 or Grade 60.

1. Small quantities purchased from warehouses may, at the Engineer's direction, be accepted if bend tested under ASTM A615 or AASHTO M31. The test specimen must cold bend around a pin without cracking on the outside of the bent portion.

B. Bars which are to be welded must be Grade 60 and must conform to ASTM A706.

C. Minimum Bend Requirements:

1. Where bars are to be bent, the diameter of the bend measured on the inside of the bar, other than for stirrups and ties, must not be less than the following values:

BAR SIZE	MINIMUM DIAMETER
#3 through #8	6 bar diameters
#9, #10, and #11	8 bar diameters
#14 and #18	10 bar diameters

2. Inside diameter of bends for stirrups and ties must not be less than 4 bar diameters for #5 bar and smaller. For #6 bar and larger, minimum bend diameter must be as shown in the above table.

3. All reinforcement must be bent cold unless otherwise permitted by the Owner's Representative.

4. At the time that concrete is placed, metal reinforcement must be free from mud, oil, or other nonmetallic coatings that adversely affect bonding capacity.

5. Metal reinforcement with rust, mill scale, or a combination of both will be considered satisfactory provided that the minimum dimensions (including height of deformations) and weight of a hand-wire brushed test specimen are not less than the applicable ASTM specification requirements.

32.2.02 BAR SUPPORTS

A. Approved bar supports must be used to support reinforcing bars.

1. Pre-molded concrete blocks must be used at the bottom of slabs on grade having a minimum 4 square inches bearing area and having a compressive strength equal to the concrete being placed.

2. Bar spacers made of steel must be used between layers of bars. These must have sufficient strength to support construction loads without deformation.

3. Steel bar spacers must not come in contact with the forms.

4. Bolsters with non-corroding feet must be used to support bars on suspended slabs.

5. Bolsters with non-corroding feet must be used to provide the spacing required between reinforcing steel and formed wall surfaces.

32.2.03 WIRE AND WIRE MESH

A. Furnished wire must meet cold-drawn steel wire AASHTO M32 requirements.

B. Furnished wire mesh for concrete reinforcement must meet AASHTO M55 and ASTM A1064 requirements.

C. Furnished bar mats must meet ASTM A184 requirements.

D. Tie wire must be No. 16 gauge annealed wire.

32.2.04 REBAR SPLICE SYSTEM

A. Technical Provisions

1. Reserved.

2. The rebar splice system must be Grade 60 and as manufactured by Richmond Screw Anchor Co., Inc. or an approved equal.

3. For dowel bar substitution and rebar splice systems other than Richmond Screw Anchor Co., Inc., the Contractor shall submit manufacturer's literature, product samples, and certified test reports to the Owner's Representative.

a. Test reports must show yield and ultimate tensile load capacities. All male threads must be rolled (UN or UNC); cut threads are not permitted. Tension failure must occur in the nominal bar diameter of the Dowel-In.

32.2.05 MECHANICAL SPLICES

A. Mechanical reinforcement bar splices must be made with devices that are capable of transferring 125% of the yield strength of the bar size being joined across the splice.

PART 3 EXECUTION

32.3.01 GENERAL

A. The Contractor shall furnish all labor, materials, and services necessary for the construction of all reinforcement and appurtenances thereto as shown on the Drawings and specified herein.

32.3.02 PROTECTION

A. The Contractor shall protect steel reinforcement from damage at all times. Steel must be placed free from dirt, detrimental scale, paint, oil, and other foreign substance. The Contractor shall clean steel reinforcement having easily removed rust, loose scale, and dust using an approved method.

B. All materials shall be stored in a manner which protects them from dampness, damage, and freezing.

C. Reinforcing steel must not be stored in direct contact with the ground.

32.3.03 FABRICATION

A. The Contractor shall not field bend bars, unless specified. If field bending is specified, the Contractor shall bend reinforcing bars cold. The Contractor shall not field bend any bar partially imbedded in concrete, except as specified on the plans.

B. Bar reinforcement must be shipped in standard bundles, tagged, and marked meeting ACI 315 requirements.

C. Concrete reinforcement and accessory details not covered herein or on the drawings, must meet ACI 315 requirements.

32.3.04 PLACING AND FASTENING

A. The Contractor shall accurately place and hold firm all steel reinforcement in the plan locations as concrete is being placed.

B. All reinforcement must be supported and fastened to prevent displacement due to construction loads. Approved bar chairs and spacers must be used over form work. For

concrete surfaces exposed to the weather in the finished structure, the Contractor shall assure the portions of all accessories within 1/2 inch of the concrete surface are noncorrosive or protected against corrosion.

C. The Contractor shall overlap welded wire fabric for successive mats or rolls providing an overlap measured between outermost cross wires of each fabric sheet at least 2 inches. The fabric must be extended across supporting beams and walls to within 4 inches of concrete edges. It may extend through contraction joints. Fabric must be adequately supported during concrete placement to maintain its position in the slab using the methods previously described or by laying the fabric on a concrete layer of the required depth before placing the upper slab layer.

D. The Contractor shall offset vertical bars in columns at least one bar diameter at lap splices. Templates must be furnished for all column dowels.

E. Reinforcing bars must be free of ice, loose rust, and loose mill scale prior to placement of the concrete.

F. Splices must be lapped as shown on the Drawings.

1. Bars must not be welded, flame cut, or heated.

2. Splices for direct tension ties must be mechanical.

G. All splices must be staggered unless noted otherwise.

H. The Contractor shall obtain Engineer approval for all splices not shown on the plans. Mechanical connectors for reinforcing bars may be used if approved.

I. The Contractor shall not use pebbles, pieces of broken stone, concrete rubble, broken brick or building blocks, metal pipe, or wooden block to position the fabric.

J. The Contractor shall follow the minimum concrete protective covering for reinforcement below.

1.	Concrete deposited against ground	3 inches
2.	Formed surfaces exposed to weather or in contact with the ground:	
a.	#6 bars or larger	2 inches
b.	Smaller than #6	1 1/2 inches

K. Fabric reinforcement shipped in rolls must be straightened into flat sheets before being placed.

32.3.05 REINFORCEMENT THROUGH EXPANSION JOINTS

A. The Contractor shall not continue reinforcement or other embedded metal items bonded to the concrete through expansion joints.

B. Dowels bonded on only one side of a joint and waterstops must extend through the joint.

32.3.06 COLD WEATHER CONCRETING

A. All concrete reinforcement, with which the concrete is to come in contact with must be free from frost.

32.3.07 EMBEDDED ITEMS

A. Clear cover between embedded items and reinforcing steel must be at least two inches.

32.3.08 PLACING CONCRETE

A. Vibrators must be manipulated so as not to displace reinforcement or forms.

32.3.09 DEFECTIVE WORK

A. Concrete placed prior to the Engineer's approval of reinforcing is subject to removal at no additional cost to the Owner.

B. The Contractor shall correct any defective work with regard to reinforcement and its placement prior to the casting of the concrete.

END OF SECTION

SECTION 32 0528 – CAST-IN-PLACE CONCRETE

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes work for the construction of various cast-in-place concrete.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ACI American Concrete Institute

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 25	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 26	CONCRETE FORMING
SECTION 32 05 27	CONCRETE ACCESSORIES
SECTION 32 05 28	CONCRETE REINFORCING
SECTION 32 05 29	STRUCTURAL CONCRETE
SECTION 32 05 30	CONCRETE FINISHING
SECTION 32 05 31	CONCRETE CURING

31.1.04 SUBMITTALS

A. Shop drawings and product data must be submitted for concrete, reinforcing bars, expansion material, and other pertinent items in accordance with SUBMITTAL PROCEDURES of these Specifications.

B. The Contractor shall submit proposed construction joints and contraction joints. Any differences from those indicated on the Drawings must be noted.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Only approved materials, conforming to the requirements of these Specifications will be used in the work.

31.2.02 CLASSIFICATION

A. These Specifications divide the concrete into five classes as follows:

CLASS	COMPRESSIVE STRENGTH AT 28 DAYS (psi)
AAA	4500
AA	4000
A	3500
B	3000
C	2500
CLSM	60

B. All concrete must be air entrained unless noted otherwise or approved by the Owner's Representative.

C. Concrete to be used for any item of work must be of the 4000-psi class as shown above unless noted otherwise.

D. Concrete from the 4000-psi and the 4500-psi classes as shown above must have a minimum cement content of six (6) sacks per cubic yard.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall furnish all labor, materials and services necessary for the completion of all work as shown on the Drawings and specified herein. All work will be subject to the review of the Owner's Representative.

31.3.02 MATERIALS STORAGE

A. All materials must be stored and handled in a manner to insure the preservation of their quality and fitness for use and which protects them from dampness, damage, and freezing.

31.3.03 EMBEDDED ITEMS

A. Before placing concrete, any items that are to be embedded must be firmly and securely fastened in place as indicated.

B. Embedded items must be clean and free from rust, scale, oil, or any foreign matter.

C. The embedding of wood must be avoided.

D. The concrete must be consolidated around and against embedded items.

E. Clear cover between embedded items and reinforcing steel must be at least two inches.

F. All Subcontractors whose work is related to, embedded in, or supported by the concrete, shall be given ample notice and opportunity to furnish and/or incorporate their work before the closing of the forms and placement of concrete.

31.3.04 PLACING CONCRETE

A. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed therein.

B. All concrete must be placed during daylight, unless otherwise approved.

C. The concrete must not be placed until the depth and character of the foundation, the adequacy of forms and falsework, and the placing of steel reinforcement have been reviewed by the Owner's Representative.

D. Concrete must be placed as soon as practical after mixing, and no later than 90 minutes after water has been added to the mix, unless otherwise approved by the Engineer with consideration of admixtures used.

1. No water may be added after 60 minutes.

E. The method and manner of placing will be such to avoid segregation and displacement of the foundation, forms, and reinforcement.

1. Troughs, pipes, and chutes must be used as an aid in placing concrete when necessary.

2. Dropping the concrete a distance of more than five (5) feet, or depositing a large

quantity at one point, will not be permitted.

F. Concrete must be placed upon clean surfaces, free from running water, or upon properly consolidated damp soil.

G. All concrete must be consolidated by suitable mechanical vibrators.

1. When necessary, vibrating may be supplemented by hand spading with suitable tools to assure proper and adequate consolidation.

2. Vibrators must be manipulated so as not to displace reinforcement or forms.

3. The vibration at any point must be of sufficient duration to accomplish consolidation but shall not be prolonged to the point where segregation occurs.

4. Vibrators must not be used to level or otherwise relocate concrete.

5. The use of vibrating screeds will not be considered an adequate means of providing consolidation of concrete flatwork, regardless of concrete thickness. Flat work concrete must be consolidated by means of a concrete vibrator.

H. Any relocation or leveling of concrete must be done with shovels or rakes in a manner so as to minimize the potential for segregation.

I. Concrete deposited under water must be carefully placed in a compact mass in its final position by means of a tremie, a closed bottom dump bucket, or other approved method and must not be disrupted after being deposited.

J. A delay, at least until the concrete in columns and walls is no longer plastic, must occur before casting or erecting beams, girders, or slabs supported on them.

K. Beams, girders, brackets, column capitals and haunches will be considered as part of the slab system and must be placed monolithically with the slab.

31.3.05 CONSTRUCTION JOINTS

A. The layout of construction joints must be approved by the Owner's Representative prior to commencement of the concrete work.

B. Where construction joints are shown on the Drawings, they will be included in the work unless noted otherwise.

C. When the placing of concrete is suspended, provisions must be made for joining future work before the placed concrete takes its initial set.

1. For the proper bonding of old and new concrete, provisions must be made for grooves, steps, keys, dovetails, reinforcing bars, or other devices as may be prescribed.

D. The work must be arranged so that a section begun on any day will be finished during daylight of the same day.

E. Before depositing new concrete on or against concrete which has been hardened, the surface of the hardened concrete must be cleaned, and thoroughly coated with a latex bonding agent.

F. Beams, girders, or slabs supported by columns or walls must not be cast or erected until concrete in the vertical support member is no longer plastic.

G. Construction joints in floors must be located near the middle of spans of slabs, beams, or girders, unless a beam intersects a girder at the middle location, in which case joints

in the girders must be offset a distance equal to twice the width of the beam.

H. Provisions, subject to the approval of the Owner's Representative, must be made for transfer of shear and other forces through the construction joint.

31.3.06 ISOLATION AND EXPANSION JOINTS

A. Isolation and expansion joints must extend the full depth and should only be constructed to isolate fixed objects abutting or within the paved area.

B. Pre-molded filler must be cut to the same shape as that of the surfaces being joined.

C. Filler must be fixed firmly against the surface of the concrete already in place in such a manner that it will not be displaced when concrete is deposited against it.

31.3.07 CONTRACTION (CONTROL) JOINTS

A. The layout of contraction joints must be approved by the Owner's Representative prior to commencement of the concrete work.

B. Contraction joints must be tooled or sawn at the locations shown on the Drawings, and as directed by the Owner's Representative. Joint spacing must not exceed 30 times the concrete thickness with a maximum spacing of 15 feet.

C. Angles less than 60-degrees must be avoided by offsetting at least 1.5 feet perpendicular to the adjoining joint.

D. The depth of the joints must be at least 1.5 inches but no deeper than within 0.5 inch of the reinforcing steel.

E. Joint width must be as shown on the Drawings and as specified herein to accommodate joint filler material if specified.

1. Technical Provisions

a. Reserved.

F. Sawn contraction joints must be installed within 24 hours of termination of the moist cure.

G. Sawing performed during the moist curing period must be conducted in a manner that minimizes the interruption of the moist cure.

31.3.08 TESTING

A. Testing for concrete must be performed in accordance with SECTION 32 05 23 – COMMON WORK RESULTS FOR CONCRETE of these Specifications.

B. Slump of the concrete must fall within the following ranges:

Slab on grade	2 to 4 inches
Pavements	1 to 2 inches

31.3.09 CLEANUP

A. As work progresses, the Contractor shall remove debris, excess concrete, and complete to finish grade each portion of the work. Once the work is complete, the Contractor shall clear debris and finish the entire site to smooth, uniform slopes presenting a neat and workmanlike appearance.

B. Cleanup will include the removal and disposal of all unsuitable/excess materials.

C. Concrete waste material must be disposed of at a suitable location designated by the Contractor. The Contractor may furnish a concrete waste disposal container for onsite use at no expense to the Owner. Local, state, and federal regulations for disposal must be upheld.

31.3.10 DEFECTIVE WORK

A. Any defective work disclosed after the forms have been removed must be immediately removed and replaced.

B. If any dimensions are deficient, or if the surface of the concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Owner's Representative cannot be repaired satisfactorily, the entire section must be removed and replaced at no additional expense to the Owner.

END OF SECTION

SECTION 32 0529 – CONCRETE FINISHING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification consists of finishing concrete constructed in accordance with these Specifications and placed at the locations shown on the Drawings.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 23 COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 28 CAST-IN-PLACE CONCRETE

31.1.04 SUBMITTALS

A. The Contractor must submit shop drawings and product data in accordance with SUBMITTAL PROCEDURES for concrete finishing products.

PART 2 PRODUCTS

31.2.01 RESERVED

A. Technical Provisions

1. Reserved.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall furnish all labor, materials, and services necessary for the completion of all work as shown on the Drawings and specified herein. All work will be subject to the review of the Owner's Representative.

31.3.02 SURFACE FINISH

A. All exposed concrete surfaces must be true, smooth, free from open or rough spaces, depressions, or projections.

B. All exposed concrete must be float finished on all surfaces unless otherwise shown on the Drawings.

C. Within 24 hours after form removal, all fins and irregular projections must be removed from all concrete surfaces.

D. All form ties must be removed without causing spalling or damage to the concrete.

E. Tining - Run a clean metal tine longitudinally along the approach slab. Begin tining 6 inches from the beginning and ending of the approach slab. Stop tining 24 inches from the face of barrier and curb. The tine may be hand-operated. Use a tine that provides

grooves that are 1/8 inch in width (±1/64 inch) and 1/8 inch in depth (±1/64 inch) with a center to center spacing of 3/4 inch.

F. Concrete surfaces, which are to be exposed, waterproofed, damp proofed, painted, or coated with concrete surface finishes must be finished as follows:

1. Cavities resulting from form tie removal, sand pockets, honeycombing and all other holes greater than 1/2-inch in any direction must be cleaned, saturated with water, and completely filled with mortar consisting of one-part cement and two parts fine sand.

2. All depressions and voids must be filled so as to allow painting or coating with damp proofing compounds to be applied without undue difficulty in covering or filling remaining voids.

31.3.03 MATERIALS STORAGE

A. All materials must be stored and handled in a manner ensure the preservation of their quality and fitness for use and which protects them from dampness, damage, and freezing.

31.3.04 CURING AND PROTECTION

A. The Contractor shall be responsible for verifying that curing compounds and methods are compatible with the concrete surface finisher and floor finishes.

31.3.05 DEFECTIVE WORK

A. Any concrete that is not finished as specified herein must be immediately removed and replaced at no additional cost to the Owner.

SCHEDULE 32 05 29

CONCRETE FINISHES

DESCRIPTION/LOCATION	SURFACE FINISH
Exterior slabs, curbs and gutter	Broomed

END OF SECTION

SECTION 32 0530 – CONCRETE CURING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification consists of protecting and curing concrete constructed in accordance with these Specifications and placed at the locations shown on the Drawings.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM C140	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C642	Standard Test Method for Density, Absorption, and Voids in Hardened Concrete

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 23	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 28	CAST-IN-PLACE CONCRETE

31.1.04 SUBMITTALS

A. The Contractor must submit shop drawings and product data in accordance with SUBMITTAL PROCEDURES for concrete curing products.

PART 2 PRODUCTS

31.2.01 LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE

A. The Contractor shall furnish liquid membrane-forming compound meeting the requirements of ASTM C309, Type 1 or Type 2.

B. The curing compound must be free from permanent color that would change the color of the natural concrete. The concrete surface must maintain its natural color after curing.

31.2.02 EMULSIFIED LINSEED OIL COMPOUND

A. All requirements of ASTM C309 must be met. The compound must contain at least 2.7 pounds of linseed oil per gallon. A manufacturer's certification showing that the formulated weight of linseed oil per gallon equals or exceeds this limit must be furnished to the Engineer.

PART 3 EXECUTION

31.3.01 GENERAL

A. The Contractor shall furnish all labor, materials, and services necessary for the completion of all work as shown on the Drawings and specified herein. All work will be subject to the review of the Owner's Representative.

B. The Contractor shall thoroughly cure concrete surfaces subject to premature drying by covering as soon as possible with canvas, plastic sheets with sealed joints, burlap and sand, or other satisfactory materials and keep concrete moist. If the concrete surfaces are not covered, they must be kept moist by flushing or sprinkling. Curing must continue for at least 7 days after placing the concrete. Concrete surfaces placed against forms may be cured by leaving the forms in place for at least 7 days, when approved.

C. Concrete must be protected against freezing or other conditions detrimental to strength development meeting the applicable requirements of this Specification.

D. To aid finishing, side forms on ornamental work, curbs, and sidewalks, railing and parapets may be removed after 12 hours, not to exceed 48 hours, depending on weather conditions. Moist curing must continue during the concrete finishing operation.

E. Untreated forms and existing concrete must be kept continuously wet for at least 1 hour before any concrete is placed and kept wet until covered with concrete. Adequately treated forms must be thoroughly washed with a water spray immediately before placing the concrete.

F. The work must be protected from natural elements, flowing water and from defacement of any type.

G. The curing of concrete, by either water curing or membrane curing, must be as included herein unless otherwise approved by the Engineer.

31.3.02 MATERIALS STORAGE

A. All materials must be stored and handled in a manner to ensure the preservation of their quality and fitness for use and which protects them from dampness, damage, and freezing.

31.3.03 WATER CURING

A. The Contractor shall keep all concrete top surfaces continuously moist after finishing, with a fine water spray, until the concrete has set. The moist concrete must be covered with water or an approved curing covering.

B. Concrete deck slabs and concrete floors must be cured for at least 7 days. Cure may be achieved by placing burlap, cotton mats or other absorptive material as close behind the finishing operation as possible without marring the finished surface. The absorptive material must be kept continuously moist for the full time it is used. The absorptive material may be kept in place for the entire curing period, or it may be removed as soon as practical and the entire surface covered with approximately 1-1/2 inches of sand, kept continuously moist for the entire curing period.

C. When it becomes necessary to remove forms and repair surface irregularities, it must be accomplished without interfering with any of the curing requirements. As soon as the vertical forms have been removed and the surface irregularities repaired, the concrete with absorptive material must be covered and kept continuously wet for the balance of the curing a period.

31.3.04 IMPERVIOUS MEMBRANE CURING

A. The Contractor shall assure membrane curing compounds are delivered to the job in the manufacturer’s original container, clearly labeled to show the name of the manufacturer and the contents.

B. The compound must be ready for use as shipped by the manufacturer. Dilution must be as per the manufacturer's recommendations. Sampling will not be required if manufacturer's certification is available. Curing compound must be applied under pressure with a spray nozzle to cover the entire exposed surface thoroughly and completely with a uniform film not exceeding manufacturer's specifications. The required pressure in the spray machine must be maintained to force the material to leave the nozzle in a fine mist. All concrete surfaces must be kept moist with a fine water spray or with wetted burlap until the sealing compound is applied. The curing compound application must be kept close to the finishers of the top surface of concrete at all times. The concrete must be sealed immediately after the finishing operations have been completed, to the satisfaction of the Engineer.

C. If it is necessary to allow workers or equipment on the surface before the 7-day curing period is completed, the top surface of sealed concrete must be covered with a protective cushion for runways. A cushion must be used consisting of a moist, 1-inch minimum thick layer of fine sand, or layers of moist burlap that will prevent damage to the finished concrete. The approved cushion must be covered with four-foot by eight-foot sheets of 3/4-inch plywood laid over the cushion. The cushion material must not be placed for at least 8 hours after the final application of the curing compound. The Engineer's written approval must be obtained for any other proposed cushion material before use. Layers of plastic, visqueen, or canvas are not acceptable cushion materials.

D. Concrete, which has not completed its curing period, must be kept continuously moist during the stripping and surface repair operations. All surface irregularities must be removed and all depressions, voids, or holes, including those formed by trapped air must be repaired to the satisfaction of the Engineer. The curing compound must be applied immediately before the surface has had an opportunity to dry out. Concrete, from which forms have been stripped, must be kept continuously moist until surface repair and finishing are completed, and the impervious membrane curing has been applied.

31.3.05 DEFECTIVE WORK

A. Any concrete that is not cured and protected as specified herein must be immediately removed and replaced at no additional cost to the Owner.

END OF SECTION

SECTION 32 1113 – SUBGRADE MODIFICATIONS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes subgrade modification to repair soft areas of the subgrade in areas to receive aggregate base or surface course and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCED SPECIFICATIONS

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 31 23 00	EXCAVATION AND FILL
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 32 11 23	AGGREGATE BASE COURSES

PART 2 PRODUCTS

31.2.01 REPLACEMENT MATERIAL

A. Replacement material for sub-excavations shall consist of:

1. Aggregate base material conforming to the requirements of SECTION 32 11 23 – AGGREGATE BASE COURSES of these Specifications, or;
2. Suitable aggregate materials from within the project limits as determined by the Engineer, or;
3. Imported pitrun gravel meeting the following gradation requirements:

Sieve Opening	% Passing
3 – inch	100
No. 4	25 - 60
No. 200	12 Max

PART 3 EXECUTION

31.3.01 GENERAL

A. Unstable sections of the subgrade shall be repaired by the Contractor after the existing base or surface courses have been removed.

B. Soil is unsuitable if, in the opinion of the Engineer, it contains excessive organics, refuse, construction debris, or other objectionable material; or if it is unstable, rutting or yielding; or if it contains excessive moisture. Generally, soils will be sub-excavated and replaced only if they are unable to adequately support equipment typically used for excavation and soil transport.

1. The Contractor shall report to the Engineer any discovered areas believed to be unsuitable.

2. The Contractor shall proof-roll suspect areas to determine the extents of unstable subgrade, as requested by the Engineer.

C. Subgrade modification as described herein shall be performed at locations of unstable subgrade and as directed by the Engineer.

1. The Contractor shall sub-excavate below the subgrade for its full width as may be necessary to remove any saturated or unstable materials, according to SECTION 31 23 00 – EXCAVATION AND FILL of these Specifications.

a. This shall include the excavation of saturated/unsuitable material to a minimum depth of six (6) inches determined by the Engineer.

b. The Contractor shall assure the Engineer has measured the area where unstable materials have been removed before backfilling. Any area where unstable foundation soils have been excavated shall not be backfilled until authorized by the Engineer. Backfill placed without approval may be ordered removed and replaced at Contractor expense.

2. The excavated saturated/unsuitable material shall be replaced with aggregate material approved by the Engineer.

3. Compaction shall be performed in accordance with the provisions of SECTION 31 05 00 – GENERAL WORK RESULTS FOR EARTHWORK of these Specifications.

4. The resulting grade and cross section shall consist of a smooth subgrade surface conforming to the prescribed elevations for the particular subgrade being prepared, prior to constructing an additional course thereon.

D. When a geotechnical report is provided, and the provisions contained within the geotechnical report are more stringent than those contained in this Section, the provisions of the geotechnical report shall govern.

31.3.02 TESTING

A. Testing shall be performed in accordance with the provisions of General Notes, SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK, and SECTION 32 05 00 – COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS of these Specifications.

END OF SECTION

SECTION 32 1123 – AGGREGATE BASE COURSES

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification shall include all base course aggregate in parking and roadway areas and all work included thereto, as shown on the Drawings and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

31.1.04 SUBMITTALS

A. Shop drawings shall be submitted for the aggregate base courses in accordance with submittal procuderes of these Specifications. The following information shall be supplied:

1. Name and location of the supply pit
2. Gradation reports showing, at a minimum, the percent passing the critical sieves for the aggregate type as shown in Table 816-01 of the NDDOT Specifications
3. Report of the Plasticity Index (PI) determined in accordance with test ND T 90 “Determining the Plastic Limit and Plasticity Index of Soils”
4. Report of the Shale Content as determined by ND T 113
5. Report of the LA Abrasion as determined by AASHTO T 96
6. Percent of material retained on the No. 4 sieve having at least 1 fractured face (or 2 fractured faces for Class 7 aggregates) as determined by NDDOT 4

B. The Contractor shall submit all haul tickets at the end of each day material is delivered on site which shall contain the following information:

1. Contractor’s Name
2. Name of Product
3. Street or Location Being Hauled to
4. Class of Material
5. Tonnage
6. Date Hauled
7. Pit Name

PART 2 PRODUCTS

31.2.01 GENERAL

A. The aggregate shall be installed and maintained smooth and compacted to the lines and grades shown on the Drawings.

31.2.02 AGGREGATE FOR BASE CONSTRUCTION

A. The aggregate for base construction shall consist of sound, durable particles of gravel or sand, which may include limited quantities of fine soil particles as binding material.

B. The aggregate for base construction shall be free of any deleterious or organic material.

C. The aggregate for base construction shall be of the type specified in the Drawings in conformance with Table 816-01 of the NDDOT Specifications.

D. Salvaged base course shall not be used unless otherwise noted on the Drawings or approved by the Owner’s Representative.

E. Technical Provisions

1. Reserved.
2. Salvaged base course as Specified in Section 817 of the NDDOT Specifications will be permitted on this Project.

PART 3 EXECUTION

31.3.01 PLACEMENT AND COMPACTION

A. Aggregate base construction shall be in accordance with Section 302 of the

NDDOT Specifications unless otherwise specified herein.

B. The aggregate shall not be placed until the subgrade has meet the compaction, moisture, grade, and all other requirements included in these Specifications and in any geotechnical report included the specifications.

C. The aggregate shall be compacted by means sufficient to achieve the required density.

D. In addition to the density requirements, compaction shall continue until no rutting or displacement occurs under the roller operation.

E. The prescribed elevation for any point on the base course surface where measurement is made shall be as determined from the grades shown on the Drawings or as directed by the Owner's Representative within 0.05 feet.

31.3.02 LIMITATIONS

A. No material shall be placed on frozen subgrade.

B. The material shall be spread within 48 hours of placement.

31.3.03 TESTING

A. The Contractor shall retain the services of an independent testing company to test the base course as specified below.

B. All areas that fail any of the required tests shall be corrected at the Contractor's expense.

1. The Contractor shall have the areas retested to demonstrate that adequate compaction has been obtained.

2. The Contractor shall bear the cost of retesting and no reimbursement shall be made therefor.

C. The tests shall be conducted at random locations determined by the testing company.

D. Gradation:

1. Three gradation samples shall be collected from each 1,000 tons of material placed except when more than 1,000 tons are placed in a single day. When more than 1,000 tons are placed in a single day, only three samples shall be collected that day.

2. The average of the three gradations shall be considered representative of the

1,000 tons or material placed that day.

E. Miscellaneous Properties:

1. Three samples shall be collected from each 10,000-ton lot of material. If a fractional lot is less than 2,500 tons, it will be included in the previous lot.

2. The miscellaneous properties to be tested are the shale content in accordance with ND T 113, Fractured Faces in accordance with NDDOT 4, and Plasticity Index in accordance with ND T 90.

3. If Table 816-01 of the ND/DOT Specifications does not include a requirement for one or more of these properties for the class of aggregate tested, that property does not need to be tested.

4. The average of the three samples shall be considered representative of the entire lot.

F. Density and Moisture:

1. The density and moisture content of the base course shall be tested a minimum of once every 3,000 SY.

2. Unless otherwise noted on the Drawings or within any geotechnical report the base course shall be compacted to 95% of the maximum dry density with a moisture content of ±3% in accordance with ASTM D698.

END OF SECTION

SECTION 32 1313 – RIGID PAVING CONCRETE

PART 1 GENERAL

32.1.01 DESCRIPTION

A. This Specification includes work for the concrete paving.

32.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ACI	American Concrete Institute
NDDOT	2024 Construction Specifications

32.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 32 05 25	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 26	CONCRETE FORMING
SECTION 32 05 27	CONCRETE ACCESSORIES
SECTION 32 05 28	CONCRETE REINFORCING
SECTION 32 05 29	STRUCTURAL CONCRETE
SECTION 32 05 30	CONCRETE FINISHING
SECTION 32 05 31	CONCRETE CURING

32.1.04 SUBMITTALS

A. Shop drawings and product data must be submitted for concrete, reinforcing bars, expansion material, and other pertinent items in accordance with SUBMITTAL PROCEDURES of these Specifications.

B. The Contractor shall submit proposed construction joints and contraction joints. Any differences from those indicated on the Drawings must be noted.

C. The contractor shall submit a plan to the engineer which will include paving plan, staging and phasing, and a joint layout plan.

PART 2 PRODUCTS

32.2.01 GENERAL

A. Concrete from the 4000-psi and the 4500-psi classes as shown above must have a minimum cement content of six (6) sacks per cubic yard.

32.2.02 WATER-CEMENT RATIO

A. Follow NDDOT Specification 550.

PART 3 EXECUTION

32.3.01 GENERAL

A. Follow NDDOT Specification 550 for construction methods, mix design requirements, quality control testing.

END OF SECTION

SECTION 32 1613 – CURBS AND GUTTERS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification includes concrete curb and gutter, and all work incidental thereto, as shown on the Plans and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 22 19	MEASUREMENT AND PAYMENT
SECTION 01 33 00	SUBMITTAL PROCEDURES
SECTION 03 05 00	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR SITE IMPROVEMENTS

31.1.04 SUBMITTALS

A. The Contractor shall submit product data for the following to the Engineer in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES:

1. Concrete Mix Design
2. Expansion Joint Materials
3. Curing Compounds

PART 2 PRODUCTS

31.2.01 CONCRETE

A. All concrete for curb and gutter shall be of the 4000-psi class as specified in SECTION 03 30 00 – CAST-IN-PLACE CONCRETE.

31.2.02 EXPANSION JOINT MATERIALS

A. Expansion joint materials shall conform to the requirements of SECTION 03 15 00 – CONCRETE ACCESSORIES of the Specifications.

31.2.03 CURING COMPOUNDS

A. Curing compound materials shall conform to the requirements of SECTION 03 39 00 – CONCRETE CURING of the Specifications.

PART 3 EXECUTION

31.3.01 CONCRETE CURB AND GUTTER

A. All concrete curb and gutter shall be constructed to the alignment and grades shown on the Drawings.

1. Curb and gutter shall match into existing curb and gutter.
2. Preparation of the subgrade shall be included in the price bid for curb and gutter and no additional compensation will be made therefor.
3. Foundation shall be excavated, shaped, and compacted to a firm, uniform bearing surface, conforming to the planned section and established grade.
4. Unsuitable subgrade soils shall be removed and replaced as specified in SECTION 31 23 13 – SUBGRADE PREPARATION.

B. Expansion joints:

1. Transverse expansion joints shall be placed at the ends of all curved sections, and at the ends of the curved portions of entrance and street returns.
2. Transverse expansions joints shall be placed at a minimum spacing of 150 feet.
3. Longitudinal expansion joints shall be placed as shown in the Drawings.
4. Expansion joints with filler material shall also be placed at locations where the concrete surrounds or adjoins any existing fixed objects such as fire hydrants, building foundations, and other rigid structures.

C. Contraction joints:

1. Contraction joints shall be provided at ten (10) foot intervals in curb or curb and gutter construction except as otherwise shown in the Plans.

2. Contraction joints shall generally be formed to the full depth of the concrete, using 1/8-inch-thick removable inserts conforming to the cross sectional shape of the concrete.

3. Where practicable, such as in driveway pavement or where a curb machine is used, the contraction joints may be formed or sawed as approved by the Owner's Representative to a depth of at least two (2) inches from all exposed surfaces.

D. Joints shall be constructed perpendicular to the subgrade and shall align with similar joints in adjoining work when practicable.

E. Transverse joints, if necessary, shall be placed at right angles to the longitudinal axis of the work unless otherwise indicated on the Drawings.

F. Placement of the curb and gutter may be performed with a slip form machine or by fixed forms.

G. The finish of the surface shall be struck with a light broom perpendicular to the length of the curb and gutter.

H. All concrete curb and gutter shall be cured with a liquid membrane curing compound as specified for slip formed curb and gutter.

1. All surfaces including the back of the curb shall be coated with curing compound conforming to SECTION 03 39 00 – CONCRETE CURING.

31.3.02 BACKFILLING

A. Backfill shall be placed behind the curb and gutter in a manner that will not cause displacement of the section nor damage to the exposed edges.

B. All damaged curb and gutter shall be replaced at the Contractor's expense.

31.3.03 TESTING

A. Testing of the curb and gutter shall be in accordance with SECTION 03 05 00 – COMMON WORK RESULTS FOR CONCRETE of these Specifications.

31.3.04 FINISHING

A. Finishing of the curb and gutter shall be in accordance with SECTION 03 35 00 – CONCRETE FINISHING of these Specifications.

END OF SECTION

SECTION 32 1623 – SIDEWALKS AND DRIVEWAYS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification shall include all concrete sidewalks, driveway approaches, and all work included thereto, as shown on the Plans and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 22 19	MEASUREMENT AND PAYMENT
SECTION 01 33 00	SUBMITTAL PROCEDURES
SECTION 03 05 00	COMMON WORK RESULTS FOR CONCRETE
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR SITE IMPROVEMENTS

31.1.04 SUBMITTALS

A. The Contractor shall submit product data for the following to the Engineer in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES:

1. Concrete Mix Design
2. Expansion Joint Materials
3. Concrete Curing Compounds
4. Detectable Warning Panels

PART 2 PRODUCTS

31.2.01 CONCRETE

A. All concrete for pavements, driveways and walks shall be of the 4000-psi class as specified in SECTION 03 30 00 – CAST-IN-PLACE CONCRETE.

31.2.02 EXPANSION JOINT MATERIALS

A. Expansion joint materials shall conform to the requirements of SECTION 03 15 00 – CONCRETE ACCESSORIES of the Specifications.

31.2.03 CURING COMPOUNDS

A. Curing compound materials shall conform to the requirements of SECTION 03 39 00 – CONCRETE CURING of the Specifications.

31.2.04 DETECTABLE WARNING PANELS

A. The detectable warning panels shall have a minimum size of 2 foot by 4 feet.

B. The panels shall be safety yellow color throughout the panel and consist of a surface of truncated domes aligned in a square grid pattern.

C. The truncated domes shall be aligned on a square grid in the predominant direction of travel.

D. The truncated domes shall have a base diameter of 0.9-inches to 1.4-inches with a top diameter between 50 and 65 percent of the base diameter. The height of the truncated domes shall be 0.2-inches. The truncated domes shall have a center-to-center spacing of 1.6-inches to 2.4-inches and a base-to-base spacing of at least 0.65-inches measured between adjacent domes on the square grid.

E. Technical Provisions

1. Reserved.

2. The detectable warning panels shall be as manufactured by:

a. ADA Arcis Tactile

b. Armor-Tile Tactile Systems by Engineered Plastics, Inc.

c. Detectable Warning Paver by Hanover Architectural Products

d. ADA Solutions, Inc.

e. Or Approved Equal.

PART 3 EXECUTION

31.3.01 CONCRETE SIDEWALKS

A. The sidewalk foundation shall be excavated, shaped, and compacted in accordance with SECTION 31 23 13 – SUBGRADE PREPARATION to a firm, uniform bearing surface, conforming to the planned section and established grade.

1. Unsuitable subgrade soils shall be removed and replaced as specified herein.

2. Unless otherwise specified on the Drawings, a minimum of 6 inches granular material shall be furnished, placed, and compacted thoroughly below the sidewalks. The granular material shall meet the requirements as specified in SECTION 32 11 23 – AGGREGATE BASE COURSES of these Specifications.

B. The concrete shall be placed in forms and consolidated without causing segregation.

1. The finished surface shall not vary more than 3/16-inch from a 10-foot straight edge and the formed edges shall not vary more than 1 inch from the required location.

C. Joints:

1. Joints in sidewalks shall divide the surface into panels of uniform size.

2. The panels shall be square where practical.

3. Joints shall be perpendicular to the finished surface.

4. Panels shall not have an area in excess of 36 square feet.

5. Joints shall all align with like joints in adjacent work unless the concrete is separated with no less than 1/2-inch of expansion joint filler material.

6. All joints and edges shall be rounded with a 1/2-inch radius-edging tool.

D. Expansion joints:

1. Expansion joints shall be a minimum of 1/2-inch thickness.
2. Expansion joint material shall extend the full width and depth of the concrete.
3. Traverse expansion joints shall be placed at driveways and at a minimum spacing of 50 feet.
4. Longitudinal expansion joints shall be placed as shown in the Drawings.
5. Expansion joints with filler material shall also be placed at locations where the concrete surrounds or adjoins any existing fixed objects such as fire hydrants, building foundations, and other rigid structures.

E. Contraction joints:

1. Contraction joints shall be provided at five (5) foot intervals in sidewalk construction except as otherwise shown in the Plans.
2. Contraction joints shall extend to at least 1/4 the concrete thickness and shall be approximately 1/8-inch wide.

F. All exposed surfaces of concrete pavements, walks and driveways shall receive a broomed finish as specified in SECTION 03 35 00 – CONCRETE FINISHING of these Specifications.

G. All exposed surfaces of concrete pavements, walks and driveways shall be cured with a liquid curing compound as specified in SECTION 03 39 00 – CONCRETE CURING of these Specifications.

31.3.02 BACKFILLING

A. Backfill shall be placed along the edges of completed sidewalks in a manner that will not cause displacement of the section nor damage to the exposed edges.

B. All damaged sidewalks shall be replaced at the direction of the Owner's Representative at the Contractor's expense.

31.3.03 TESTING

A. Testing of the sidewalks shall be in accordance with SECTION 03 05 00 – COMMON WORK RESULTS FOR CONCRETE of these Specifications.

31.3.04 FINISHING

A. Finishing of the sidewalks shall be in accordance with SECTION 03 35 00 – CONCRETE FINISHING of these Specifications.

END OF SECTION

SECTION 32 1723 – PAVEMENT MARKINGS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. The work covered under this Specification includes painted markings applied to asphalt or concrete pavement, and all work incidental thereto, as shown on the Plans and as specified herein.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 01 11 00	SUMMARY OF WORK
SECTION 01 22 19	MEASUREMENT AND PAYMENT
SECTION 01 33 00	SUBMITTAL PROCEDURES
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

31.1.04 SUBMITTALS

A. Product Data: For each type of product

1. Include technical data and tested physical and performance properties.

B. Shop Drawings:

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.

2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, eight inches square.

D. All requirements for materials and workmanship must follow section 762 of the 2023 NDDOT Standard Specifications for Road and Bridge Construction.

31.1.05 PREINSTALLATION MEETINGS

A. A preinstallation meeting will be held on job site with the Owner's Representative, the Contractor, and any relevant Subcontractors. The purpose of the meeting will be to review methods and procedures related to marking pavement including, but not limited to, the following:

1. Pavement aging period before application of pavement markings.

2. Protection of pavement markings, including restriction of traffic during the installation period.

PART 2 PRODUCTS

31.2.01 PAVEMENT MARKING PAINT

A. Construction materials must follow section 880 of the 2024 NDDOT Standard Specifications for Road and Bridge Construction.

PART 3 EXECUTION

31.3.01 PAVEMENT MARKINGS

A. Construction requirements must follow section 762.04 of the 2024 NDDOT Standard Specifications for Road and Bridge Construction.

END OF SECTION

SECTION 32 9113 – SOIL PREPARATION

PART 1 GENERAL

32.1.01 DESCRIPTION

A. The work covered under this Specification includes topsoil installation, source, classification, and all work incidental thereto, as shown on the Drawings and as specified herein.

32.1.02 REFERENCES

A. Reserved.

32.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS

32.1.04 SUBMITTALS

A. The Contractor shall submit product data for the following to the Engineer in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES:

1. Imported Topsoil Analysis.
2. Topsoil Source.
3. Noxious Weed Free Status.

PART 2 PRODUCTS

32.2.01 TOPSOIL CLASSIFICATION AND FERTILITY

A. Topsoil Classification: Provide imported topsoil with a textural classification of loam, sandy loam, or silty loam.

B. Imported Topsoil Fertility: Provide imported topsoil that is sufficiently fertile to sustain normal healthy plant growth. Amendments and fertilizers may be required to allow the topsoil to meet these requirements and shall be incorporated into all topsoil fill by rototilling or other approved means.

Parameter	Minimum	Maximum	Optimal
pH	5.5	8.4	6.5
Nitrates (mg/kg)	1.0	150	20
Organic Matter (%)	1.0	10.0	>3.0
Olsen Phosphorus (mg/kg)	1.0	150	>50
Potassium (mg/kg)	100	1,500	>500
Sodium (meq/100g)	n/a	2.0	<1.0
Calcium (meq/100g)	0.2	5.0	>0.3
Sulfate (mg/kg)	1.0	1,500	>20
Conductivity (mmhos/cm)	n/a	2.0	<1.0
Lime (qualitative)	n/a	Moderate	Slight

32.2.02 TOPSOIL SOURCE

A. Surface Soil Stockpiled On-site: Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps and other extraneous materials harmful to plant growth.

B. Imported Topsoil: Import topsoil when sufficient quantities cannot be retained from the site. Do not obtain topsoil from wetland areas. Imported topsoil must be free of stones one inch or larger in any dimension and free of other extraneous materials or construction debris that is harmful to plant growth.

PART 3 EXECUTION

32.3.01 FINISH GRADING

A. Perform finish grading operations prior to topsoil placement in accordance with SECTION 31 22 19 – FINISH GRADING of these Specifications.

32.3.02 TOPSOIL DEPTH

A. Seeding Areas: Provide a 6-inch depth of topsoil in all areas to receive seed.

1. Surface Soil Stockpiled On-site: Spread 5 inches of stockpiled topsoil and 1 inch of compost. Rototill compost into stockpiled topsoil for a total seed bed profile of 6 inches.

2. Imported Topsoil: Provide a 6-inch depth of imported topsoil in all areas to receive seed.

32.3.03 TOPSOIL INSTALLATION

A. Tree Pits: Provide stockpiled or imported topsoil as backfill material in all tree pits.

B. Spread excess topsoil to provide gentler slopes or remove from the site as directed by the Owner or the Owner's Representative.

C. Topsoil must be left in a condition such that seeding or sodding can be accomplished with minimal soil preparation or tillage.

32.3.04 COMPACTION

A. Compact all areas to receive seed or plantings to 90 percent proctor density.

32.3.05 CLEANUP

A. All topsoil stockpiles areas must be restored to their original condition as incidental work unless otherwise specified.

END OF SECTION

SECTION 33 0110.58 – DISINFECTING OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

33.1.01 DESCRIPTION

A. This Specification includes the disinfection of all raw water and potable water utilities including fittings, valves, mains and service lines, appurtenant equipment, and all work included thereto as shown on the Drawings and specified herein.

33.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AWWA C651	Disinfecting Water Mains
ANSI/NSF 61	Municipal Drinking Water System Components

33.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 33 01 12	INSPECTION AND TESTING OF WATER UTILITIES
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 14 13	PUBLIC WATER UTILITY DISTRIBUTION PIPING
SECTION 33 14 19	VALVES AND HYDRANTS FOR WATER UTILITY SERVICE

PART 2 PRODUCTS

33.2.01 CHLORINE

A. Any of the following forms of chlorine can be used, subject to the approval of the Owner's Representative.

1. Liquid Chlorine
2. Sodium Hypochlorite
3. Calcium Hypochlorite

PART 3 EXECUTION

33.3.01 ACCEPTANCE

A. Each unit of completed potable water line shall be disinfected with chlorine before acceptance and being placed into service as determined by the Owner's Representative.

33.3.02 STANDARDS

A. Disinfection shall be accomplished as described herein or by the system prescribed by the American Water Works Association Standard C651.

1. The Contractor shall provide a copy of the AWWA standard C651 to the Owner's Representative for the system of disinfection used.
2. The copy of the Standard shall be returned to the Contractor upon completion of the disinfection testing.

B. After the final flushing, the water shall be tested for bacteriological quality to verify conformance with the standards prescribed by the State Department of Health/Environmental Quality.

33.3.03 PRELIMINARY FLUSHING

A. The main shall be flushed prior to disinfection except when dry chlorine compounds are placed in piping at the time of jointing.

B. If no hydrant is installed at the end of the main, a tap shall be provided large enough to affect a velocity in the main of at least 3 fps.

C. Flushing at the outlet shall be continued until the comparison of samples show no further improvements in color and turbidity.

33.3.04 CHLORINATION

A. The chlorine compounds should be added to an amount that will produce a solution of 50 to 100 parts per million (ppm) of available chlorine.

B. The following table indicates the amount of calcium hypochlorite that should be added for the respective length of pipe shown to furnish a resulting solution of 50 to 100 ppm of free chlorine.

Pipe Diameter Inches	Ounces of Granular Calcium Hypochlorite per 500 feet of pipe	No. of 5 gram Hypochlorite Tablets per 20 feet of pipe
4	0.5	1
6	1.0	1
8	2.0	2
10	3.0	3
12	4.0	4
16	8.0	7
20	8.0	10
24	8.0	14
30	8.0	22
36	8.0	32
42	8.0	43
48	8.0	56

33.3.05 CONTACT PERIOD

A. The chlorinated material shall be introduced into the water lines in a manner approved by the Owner's Representative.

B. After a contact period of not less than eight (8) and preferably twenty-four (24) hours, the system shall be flushed with clean water until the residual chlorine content is not greater than 1.0 ppm.

C. All valves except the isolation valves in the lines being disinfected shall be opened and closed several times during the contact period.

D. Minimum flushing flows shall be as follows

Pipe Diameter (Inches)	Minimum Flow Rate (GPM)
6	260
8	470
10	730

E. Should the test indicate fail to meet the prescribed standards, the Contractor shall disinfect, flush and retreat until satisfactory results are obtained.

33.3.06 COST

A. The cost of disinfection and bacteriological testing shall be included in the price bid for the water line and no additional compensation will be made therefor.

33.3.07 BACTERIA TESTING

A. Bacteriological testing of the water main shall be performed in accordance with AWWA Standard C651. Following disinfection and final flushing and before the new main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, must be collected from the new water main. At least one set of samples shall be collected from every 1,200 feet of main, plus one set from the end of the line, and at least one set from each branch.

B. The Contractor shall schedule and perform bacteriological sampling in the presence of the Engineer or Owner.

C. Tests shall be completed by a state certified lab for the State in which the project is located.

33.3.08 DISINFECTION WATER DISCHARGE

A. The discharge from the water utility disinfection work shall be treated to levels that meet the Federal and State non-degradation criteria. The Contractor is responsible for all permits, tests, and work related to meeting this requirement and this cost shall be incidental to the work. Prior to discharge, an approved reducing agent shall be applied to the water to reduce the chlorine levels to less than 0.2 ppm. The discharge shall be neutralized prior to discharging to the street or storm sewer system. The cost of neutralizing the disinfection water will be incidental to the cost of the project.

B. Technical Provisions

1. Reserved.

2. State permits may be required for de-chlorination and discharge of chlorinated disinfection water. The Contractor is advised to contact the North Dakota Department of Environmental Quality at:

North Dakota Department of Environmental Quality
Division of Water Quality
4201 Normandy Street, 3rd Floor
Bismarck, ND 58503-1324
Telephone: (701) 328-5210

END OF SECTION

SECTION 33 0112 – INSPECTION AND TESTING OF WATER UTILITIES

PART 1 GENERAL

33.1.01 DESCRIPTION

A. This Specification includes the testing of all water utility piping, fittings, appurtenances, and all work included thereto as shown on the Drawings and specified herein.

33.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ANSI/NSF 61 Municipal Drinking Water System Components

33.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 33 01 10.58	DISINFECTION OF WATER UTILITY PIPING SYSTEMS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 14 13	PUBLIC WATER UTILITY DISTRIBUTION PIPING
SECTION 33 14 19	VALVES AND HYDRANTS FOR WATER UTILITY SERVICE

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

33.3.01 GENERAL

A. Refer to SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications for provisions common to utility construction including water lines

B. Disinfection of all water lines, fittings, and appurtenances shall be achieved in conformance with the provisions of SECTION 33 01 10.58 – DISINFECTION OF WATER UTILITY PIPING SYSTEMS of these Specifications.

33.3.02 FILLING AND FLUSHING

A. Prior to testing water lines shall be filled and flushed in conformance with the provisions of SECTION 33 14 13 – PUBLIC WATER UTILITY DISTRIBUTION PIPING of these Specifications.

33.3.03 TESTING

A. Each valved section shall be subjected to the pressure and leakage tests prescribed herein.

1. The Contractor shall furnish the pump, pipe connections, gauges, and measuring equipment, and shall perform the testing under the direct observation of the Owner’s Representative.

2. Where permanent air vents are not provided, the Contractor shall furnish and install corporation stops at the high points as needed for release of air as the line is filled with water, the cost of which is included in the price bid for the water line.

B. Where concrete reaction blocking is placed, the water line shall not be subjected to hydrostatic pressure until at least 5 days have elapsed after the concrete casting.

1. This period may be reduced to 2 days where high early strength concrete is used.

C. At the option of the Engineer, the pressure and leakage tests may be conducted simultaneously.

D. Any defective joints, and any defective pipe, fittings, valves, or hydrants, revealed during the testing or before final acceptance of the work shall be satisfactorily corrected and the tests shall be repeated until the specified requirements have been met.

E. General Requirements

1. The working pressure is the maximum sustained operating pressure in the line being tested.

2. In no event shall the test pressure exceed the pressure rating of pipes, fittings, valves, thrust restraints or other appurtenances.

F. Pressure Test

1. The section being tested shall be slowly filled with water and the specified test pressure shall be applied, after all air has been expelled from the pipe.

2. A hydrostatic pressure of not less than the greater of the value shown in Schedule 33 01 12 - A or 150% of the working pressure, measured at the point test, shall be applied by means of a pump connected to the pipe in a satisfactory manner.

3. The specified pressure shall be held for the minimum duration shown in Schedule 33 01 12 - A.

4. No drop in pressure will be allowed.

5. Service pipe may be tested at the time of the foregoing test, if installed, at the Contractor's option.

a. Testing of service pipes may be completed as a separate operation from main testing, and if so, the test pressure for service lines shall be 100 psi. Service pipe testing, if done separately, shall be done with the corporation stop open.

G. Leakage Test

1. After satisfactory completion of the pressure test, a leakage test shall be performed on each valved section of water main to determine the quantity of water that must be supplied into the section to maintain a test pressure of equal to the greater of the test pressure shown in Schedule 33 01 12 – A or 150% of the working pressure, after the air in the pipeline has been expelled and the pipe has been filled with water.

2. After filling the pipe with water and expelling all air in the line, the specified pressure shall be applied in the same manner as prescribed for the pressure test,

and sufficient water shall be measured and supplied into the pipe section to maintain the pressure for the test duration shown in Schedule 33 01 12 - A.

3. Each pipe section tested will be accepted if the leakage does not exceed the quantity determined by the formula given below:

$$L = \frac{S \times D \times \sqrt{P}}{148{,}000}$$

L = Maximum permissible leakage in gallons per hour
S = Length of pipe tested in feet
D = Nominal diameter of pipe in inches
P = Test pressure in psi

4. If the pipe section under test contains pipe of various diameters, the allowable leakage will be the sum of the computed leakage for each size of pipe.

5. When requested, the Contractor shall furnish a written report of the results of leakage tests, which shall identify the specific test section, the average pressure, the duration of test, and the amount of leakage.

H. The costs of furnishing all labor, water, materials, and equipment necessary for the testing of water lines shall be included in the price bid for the water line and no additional compensation shall be made therefor.

33.3.04 DISINFECTION

A. Disinfection shall be as specified in SECTION 33 01 10.58 – DISINFECTION OF WATER UTILITY PIPING SYSTEMS.

SCHEDULE 33 01 12 – A

WATER UTILITY DISTRIBUTION PIPE TESTING

		TEST DURATION (HOURS)		
DESCRIPTION	TEST PRESSURE (PSI)	PRESSURE	LEAKAGE	COMBINED
6” – 12” PVC	150	1	2	2
6” – 14” HDPE	150	1	2	2

END OF SECTION

SECTION 33 0500 – COMMON WORK RESULTS FOR UTILITIES

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes work common to water, sanitary sewer and storm water utilities and all work included thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AWWA C105	Polyethylene Encasement for Ductile Iron Pipe Systems
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 33 01 10.58	DISINFECTION OF WATER UTILITY PIPING SYSTEMS
SECTION 33 01 12	INSPECTION AND TESTING OF WATER UTILITIES
SECTION 33 05 07.13	UTILITY DIRECTIONAL DRILLING
SECTION 33 05 31.19	FUSIBLE POLYVINYL CHLORIDE PIPE
SECTION 33 05 33	POLYETHYLENE UTILITY PIPE
SECTION 33 05 61	CONCRETE MANHOLES
SECTION 33 05 97.16	MARKERS FOR UTILITY IDENTIFICATION
SECTION 33 14 13	PUBLIC WATER UTILITY DISTRIBUTION PIPING
SECTION 33 14 17	SITE WATER UTILITY SERVICE LATERALS
SECTION 33 14 19	VALVES AND HYDRANTS FOR WATER UTILITY SERVICE
SECTION 33 31 11	PUBLIC SANITARY SEWERAGE GRAVITY PIPING
SECTION 33 41 16	SUBDRAINAGE PIPING
SECTION 33 41 19.13	UNDERSLAB DRAINAGE PIPING
SECTION 33 42 11	STORMWATER GRAVITY PIPING
SECTION 33 42 31	STORMWATER AREA DRAINS AND INLETS

31.1.04 SUBMITTALS

A. Refer to Related Work sections for applicable submittals required in these Contract Documents if not included herein.

B. Shop drawings and product data shall be submitted for in accordance with SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Refer to Related Work sections for applicable tests required in these Contract Documents if not included herein.

31.2.02 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement must comply with the requirements of AWWA C105.

B. Linear low-density polyethylene (LLDPE) shall have a film thickness of 8 mils.

C. High-density cross-laminated polyethylene (HDCLPE) shall have a minimum film thickness of 4 mils.

D. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, off-sets, etc.

31.2.03 INSULATION

A. Insulation boards must be extruded polystyrene. Minimum thermal resistance per inch at 75° F mean must be a minimum of 5.0. Compressive strength must be a minimum of 30 psi. Flexural strength must be a minimum of 50 psi.

B. Spray-on Insulation must be closed-cell spray polyurethane foam. Minimum thermal resistance per inch at 75° F mean shall be a minimum of 5.0. Compressive strength shall be a minimum of 30 psi. Flexural strength shall be a minimum of 50 psi.

PART 3 EXECUTION

31.3.01 GENERAL

A. Underground utilities shall be installed to the lines and grades shown on the Drawings and as specified herein.

B. Excavation and backfilling of utility trenches shall be in conformance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILLING of these Specifications.

31.3.02 INSPECTION

A. The Contractor is responsible for all Contractor furnished material. The Contractor shall inspect all pipe, fittings, and appurtenances for damage and defects when the materials are unloaded.

B. The Contractor shall also inspect these materials when they are installed to detect any damage which may have occurred due to handling.

C. Particular attention shall be given to jointing surfaces.

D. All defective or damaged materials shall be promptly removed from the site by the Contractor. This includes material discovered to be damaged or defective before final acceptance of the work, or during the guarantee period.

31.3.03 EQUIPMENT

A. All equipment necessary and required for the proper construction of utilities shall be on the project in first class working condition and approved by the Engineer before construction is permitted to start.

B. The Contractor shall provide suitable lifting equipment to handle the unloading and placing of pipe used in this project into final position.

C. The Contractor shall provide hand tampers and pneumatic tampers to obtain the compaction of the pipe bedding and backfill as specified.

31.3.04 PIPE LAYING

A. Trench excavation and bedding preparation shall proceed ahead of pipe placement as will permit proper placement and joining of the pipe and fittings at the prescribed grade and alignment without unnecessary hindrance.

1. All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench, and they shall be kept clean by approved means during and after laying.

2. The pipe materials shall be carefully lowered into laying position by the use of suitable restraining devices.

3. Under no circumstances shall the pipe be dropped or dumped into the trench.

B. At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes.

1. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length.

2. No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper.

3. All pipes shall have a minimum of 4" of bedding material below the pipe.

C. When placement or handling precautions prove inadequate, in the Engineer’s opinion, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit.

D. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade.

1. The pipe shall be secured in place with granular bedding material, which shall be thoroughly compacted by tamping around the pipe to a height of at least six (6) inches above its top.

2. Acceptable tamping techniques include hand tamping and use of hand operated mechanical tamping devices.

E. At all times when pipe laying is not in progress, including lunch breaks and overnight periods, all open ends of the pipe shall be closed by watertight plugs or other means approved by the Engineer.

1. If water is present in the trench, the seals shall remain in place until the trench is pumped completely dry.

F. When connecting to existing utilities, the Contractor shall take every precaution necessary to prevent dirt or debris from entering the existing lines.

31.3.05 ALIGNMENT AND LENGTHS

A. The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe and so as to leave a smooth square-cut end.

1. Pipe shall be cut with approved mechanical cutters.

2. The electric-arc cutting method, using carbon or steel rod, will be approved for use on larger size ductile or gray pipe where mechanical cutters are not available.

3. Flame cutting will not be allowed under any conditions.

4. All rough edges shall be removed from the cut ends of pipe and, where rubber gasket joints are used, the outer edge shall be rounded or beveled by grinding or filing to produce a smooth fit.

B. Wherever it is necessary to deflect pipe from a straight line either in the vertical or horizontal plane, to avoid obstructions, plumb stems, or produce a long radius curve when permitted, the amount of deflection allowed at each joint shall not exceed the allowable limits for maintaining a satisfactory joint seal as given by manufacturer's recommendations for mechanical joints and push-on joints.

1. If the specified alignment requires angular deflections greater than recommended or allowed, the Contractor shall provide appropriate bends or shorter pipes such that the maximum angular deflection is not exceeded.

C. Connection and assembly of joints shall be accomplished during the setting, aligning, and fitting operations.

31.3.06 THRUST BLOCKING AND RESTRAINING DEVICES

A. All plugs, caps, tees, bends, valves, and other thrust points shall be provided with reaction backing, or movement shall be prevented by attachment of suitable restraining devices, in accordance with the requirements of the Drawings or specified herein.

B. In the absence of other specified requirements for reaction backing or restraining devices, the following provisions shall apply:

1. All horizontal bends exceeding 20 degrees deflection, and all caps, plugs, and branch tees shall be provided with concrete buttress blocking.

2. All vertical bends exceeding 20 degrees deflection shall be provided with concrete buttress blocking at the low points and with metal tie rod or strapping restraints at the high points.

3. Offset bends made with standard offset fittings need not be strapped or buttressed.

C. Hardwood blocking shall only be used as temporary reaction backing until acceptable permanent reaction blocking or restraining devices have been installed.

1. This temporary blocking shall be nominal 2-inch timber having an area equivalent to at least four times the area of the surface of the cap or plug it retrains.

D. Concrete buttresses shall be poured against firm, undisturbed ground and shall be formed in such a way that the joints will be kept free of concrete and remain accessible for repairs.

1. Minimum buttress dimensions shall be as shown on the Drawings.

E. Thrust blocking for reducers or fittings of different main line sizes must be sized for the larger main line thrust.

F. Mechanical restraint of fittings and hydrants is allowed in lieu of concrete thrust blocks. If restraint lengths are not indicated on the plans, calculations for required length of restraint shall be provided for all types of fittings and restraint devices used. Calculations

provided using the manufacturer's software is acceptable for evidence of satisfactory joint restraint.

G. Where mechanical restraining systems are used, joint restraints must be installed per the manufacturer's requirements.

H. The cost for all necessary fittings, bands, tie rods, nuts, and washers, concrete and all labor and excavation required for installation of reaction restraints shall be included in the price bid for the fitting or pipe being restrained and no direct compensation provided therefor.

I. Restraining devices must be accompanied in tandem with appropriately sized thrust blocking.

31.3.07 POLYETHYLENE ENCASEMENT

A. All ductile iron and gray iron pipe, valves, valve boxes, fittings and appurtenances, shall be fully encased in polyethylene film in accordance with AWWA C105.

1. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc.

2. The polyethylene tubing shall be installed on the pipe prior to being lowered into the trench.

3. Tubing length shall be sufficient to provide a minimum overlap at all joints of one foot or more. After completing the pipe jointing and positioning the overlap material, the overlap shall be secured in place with adhesive tape wrapped circumferentially around the pipe not less than three turns.

B. After encasement, the circumferential slack in the tubing film shall be folded over at the top of the pipe to provide a snug fit along the barrel of the pipe.

1. The fold shall be held in place with adhesive tape applied at intervals of approximately three feet along the pipe length.

2. Any rips, punctures, or other damage to the tubing shall be repaired as they are detected. These repairs shall be made with adhesive tape and overlapping patches cut from sheet or tubing material.

C. At odd-shaped appurtenances such as gate valves, the tubing shall overlap the joint and be secured with tape, after which the appurtenant piece shall be wrapped with a flat film sheet or split length of tubing by passing the sheet under the appurtenance and bringing it up around the body.

1. Seams shall be made by bringing the edges together, folding over twice, and taping down. Wherever encasement is terminated, it shall extend for at least two feet beyond the joint area.

D. Openings in the tubing for branches, service taps, air valves and similar appurtenances shall be made by cutting an X-shaped slit and temporarily folding back the film.

1. After installing the appurtenance, the cut tabs shall be secured with tape and the encasement shall be completed as necessary for an odd-shaped appurtenance.

E. Polyethylene encasement shall not be installed below a point 6 inches above the drain outlet of hydrants.

1. The foundation material at the base of the hydrant shall be placed against the polyethylene to secure it in place.

31.3.08 JOINTS

A. Where connections are to be made to existing pipes, the Contractor shall verify the necessary dimensions required for all couplings and appurtenances.

B. No utility line shall be removed from service as may be necessary for making a connection until the proper measurements have been taken and the Contractor has verified that all necessary and properly sized fittings, valves and appurtenances are on hand.

C. All surfaces of the joints, including gaskets, shall be thoroughly cleaned to remove all oil, dirt, grit or other foreign matter before any joint lubricant is applied.

31.3.09 INSULATION

A. Insulation boards shall be installed whenever the water main, sewer main, water or sewer service, or force main passes within 2 feet beneath a storm sewer.

B. Insulation boards shall be installed above shallow-bury water main, sewer main, water or sewer service, force main, or otherwise shown on the plans or as directed by the Engineer.

C. Insulation boards shall be placed on a firm compacted and smooth base. Sand may be used to provide the base. Insulation boards shall be covered with a minimum of 2 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.

D. The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the preceding layer. The upper joint shall be no closer than 6 inches from the lower joint. The insulation must extend a minimum of 4 feet beyond the outer walls of the storm sewer. In shallow-bury applications, the insulation must extend a minimum of 2 feet beyond the outer walls of the installed piping.

E. Underground structures that are identified on the Drawings to be insulated shall be insulated with a minimum 4” thick closed-cell spray polyurethane foam or extruded polystyrene boards a minimum of 6 feet down from finish ground elevation on the exterior walls, on the interior ceiling, and on the interior hatch/lid. Insulation on the exterior shall be secured by backfill. Interior board attachment to the ceiling shall be by galvanized concrete nails and washers, or self-tapping concrete screws. Boards shall be fastened on not less than a 12” x 24” grid. Fasteners shall have heads or washers at least 1” in diameter. Boards may be glued or bolted to the underside of the hatch.

31.3.10 RECORDS

A. The Contractor shall prepare and maintain an accurate record of encountered underground utility locations and depths.

B. Records shall include utility lines which are installed and those that are exposed during the course of work.

1. A table has been provided in SCHEDULE 33 05 00 – A at the end of this section for convenience. Contractor is responsible to supply necessary data as specified in this section.

C. The Contractor shall use references such as lot corners, building corners, manholes and other similar surface improvements or monuments.

D. Said records shall be submitted to the Owner's Representative upon completion of the work.

31.3.11 SEPARATIONS

A. Sanitary sewers and storm sewers must be laid at least 10 feet horizontally from any existing or proposed water main. The distance must be measured edge to edge.

B. Water mains must be laid at least 10 feet horizontally from any existing or proposed sanitary sewer main, sewer manhole, or storm sewer. The distance must be measured edge to edge.

C. If the proper horizontal separation as described above cannot be obtained, the sewer must be constructed with the following minimum conditions:

1. Sewers must be constructed of slip-on or mechanical joint pipe complying with public water supply design standards and be pressure tested to a minimum 150 psi for two hours to assure water tightness.

2. Sewer services utilizing in-line fittings must be installed and tested in the area of the encroachment. Saddles are not acceptable.

D. Sewer/water main crossings must be laid with a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This must be the case where the water main is either above or below the sewer.

E. Sewer/water main crossings must be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

F. Where a water main crosses under a sewer, adequate structural support must be provided for the sewer to maintain line and grade and to prevent damage to the water main.

G. If proper vertical separation as described above cannot be obtained, the sewer main must be constructed with the following minimum conditions:

1. Vertical separation at crossings between water and sewer mains must be at least 6 inches.

2. Sewers must be constructed of slip-on or mechanical joint pipe complying with public water supply design standards and be pressure tested to a minimum 150 psi for two hours to assure water tightness.

3. At crossings, one standard length of new pipe must be centered at approximately a 90-degree angle in respect to the existing pipe.

4. Sewer services utilizing in-line fittings must be installed and tested within 10 feet of the crossing. Saddles are not acceptable.

5. Either the water or sewer main must be encased in a watertight carrier pipe which extends 10 feet on both sides of the crossing or the mains must be encased in a minimum of 6 inches of flowable fill for a minimum of 10 feet each side of the crossing pipes.

6. If the minimum 6-inch separation is not viable, the water line must be relocated and vertical separation at crossings between water and sewer mains must be at least 18 inches.

31.3.12 UTILITY LINE DEPTH OF COVER

A. The depth of cover over utility lines is defined as the vertical distance as measured from top of pipe to finish grade elevation.

B. Technical Provisions

1. Reserved.

2. Depth of cover for water mains, services, and hydrant leads as specified in part A of this subsection will be as called out on the Drawings. When field adjustment to utility depth results in a depth of cover of 7.5 feet or less, the utility must be furnished with insulation as specified herein.

31.3.13 EXISTING UTILITIES

A. The Contractor is fully responsible for liaison with utility companies and for repairing utilities damaged by him at no expense to the Owner. Utility mains in conflict shall be relocated by the Contractor or he shall make arrangements with the utility to perform the work.

B. Temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, water mains, home service connection for both sewer and water and other obstructions encountered in the progress of the work shall be furnished by the Contractor all at his own expense under the direction of the Engineer.

C. All utility lines that are cut or broken by the Contractor shall be repaired or replaced by the Contractor at his own expense.

31.3.14 CLEANUP

A. The Contractor shall maintain the work in a clean and orderly condition at all times.

B. All surplus materials, rubbish and debris shall be removed from the site.

C. In no instance shall it be permitted to dispose of any waste materials, rubbish, pallet materials or other debris in the backfill of utility trenches.

SCHEDULE 33 05 00 – A

UNDERGROUND UTILITY “ AS BUILT DATA”

Station (Location)	Installed Utility	Installed Utility Depth (FT)	Exst. Utility Type Description (Type/Size)	Existing Utility Depth (FT)	Notes

END OF SECTION

SECTION 33 0533 – POLYETHYLENE UTILITY PIPE

PART 1 GENERAL

33.1.01 DESCRIPTION

A. This Specification includes high density polyethylene pipe and fittings, including standards for dimensionality, testing, quality, and acceptable fusion practice.

33.1.02 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.

C. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

REFERENCE	TITLE
ANSI/AWWA C110/A21.10	American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
ANSI/AWWA C111/A21.11	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	AWWA Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C651	Standard for Disinfecting Water Mains
AWWA C906	Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 in. through 63 in. for Water Distribution and Transmission
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM D3035	Standard Specification for PE Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

ASTM F1055	Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
NSF-14	Plastics Piping System Components and Related Materials
NSF-61	Drinking Water System Components--Health Effects
TR-33	Plastic Pipe Institute – Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe

33.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 31 11	PUBLIC SANITARY SEWERAGE GRAVITY PIPING
SECTION 33 31 23	SANITARY SEWERAGE FORCE MAIN PIPING

33.1.04 PRE-CONSTRUCTION SUBMITTALS

A. Shop drawings and product data shall be submitted for Piping, Fittings, and Appurtenances in accordance with SUBMITTAL PROCEDURES of these Specifications.

1. A manufacturer’s certification shall be included, certifying that all materials furnished meet applicable standards as specified herein.

B. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:

1. Pipe Size
2. Dimensionality
3. Pressure Class per applicable standard
4. Color
5. Recommended Minimum Bending Radius
6. Recommended Maximum Safe Pull Force
7. Fusion technician qualification indicating conformance with this specification
8. Pipe fusion and fusion services warranty information
9. Written procedural documentation for piping products including proper handling and storage, installation, tapping, and testing
10. Fusion technician qualification indicating conformance with this specification

33.1.05 POST-CONSTRUCTION SUBMITTALS

A. The following AS-RECORDED DATA is required from the contractor and/or fusion provider to the owner or pipe supplier upon request:

1. Fusion report for each fusion joint performed on the project, including joints that were rejected. Specific requirements of the fusion technician’s joint report shall include:
   a. Pipe Size and Temperature
   b. Machine Size

c. Fusion Technician Identification

d. Job Identification

e. Fusion Joint Number

f. Fusion, Heating, and Drag Pressure Settings

g. Heat Plate Temperature

h. Time Stamp

i. Heating and Cool Down Time of Fusion

j. Ambient Temperature

2. Approved datalogger device report

3. As-recorded Information

a. The as-recorded plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.

b. All fittings, valves, or other appurtenances will also be referenced and shown.

33.1.06 FUSION TECHNICIAN REQUIREMENTS

A. Fusion Technician shall be fully qualified by the pipe supplier to install HDPE pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

B. A minimum of 10,000 feet of documented HDPE pipe fusion experience is required (greater than 4 inches in diameter), and shall be supplied to the Engineer.

33.1.07 WARRANTY

A. The pipe shall be warranted for one year from the date of substantial completion.

B. In addition to the standard pipe warranty, the fusion services shall be warranted for one year from the date of substantial completion.

PART 2 PRODUCTS

33.2.01 MATERIALS

A. Pipe shall be made from the same resin meeting the requirements of the Plastic Pipe Institute (PPI) material designation PE 4710 with an ASTM D3350 minimum cell classification of PE 445574C. Pipe shall have a manufacturing standard of ASTM F714. Pipe shall be AWWA C906 unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

B. The material shall have a minimum Hydrostatic Design Basis (HDB) of 1,600 psi at 73 degrees F.

C. All materials which come in contact with water, including lubricants, shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 61.

33.2.02 HIGH DENSITY POLYETHYLENE PRESSURE PIPE

A. HDPE pipe shall be manufactured in ductile iron pipe sizes (DIPS) and shall conform to AWWA C906 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.

B. HDPE pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

C. For potable water applications, a permanent identification of piping for potable water use shall be provided by co-extruding longitudinal blue stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the outside surface shall not be acceptable.

D. For wastewater applications, a permanent identification of piping for wastewater use shall be provided by co-extruding longitudinal green stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed or painted on the outside surface shall not be acceptable.

E. Pipe shall be marked as follows:

1. Nominal pipe size
2. HDPE
3. Dimension Ratio
4. The letters PE followed by the polyethylene grade in accordance with ASTM
5. NSF-61 mark verifying suitability, when used for potable water service
6. Extrusion production-record code
7. Trademark or trade name
8. PPI material designation

F. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

G. Technical Provisions

1. Reserved.
2. HDPE pipe used for gravity sewer shall have a minimum pressure rating of 200 psi (DR 11).

33.2.03 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

A. Plain end butt fused fittings and electrofusion couplings shall be used when joining polyethylene materials. Mechanical (compression) fittings shall be used only when joining polyethylene materials to different piping materials and approved by the Owner's Representative.

B. The fittings shall contain no recycled compound except for rework material generated in the manufacturer's own plant that has the same cell classification as the material to which it is being added. The fittings shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.

C. Butt fusion fittings: Fittings shall be PE 4710 HDPE, Cell Classification of PE 445574C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing

standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

D. Electrofusion fittings: Fittings shall be PE 4710 HDPE, Cell Classification of PE 445574C as determined by ASTM D3350. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

E. Ductile Iron Fittings: Ductile iron fittings meeting AWWA C110, latest edition may be used. Adequate joint restraint methods are required and shall be submitted to the Owner's Representative for approval.

F. Flanged and Mechanical Joint Adapters: Flanged and Mechanical Joint Adapters shall be PE 4710 HDPE, Cell Classification of PE 445574C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Joint restraint methods are required to be submitted to the Owner's Representative for approval.

G. Thermal Restraint Fittings: electrofusion thrust restraints with concrete encasement shall be installed along the length of the pipe when no restraint is provided by any other means. Joint restraint may not be sufficient in longer runs of piping where cold flow is more likely to occur. Contractor shall provide thermal restraint in accordance with the manufacturer's recommendations, subject to the approval of the Owner's Representative.

H. Service Connections: All services shall be installed with saddle fusion, tees with electrofusion joints, or sidewall fusion. No mechanical saddles will be allowed.

PART 3 EXECUTION

33.3.01 GENERAL

A. Refer to SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications for provisions common to utility construction including water lines.

B. Excavation and backfilling of utility trenches shall be in conformance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILLING of these Specifications.

C. Installation by horizontal directional drilling shall be in conformance with the provisions of SECTION 33 05 23.13 – HORIZONTAL DIRECTIONAL DRILLING.

33.3.02 DELIVERY AND OFF-LOADING

A. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Owner or Owner's Representative.

B. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify Owner or Owner's Representative immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.

C. Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.

D. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

E. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

F. If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

33.3.03 HANDLING PIPE

A. Store pipe in a manner that will not result in damage or deformation to the pipe. If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

B. Prepare pipe on a relatively smooth surface, free of sharp rocks, sticks or debris. Utilize cribbing, pipe stands, rollers or other equipment as necessary to support the pipe. Pipe shall be stored and stacked per the pipe supplier's guidelines.

C. Lift and move piping using ropes, slings or straps. Do not use unprotected chains, hooks or clamps to lift pipe.

D. When lifting and moving pipe, provide a minimum of two points of support. Do not support pipes at butt-fused joints.

E. Sections of pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and rejoined at the Contractor's expense.

F. Plug all pipes at end of each workday. Provide a watertight plug to prevent entry of foreign materials into the pipe.

G. Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Owner's Representative.

33.3.04 JOINING PIPE

A. At start of each day, the Contractor shall complete fusion weld tests in accordance with manufacturer's recommendations to verify that fusion equipment is operating properly.

B. Pipe ends shall be joined using butt fusion methods. Join pipe and fittings using butt fusion or socket or saddle fusion methods. Fusion methods shall comply with both pipe and fusion equipment manufacturers requirements.

C. Join pipe and mechanical joint or flanged fittings in accordance with both fitting and pipe manufacturer requirements. Provide pipe stiffeners, wedge type retainer glands and clamp type joint restraint system

D. Pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.

E. Pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

F. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.

G. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:

1. HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.

2. CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

3. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion

4. DATA LOGGING DEVICE – An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

H. Other equipment specifically required for the fusion process shall include the following:

1. Pipe rollers shall be used for support of pipe to either side of the machine.

2. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.

3. An infrared (IR) pyrometer for checking pipe and heat plate temperatures.

4. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

5. Facing blades specifically designed for cutting the pipe material shall be used.

I. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of the pipe material used. The software shall register and/or record the parameters required by the pipe supplier and these Specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report

33.3.05 FUSION JOINTS

A. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 psi. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. Contractor shall have at least one person on-site, certified by the pipe manufacturer, to perform butt-fusion welding of the HDPE pipe and electrofusion of the fittings and saddles.

B. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

C. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up ring or HDPE Mechanical Joint adapter with a Ductile Iron back-up ring.

D. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.

END OF SECTION

SECTION 33 0561 – CONCRETE MANHOLES

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes the installation of all concrete manholes for stormwater and sanitary sewer applications including frames, covers, appurtenant equipment, and all work included thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AASHTO H20	Load Rating
AASHTO M199	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
ASTM C923	Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM D4101	Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 03 05 00	COMMON WORK RESULTS FOR CONCRETE
SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 31 11	PUBLIC SANITARY SEWERAGE GRAVITY PIPING
SECTION 33 31 23	SANITARY SEWERAGE FORCE MAIN PIPING
SECTION 33 42 11	STORMWATER GRAVITY PIPING
SECTION 33 42 31	STORMWATER AREA DRAINS AND INLETS

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted in accordance with SUBMITTAL PROCEDURES of these Specifications for all manhole materials, including:

1. Structures
2. Boots
3. Castings and Covers

4. Mortar
5. Steps – NO STEPS
6. Coating
7. Gaskets
8. Adjustment Rings

PART 2 PRODUCTS

31.2.01 CONCRETE

A. Concrete bases, risers, top sections, and adjustment rings must be precast in accordance with ASTM C478 / AASHTO M199.

31.2.02 MORTAR

A. Mortar (non-shrink) shall be a combination of one part Portland Cement to two parts of sand by volume to which lime can be added not to exceed ten (10%) percent of cement by weight.

31.2.03 PRECAST REINFORCED CONCRETE PIPE MANHOLES

A. Precast Reinforced Concrete Manhole bases, risers, top sections, and adjustment rings shall conform to ASTM C478. The dimensions shall be as indicated in the plans and details.

B. Technical Provisions

1. Reserved.

31.2.04 CORROSION PROTECTION

A. One coat of polyurethane corrosion protection between 5 and 10 mils shall be spray-applied to the interior wall surface area for the full height of all installed sanitary sewer manholes.

B. Technical Provisions

1. Reserved.

31.2.05 MANHOLE STEPS

A. All Polypropylene Manhole Steps shall meet the requirements of ASTM C478 and AASHTO M199. Polypropylene shall conform to ASTM D4101. The 1/2" Grade 60 deformed reinforcing bar shall meet ASTM A615.

B. Technical Provisions

1. Reserved.
2. No Steps on any manholes or inlets.

31.2.06 PIPE CONNECTIONS

A. Sanitary sewer pipe to manhole connections shall be through: 1) a flexible rubber boot, which shall be securely clamped with a stainless-steel locking expansion band into a pipe

port; or, 2) a flexible rubber boot, which shall be cast into a pipe port; or, 3) a flexible rubber compression wedge, which shall be cast into a pipe port.

B. Neoprene rubber for manhole boots shall have a minimum thickness of 3/8-inch. Pipe clamp bands shall be stainless steel.

C. All sanitary sewer manhole connections shall meet the requirements of ASTM C923 and shall be installed with stainless steel locking mechanisms per the manufacturer's specifications

D. Technical Provisions

1. Reserved.

31.2.07 CASTINGS AND COVERS

A. Manhole Castings and Covers shall be grey cast iron with a minimum clear opening of twenty-four inches with solid cover with two pick holes.

B. Covers shall meet requirements set forth in ASTM C478 and be designed for AASHTO H20.

C. Technical Provisions

1. Reserved.

2. Manhole frame and cover must be as shown in the drawings.

31.2.08 JOINT SEAL

A. Joints shall be rubber gasket and shall conform to ASTM C443.

PART 3 EXECUTION

31.3.01 GENERAL

A. All stormwater must be diverted to prevent entry into the sanitary sewer system both during and after construction.

31.3.02 CONNECTIONS TO EXISTING MANHOLES

A. When a pipe is connected to an existing manhole, a hole adequate to receive the new pipe shall be cut into the manhole.

B. If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brickwork shall be cleaned, pointed and given a 1/2-inch mortar coat on the outside surface.

C. For connections to existing precast reinforced concrete sanitary sewer manholes, a hole shall be cored into the concrete manhole wall to receive the pipe. A sanded manhole adapter shall be inserted into the cored hole. Any voids in the concrete shall be firmly grouted with a non-shrinking material. The end product shall result in a water tight joint.

D. The bottom of the existing manhole shall be reconstructed to meet the new conditions.

E. Pipe connections to storm manholes must be fully grouted.

31.3.03 CONNECTIONS TO NEW MANHOLES

A. Pipe ports shall be blocked out or core-drilled at the point of manhole manufacture and shall be accurately located within 1/2-inch of proposed pipe centerline.

31.3.04 EXCAVATION

A. Excavation for manholes shall be done in a manner to provide adequate room for the construction of the item according to details as shown on the plans or stated in the specifications. When necessary the excavation shall be adequately shored or sheeted to ensure safe and satisfactory construction and backfilling.

B. Subgrade must be compacted as specified in SECTION 31 05 00 – COMMON WORK RESULTS FOR EARTHWORK.

31.3.05 AGGREGATE BASE COURSE

A. Crushed aggregate material must be installed and compacted at a minimum depth of 8" beneath the concrete base.

31.3.06 CONCRETE BASE

A. Bases shall extend a minimum of six (6) inches from the outside wall face or as indicated on the drawings.

B. Invert channels must be smooth and conform to the inside shape of the adjacent pipe sections. Changes in flow direction must be made with a smooth curve of as large a radius as the manhole size will permit. Changes in slope grade and size must be gradual.

C. The floor of the manhole outside of the channel must be smooth and slope toward the channel at a minimum of 4%.

D. The thickness and other dimensions of the base shall be as specified on the plans.

31.3.07 DROP MANHOLES

A. A drop manhole is defined as a manhole with an inlet invert elevation that is two feet or greater than the outlet invert elevation. Any manhole with an inlet/outlet elevation difference of less than two feet shall have the base channels formed with concrete to allow for uniform flow and minimal corrosive gas. Drop manholes will require a drop manhole connection constructed in accordance with the construction Drawings.

31.3.08 PLACING CASTINGS

A. Castings shall be set in full mortar beds. Castings shall be set accurately to correct elevation so that no subsequent adjustment will be needed. The maximum distance from the top of the precast reinforced concrete pipe manhole to the top of the casting shall be one and one-half (1½) feet. Building up shall be done with precast concrete manhole rings.

31.3.09 ADJUST RING FRAME AND CASTING

A. Adjusting Frames and Ring Castings in Paved Areas:

1. After completion of the bituminous base course, the Contractor shall uncover and raise all castings as specified.

2. The castings shall be set within 1/4 to 1/2 inch below the proposed finished grade of the street.

3. Aggregate base shall be placed around the casting to match the adjacent section and shall be compacted to the required density.

4. Final street surface course material shall then be placed and compacted flush with the adjacent wearing course.

5. The cost of the materials required for backfilling around the castings and/or water valve boxes shall be incidental to the contract and no direct compensation will be made therefor.

B. Adjusting Frame and Ring Castings in Areas with Aggregate Surfacing or Turf

1. In areas with aggregate surfacing, the top of casting shall be approximately 0.2 feet below the top of the surface.

2. In areas where there is turf around the casting, the casting shall be flush with the ground.

3. Adjusting castings of new manholes shall be considered incidental and no measurement will be made and no additional compensation will be made therefor.

31.3.10 BACKFILL

A. Backfill shall be deposited in horizontal layers not over twelve (12) inches in depth (loose) and each layer compacted, this process being repeated to the elevation of the finished grade as designated on the plans. Compaction shall be secured by watering each layer if dry (the water content of the material used shall not exceed the optimum moisture content) and tamping with approved mechanical rammers. The backfill shall be compacted to a density equal to the requirements specified for the pipe trench common to the manhole.

31.3.11 CLEANING

A. All manholes shall be thoroughly cleaned of any accumulations of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of the final inspection.

31.3.12 TESTING

A. All sanitary sewer manholes shall be air tested after backfilling has been completed and prior to acceptance by the Engineer. Testing shall be completed with all manhole bases, barrel and top sections. Air testing shall be done in accordance with ASTM C1244 and the following procedure:

1. The Contractor shall plug all pipe openings and secure and brace plugs and pipe;

2. The Contractor shall use a compression band to seal the base and vacuum and draw the vacuum to 10 inches Hg and start test;

3. The test duration will be determined using the minimum test times as contained Table 1 of ASTM C1244.

4. Technical Provisions

a. Reserved.

b. The test duration as specified in Part A.3 of this Subsection for all manholes that fall within the following depths and diameters will be determined as follows:

Manhole Diameter	Depth	Test Period
≤ 48”	≤ 12’	30 seconds
	12’ – 24’	60 seconds
49” - 60”	≤ 12’	40 seconds
	12’ – 24’	80 seconds
61” - 72”	≤ 12’	50 seconds
	12’ – 24’	100 seconds

5. Record drop in pressure during test period; when air pressure has dropped more than 1-inch Hg during the test period, the manhole has failed; when pressure has not dropped more than 1-inch Hg during the test period the manhole is accepted.

6. Failed manholes shall be inspected for leak sources, repaired, and corrected by the Contractor prior to re-testing. All testing, re-testing, and repairs shall be completed by the Contractor at no expense to the Owner.

31.3.13 ABANDONING MANHOLES

A. The abandonment of manholes shall not occur until all existing sanitary sewer services have been transferred to another line.

B. The Contractor shall permanently plug all pipes entering and leaving the manhole. Plug shall consist of concrete or flowable fill extending a minimum of 18” into the pipe end.

C. The Contractor shall completely remove the manhole structure down to a minimum of four (4) feet below finished grade and fill and compact with an approved backfill sand or flowable fill.

D. All disturbed surface area shall be restored.

E. Removed material shall become the property of the Contractor and shall be disposed of at no additional cost to the Owner.

31.3.14 REMOVING MANHOLES

A. The removal of manholes shall not occur until all existing sanitary sewer services have been transferred to another line.

B. The Contractor shall completely remove the manhole structure in its entirety.

C. All pipes formerly connected to the manhole must be removed entirely, or the ends must be capped or plugged in a watertight fashion.

D. All disturbed surface area shall be restored.

E. Removed material shall become the property of the Contractor and shall be disposed of at no additional cost to the Owner.

END OF SECTION

SECTION 33 0597.16 – MARKERS FOR UTILITY IDENTIFICATION

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes single conductor tracer wire, detectable buried warning tape, and marker posts. Tracer wire and buried warning tape shall be installed with all buried utility piping including mains and services. Marker posts shall be installed at the locations marked on the plans. To reduce maintenance and repair costs, the tracer wire, boxes, locator, and connectors shall come from a single manufacturer.

31.1.02 REFERENCES

A. Reserved.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 23 33	TRENCHING AND BACKFILLING
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 31 11	PUBLIC SANITARY SEWERAGE GRAVITY PIPING

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for detectable buried warning tape, tracer wire, marker posts, tracer boxes, and Appurtenances in accordance with SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 DETECTABLE MARKING TAPE

A. Underground marking tape shall be a 6” width, detectable marking tape with a minimum 5.0 mil overall thickness.

B. The tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core and then laminated to a 3.75 mil clear virgin polyethylene film.

C. The tape shall be solid colored or printed using a diagonally striped design for maximum visibility and shall meet the APWA Color-Code Standard for Identification of Buried Utilities.

D. Detectable marking tape shall be installed 18 inches to 24 inches below finished grade.

E. Technical Provisions

1. Reserved.

2. The detectable marking tape shall be manufactured by:

a. Pro-Line Safety products

b. Reef Industries

c. Or Approved Equal

31.2.02 MARKER POSTS

A. Marker posts shall be installed at the locations shown on the plans.

B. The marker posts shall be flexible to prevent damage from vehicles over a range of 40 degrees below zero Fahrenheit to 140 degrees Fahrenheit.

C. The marker posts shall be a minimum of 66 inches tall.

D. The marker posts shall meet the APWA Color-Code Standard for Identification of Buried Utilities.

E. Technical Provisions

1. Reserved.

2. The marker posts shall be:

a. Rhino Marking and Protection Systems Rhino 3-Rail

b. Or Approved Equal

31.2.03 BURIED CONNECTIONS

A. ~~The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity.~~

B. ~~All recommendations of the manufacturer for the trace wire connectors shall be followed.~~

C. ~~The buried connectors shall meet the APWA Color-Code Standard for Identification of Buried Utilities.~~

D. ~~Technical Provisions~~

1. ~~Reserved.~~

2. ~~The buried connectors shall be:~~

a. ~~Copperhead Industries, LLC SnakeBite Corrosion Proof Wire Connectors~~

b. ~~Or Approved Equal~~

PART 3 EXECUTION

31.3.01 GENERAL

A. ~~The trace wire and detectable marking tape shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation.~~

B. ~~The trace wire shall be laid flat and securely affixed to the pipe at a minimum of 10' intervals to insure that the wire remains adjacent to the pipe.~~

C. ~~The trace wire shall be protected from damage during the execution of the works. No breaks or cuts in the trace wire or insulation shall be permitted.~~

D. ~~At service saddles, the trace wire shall not be placed between the saddle and the main.~~

E. ~~At the point of connection between cast iron or ductile iron mains with any non iron main, the tracer wire shall be properly connected to the iron pipe with an exothermic weld or approved equivalent bonding device to maintain electrical continuity. Tracer wire welds or bonding clamps shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be~~

applied in a coat a minimum of 2 inches thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.

F. At all main end caps or plugs, a tracer box shall be installed a maximum of three feet beyond the end of the main.

31.3.02 TRACE WIRE ACCESS POINTS

A. Trace wire access points shall be at every proposed appurtenance including valve boxes, curb boxes, fire hydrants, and manholes.

B. Trace wire access points shall be, in general, no more than five-hundred feet apart. Where the distance between suitable appurtenances exceeds five-hundred feet, tracer box(es) shall be installed equidistant between the adjacent appurtenances.

C. Concentrations of multiple proposed valves near pipe intersections, i.e. tees or crosses, may require more than one access point in each valve box.

D. Trace wire access points shall be within public right-of-way or public utility easements.

E. The trace wire shall be run on the outside of all appurtenances. Valve boxes and curb boxes shall be drilled to permit the tracer lead to be placed inside the valve box or curb box.

31.3.03 TRACER WIRE IN DIRECTIONAL BORES

A. For directional drilling, auguring, boring, or pipe bursting installations, two #12 tracer wires shall be installed with the pipe and connected to the tracer wire at both ends or exothermic welded to the existing iron pipe at both ends.

B. The tracer wire shall be installed with the carrier pipe during the directional drill, auger, bore, or pipe bursting. Installing the tracer wire after the pipe has been installed shall not be acceptable.

31.3.04 TESTING

A. The Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineer's representative.

B. The continuity test shall be conducted after all backfilling activities have been completed for the section(s) to be tested.

C. To minimize traffic disruptions and pavement damage, the continuity test shall be conducted prior to the final lift in all paved areas.

D. If the trace wire is found to be not continuous after testing, the Contractor shall repair or replace the failed segment of wire.

END OF SECTION

SECTION 33 1413 – PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

33.1.01 DESCRIPTION

A. This Specification includes the installation of all water utilities, fittings, including mains, appurtenances, equipment, and all work included thereto as shown on the Drawings and specified herein.

33.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
ASTM A194	Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A325	Standard Specification for High-Strength Bolts for Structural Steel Joints
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (PVC) Compounds
ASTM D2000	Standard Classification System for Rubber Products in Automotive Applications
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM F1674	Standard Test Method for Joint Restraint Products for Use with PVC Pipe
ASTM F3125	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength
AWWA C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C116	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast
AWWA C153	Ductile-Iron Compact Fittings
AWWA C213	Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C219	Bolted Sleeve-Type Couplings for Plain-End Pipe
AWWA C600	Installation of Ductile-Iron Mains and Their Appurtenances

AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 65 In.
ANSI/NSF 61	Municipal Drinking Water System Components

33.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 23 33	TRENCHING AND BACKFILLING
SECTION 33 01 10.58	DISINFECTION OF WATER UTILITY PIPING SYSTEMS
SECTION 33 01 12	INSPECTION AND TESTING OF WATER UTILITIES
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 05 97.16	MARKERS FOR UTILITY IDENTIFICATION
SECTION 33 14 19	VALVES AND HYDRANTS FOR WATER UTILITY SERVICE

33.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for Piping, Fittings, and Appurtenances in accordance with SUBMITTAL PROCEDURES of these Specifications.

1. A manufacturer's certification shall be included, certifying that all materials furnished meet applicable standards as specified herein.

PART 2 PRODUCTS

33.2.01 GENERAL

A. Materials shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements. All materials shall meet the applicable ANSI/NSF Standards 60 or 61 including Annex G and be so certified by NSF, UL or other organizations accredited by ANSI to test and certify such materials.

B. Technical Provisions

1. Reserved.

33.2.02 POLYVINYL CHLORIDE PIPE

A. Polyvinyl Chloride pipe shall be of quality conforming to the requirements of ASTM D2241 in accordance with ASTM D1784 and the requirements of NSF Standards 14 and 61 including Annex G.

B. Polyvinyl Chloride pressure pipe with diameters 4" through 60" shall meet the requirements of AWWA C900 DR 18, Pressure Class 235, made to ductile iron outside diameters for "Push-On" joints.

C. Pipe joints shall be bell and spigot, having elastomeric gaskets.

D. Blue pipe shall be supplied, unless otherwise approved by the Engineer.

E. Pipe shall be legibly and permanently marked in ink with the following information as a minimum:

1. Manufacturer and Trade Name
2. Nominal Size
3. DR Rating/Pressure Class
4. Hydrostatic Proof Pressure
5. Manufacturing Date Code

F. Fusible Polyvinyl Chloride pipe shall also conform to the provisions of SECTION 33 05 31.19 – FUSIBLE POLYVINYL CHLORIDE PIPE.

G. Non-Metallic Restrained Joint Polyvinyl Chloride (PVC) Pressure Pipe shall conform to the following:

1. Restrained Joint Polyvinyl Chloride pipe shall be used with elastomeric gaskets.
2. Pipe shall be manufactured only from water distribution pipe and couplings conforming to AWWA C900 (4-inch through 60-inch). The restrained pipe joint system shall meet all short and long-term pressure test requirements of AWWA C900.
3. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 degrees F., in accordance with the requirements of ASTM D2837.
4. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900, having a maximum dimension ratio (DR) of 25. Pipe shall be furnished in standard lengths of 20 feet, except where space constraints won't allow this length, subject to approval by the Engineer.
5. Pipe and couplings shall be made from unplasticized PVC compounds having minimum cell classification of 12454, as defined in ASTM D1784.
6. Pipes shall be joined using non-metallic couplings which have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mating precision-machined grooves in the pipe and coupling to provide full 360-degree restraint with evenly distributed loading. No external pipe-to-pipe restraining devices, which clamp onto or otherwise damage the pipe surface as a result of point-loading, shall be permitted.
7. Couplings shall be designed for use at the rated pressures of the pipe with which they are utilized and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage requirements of ASTM D3139.
8. Every pipe and machined coupling shall pass AWWA C900 hydrostatic proof test requirements.
9. Technical Provisions
    a. Reserved.
    b. Certa-Lok Type Pipe is not allowed.

33.2.03 HIGH DENSITY POLYETHYLENE PIPE

A. High density polyethylene pipe with diameters 4” through 63” shall be ductile iron pipe size, shall meet the requirements of AWWA C906, and shall conform to the provisions of SECTION 33 05 33 – POLYETHYLENE UTILITY PIPE.

B. If a specific size of C900 PVC is shown on the plans, and HDPE pipe is allowed as an alternative, the inside diameter of the HDPE must be equal to or greater than the PVC size shown.

33.2.04 DUCTILE IRON PIPE

A. Ductile Iron Pipe shall be designed in accordance with the latest revision of ANSI A21.50/AWWA C150 for a minimum of 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100-psi surge allowance (if anticipated surge pressures are other than 100 psi, the actual anticipated pressure should be used); or a 2 to 1 factor of safety on the sum of working pressure plus surge pressure.

B. Ductile Iron Pipe shall be manufactured in accordance with the latest revisions of ANSI A21.51/AWWA C151. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacturer.

C. Pipe shall have a standard coating on the exterior. Pipe shall also have a cement-mortar lining on the interior in accordance with ANSI A21.4/AWWA C104.

D. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer’s mark, country where cast, year in which the pipe was produced, and the letters “DI” or “Ductile” shall be cast or stamped on the pipe.

E. All pipe shall be furnished with Push-on Type joints. Joints shall be in accordance with ANSI A21.11/AWWA C111 and be furnished complete with all necessary accessories.

1. Technical Provisions

a. Reserved.

F. All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revisions of AWWA C600.

33.2.05 MECHANICAL RESTRAINED JOINTS AND BELL RESTRAINTS

A. Mechanical restrained joints and mechanical bell restraints must have a pressure rating equal to or greater than that of the pipe being installed.

B. Mechanical restrained joints must consist of multiple gripping wedges incorporated into a follower gland.

1. Gland body, backup rings, wedges, and wedge actuating components must be ductile iron meeting or exceeding ASTM A536 and be compatible with all mechanical joints that conform to AWWA C110 (if Full Body), AWWA C153 (if Compact), and AWWA C111.

C. Mechanical bell restraints must consist of two split-body serrated retainers/rings capable of gripping the plain end of the pipe being installed.

1. Serrated retainers/rings must be ductile iron meeting or exceeding ASTM A536.

D. Restraining devices for use on PVC pipe must meet or exceed the requirements of ASTM F1674.

E. Tie rods, bolts, and nuts must be stainless steel per ASTM A193.

F. Mechanical restrained joints and mechanical bell restraints must have a fusion bonded epoxy coating meeting the requirements of AWWA C116 and NSF-61 including Annex G

33.2.06 PIPE FITTINGS

A. Fittings shall be made of ductile iron having a minimum pressure rating of 250 psi.

B. Unless otherwise specified, PVC fittings will not be accepted.

C. Fittings shall be mechanical joint fittings in accordance with either AWWA C153 (Compact) or AWWA C110 (Full Body).

D. Flanged fittings shall not be used for underground installation unless otherwise specified.

E. Fitting joints shall meet the applicable requirements of AWWA C111.

F. Fittings shall be furnished with a fusion bonded epoxy exterior and interior coating in accordance with AWWA C116 and NSF-61 including Annex G.

33.2.07 POLYETHYLENE FITTINGS

A. HDPE fittings shall meet the requirements of SECTION 33 05 33 – POLYETHYLENE UTILITY PIPE.

33.2.08 TAPPING SLEEVES AND VALVES

A. Tapping Valve: Resilient wedge gate valves conforming to SECTION 33 14 19 – VALVES AND HYDRANTS FOR WATER UTILITY SERVICE of these Specifications.

B. Shell and Lugs: Stainless steel per ASTM A240, type 304 and type 304L.

C. Bolts: 5/8" UNC rolled thread, stainless steel per ASTM A193, type 304. Four-inch nominal pipe size shall have 1/2" bolts.

D. Nuts: Heavy hex, stainless steel per ASTM A194, type 304, coated to prevent galling.

E. Washers: Stainless steel per ASTM A240, type 304 and plastic lubricating washer.

F. Gaskets: SBR per ASTM D2000 MAA 610, compounded for water and sewer service.

G. MJ Bolts & Nuts: 3/4" UNC T-Bolts, heavy hex nuts, stainless steel per ASTM A193, type 304.

H. Outlet: Stainless Steel Flange per ASTM A240, type 304 and shall accommodate tapping flanges per MSS SP-60.

33.2.09 FLEXIBLE CONNECTORS

A. Flexible connectors of the sizes shown on the Drawings shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53.

B. Each flexible expansion joint shall be factory tested against its own restraint to a minimum of 350 psi.

C. The flexible expansion joints shall be of a double ball configuration and shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint having a minimum of 15 degrees of deflection per ball joint and 4 inches of expansion.

D. All pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500-volt spark test conforming to said specification.

E. Technical Provisions

1. Reserved.

33.2.10 PIPE COUPLINGS

A. Pipe couplings must be installed to join two plain end pipes in accordance with the requirements of AWWA C219 with a pressure rating equal to or greater than that of the pipe being joined.

B. Cast components (end rings, center ring, and bolt guides) shall be ductile iron, meeting or exceeding the requirements of ASTM A536, Grade 65-45-12. Grippers shall be ductile (nodular) iron, meeting or exceeding ASTM A536, Grade 65-45-12, machine sharped and heat treated, and Xylan 1424 coated for corrosion resistance.

C. Gaskets shall be SBR compounded for water service per ASTM D2000, NSF 61 certified or NBR compounded for water service per ASTM D2000, NSF 61 certified.

D. Ramp runners shall be Nylon 66, black, 14% glass filled.

E. Fasteners shall be provided with anti-galling protection.

F. Center ring shall be fusion bonded epoxy coated and NSF 61 certified.

G. Bolts and Nuts shall be trackhead bolts, heavy hex nuts, UNC 5/8" rolled thread, Type 304 Stainless Steel.

H. Technical Provisions

1. Reserved.

PART 3 EXECUTION

33.3.01 GENERAL

A. Refer to SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications for provisions common to utility construction including water lines

B. Excavation and backfilling of utility trenches shall be in conformance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILLING of these Specifications.

C. Installation by horizontal directional drilling shall be in conformance with the provisions of SECTION 33 05 07.13 – UTILITY DIRECTIONAL DRILLING of these Specifications.

D. All buried ductile iron fittings/parts must be wrapped with polyethylene encasement conforming to the requirements of AWWA C105.

33.3.02 FROST PROTECTION

A. The cover over water lines shall be as shown on the Drawings, but in no event less than 7.5 feet without insulation protection.

B. Where required, insulation shall be in conformance with the provisions of SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications.

33.3.03 VALVE OPERATION

A. The Owner shall operate all existing valves as necessary. The Contractor shall notify the Engineer's on-site representative that valves need to be operated and which valves need to be on and off. The notification shall be made in writing a minimum of 48 hours before the valves need to be operated excluding Saturdays, Sundays, and Holidays.

B. The Contractor shall not operate any existing valves except for emergency situations.

C. The Contractor shall operate all new valves until the date of substantial completion.

33.3.04 CONNECTIONS TO EXISTING SYSTEM

A. Connections of new facilities to existing facilities must be performed with proper planning and notifications in accordance with SECTION 01 31 00 – PROJECT MANAGEMENT AND COORDINATION of these Specifications.

B. When the connection is made by using tapping sleeves and valves, the outside of the existing main and inside of the sleeve and valve shall be thoroughly cleaned with a solution of chlorinated lime and water. After installing tapping sleeve and valve and before tapping existing main, place calcium hypochlorite inside the sleeve and valve. When connection to existing fittings and the existing main has been opened, place calcium hypochlorite inside existing fitting.

C. Existing valves or gates used to isolate certain structures may not be watertight and some leakage may occur. The Contractor shall provide the necessary temporary plugs and/or plumbing facilities to handle any leakage.

33.3.05 TEMPORARY WATER SERVICE

A. The Contractor shall provide temporary water service to all residential properties which will be without water for more than (4) hours due to construction. Temporary water shall be provided as described in SECTION 01 51 36 – TEMPORARY WATER of these Specifications.

33.3.06 LAYING OF PIPE

A. The Contractor shall inspect the pipe and pipe coating for damage or defects before installation. Pipe shall be laid without damaging the pipe coating. All pipe coating damage shall be repaired following the manufacturer's instructions before laying the pipe. When using belt slings to lower the pipe into the trench, the slings shall be removed without damaging the pipe coating.

B. The Contractor shall lay pipe to the specified lines and grades with fittings and valves at the required locations. All valve stems shall be plumb.

C. Trenching and excavation for piping shall be performed in accordance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILL of these Specifications.

D. Every precaution shall be taken to prevent foreign material from entering the pipe as it is placed in the line. During laying operations, debris, tools, clothing or other materials shall not be placed in the pipe. At times when pipe laying is not in progress, the open ends of the pipe shall be closed using a watertight plug or other approved method to prevent material entering the pipe.

E. Long radius curves, either horizontal or vertical, may be laid with standard pipe with deflections at the joints where approved. If the pipe is shown curved on the plans and no special fittings are shown, it may be assumed that the curves can be made by deflection of the joints with standard lengths of pipe. If shorter lengths are required, the plan will indicate maximum lengths that can be used.

F. The Engineer will determine the method of deflection or curving where required but not specified. No additional payment will be made for laying pipe on planned curves, nor for field changes involving standard pipe lengths deflected at the joints.

G. The Contractor shall not exceed the applicable material and joint Specifications of AWWA or the pipe manufacturer's recommendations at pipe joints for various types of pipe. When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trench excavation shall accommodate deflections and curves.

H. Thrust blocking for tees, plugs, valves, reducers, caps and bends deflecting 22 ½° or more shall be furnished and installed in accordance with the provisions of SECTION 31 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications.

I. The Contractor shall cut pipe for inserting valves, fittings or closure pieces in a neat and workmanlike manner without damaging the pipe or coating and leaving a smooth end at right angles to the pipe axis. Do not cut pipe using an oxyacetylene torch.

33.3.07 PIPE JOINTING

A. Rubber Gasket, "Push-On" Joints:

1. The Contractor shall follow the manufacturer's recommendations for jointing of pipe and fittings with a rubber gasket, "push-on" type. The rubber gasket and gasket seat inside the bell must be wiped clean with a cloth. The plain end of the adjoining pipe must be wiped clean, lubricated, and inserted into the bell to make contact with the gasket. The plain end must be forced "home" using a crowbar, fork tool, or jack assembly.

B. Mechanical Joints:

1. On mechanical joint connections, the last eight inches of the outside spigot surface and the inside bell surface of each pipe and appurtenance joint shall be painted with a soap solution, after being thoroughly cleaned.

2. The gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end.

3. The rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be painted with soap solution and be placed on the spigot end with the thick edge toward the gland.

4. An approved lubricant provided by the pipe manufacturer may be used in lieu of the soap solution. The lubricant shall be applied using the pipe manufacturer's recommendations.

5. After the spigot end is inserted into the socket to full depth and centered, the gasket shall be pressed into place within the bell evenly around the entire joint.

6. After the gland is positioned behind the gasket, all bolts shall be installed and the nuts-tightened alternately to the specified torque, such as to produce equal pressure on all parts of the gland.

7. Unless otherwise specified, the bolt shall be tightened by means of a suitable torque-limiting wrench to within a foot-pound range of:

    a. 45 to 60 for 5/8-inch bolts;

    b. 75 to 90 for 3/4-inch bolts;

    c. 100 to 120 for 1-inch bolts;

    d. 120 to 150 for 1 1/4-inch bolts.

8. Anti-seize compound shall be applied to each bolt in accordance with the manufacturer's recommendations.

9. Technical Provisions

    a. Reserved.

33.3.08 FILLING AND FLUSHING

A. Lines shall be filled slowly with potable water at a maximum velocity of 1 ft/sec while venting air.

B. Precautions shall be taken to prevent entrapping air in the lines.

C. After the lines have been filled, the Contractor shall flush at all blowoffs and dead ends at a minimum velocity of 3 ft/sec.

D. A minimum of three changes of treated water shall be used in flushing operations.

E. Valves shall be closed slowly to prevent excessive surges while maintaining positive pressure at all times throughout the new line.

F. Flushing water shall be discharged without causing erosion damage, nuisance, or interruption of traffic

G. The timing of the flushing shall be in accordance with the type of chlorination provided.

33.3.09 TESTING

A. Pressure and leakage tests shall be performed in accordance with the provisions of SECTION 33 01 12 – INSPECTION AND TESTING OF WATER UTILITIES of these Specifications

33.3.10 DISINFECTION

A. Disinfection shall be performed as specified in SECTION 33 01 10.58 – DISINFECTION OF WATER UTILITY PIPING SYSTEMS.

END OF SECTION

SECTION 33 1419 – VALVES AND HYDRANTS FOR WATER UTILITY SERVICE

PART 1 GENERAL

33.1.01 DESCRIPTION

A. This Specification includes the installation of all water utility distribution valves, hydrants, appurtenances, equipment, and all work included thereto as shown on the Plans and specified herein.

33.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM A48	Standard Specification for Gray Iron Castings
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A743	Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM B30	Standard Specification for Copper Alloys in Ingot Form
ASTM D429	Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates
AWWA C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C502	Dry-Barrel Fire Hydrants
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C507	Ball Valves, 6 In. Through 60 In.
AWWA C509	Resilient-Seated Gate Valve for Water Supply Service
AWWA C515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply
AWWA C550	Protective Interior Coatings for Valves and Hydrants
ANSI/NSF 61	Municipal Drinking Water System Components

33.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 14 13	PUBLIC WATER UTILITY DISTRIBUTION PIPING

33.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for valves and other appurtenances in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES of these Specifications. As applicable for each valve type, the shop drawings shall include:

1. Specific detail regarding valve construction
2. Specific detail regarding pilot controls
3. Specific detail regarding solenoid valves
4. Specific detail regarding valve position indicators
5. Copies of the certified listings from the National Sanitation Foundation (NSF) stating that all materials in contact with potable water meet the latest version of the American National Standards Institute (ANSI) Additives Standard No. 61 for indirect additives including Annex G.
6. A manufacturer's certification shall be included, certifying that all materials furnished meet applicable standards as specified herein.

PART 2 PRODUCTS

33.2.01 GENERAL

A. Flanged pipe and fittings shall not be used for buried lines unless noted otherwise on the Drawings.

B. Technical Provisions

1. Reserved.
2. All valves must be equipped with thrust blocking in accordance with the provisions of SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications.

33.2.02 GATE VALVES

A. Gate Valves of the styles and sizes shown on the Drawings shall conform to the following:

1. Gate valves shall be designed for a minimum water working pressure of not less than 150 pounds per square inch.
2. Gate valves shall be resilient-seated conforming to AWWA Standard C509 or C515 and shall be approved by ULFM.
3. Gate valves shall be furnished with mechanical joints unless specified otherwise on the project drawings. Bonnet and mechanical joint bolts and nuts shall be stainless steel.
4. Gate valves shall have a non-rising stationary stem. Valve opening shall be achieved by turning the stem left (counterclockwise).
5. Gate valves shall have a clear waterway opening equal to the full nominal diameter of the valve.
6. Valves shall be provided with a 2-inch square operating nut. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.
7. Each valve shall be equipped with an operating nut extension, when necessary, which extends the 2-inch operating nut to within 7 feet of finish grade.

8. The wedge shall be of cast iron completely encapsulated with rubber. The sealing rubber shall be permanently bonded to the cast iron wedge to meet ASTM tests for rubber-metal bond ASTM D429

9. Each valve shall have the maker's monogram or initials, pressure rating and year of manufacturer cast on the body.

10. Valves shall be supplied with O-ring seals at all joints. No flat gaskets allowed.

11. Stems for NRS assemblies shall be cast bronze with integral collars in full compliance with AWWA. The NRS stem stuffing box shall be the O-ring seal type with two O-rings located above thrust collar and one O-ring below. The two O-rings above the thrust collar shall be replaceable with valve fully open and subjected to full rated working pressure

12. Each valve shall be tested for zero leakage past the seat at 200 psi and hydro-statically shell tested at 40 psia.

13. There shall be two low torque thrust bearings located above and below the thrust collar. The stem nut shall be independent of the wedge and shall be made of solid bronze. There shall be a smooth, unobstructed waterway free of all pockets, cavities and depressions in the seat area.

14. The body and bonnet shall be coated with fusion bonded epoxy both interior and exterior, complying with AWWA C550 and be NSF 61 approved including Annex G.

15. All direct buried gate valves shall be wrapped with polyethylene encasement conforming to the requirements of AWWA C105.

B. Technical Provisions

1. Reserved.

2. Gate valves shall be as manufactured by:

a. Mueller

b. American Flow Control

c. DeZurik

d. Or prior approved equal

33.2.03 BUTTERFLY VALVES

A. Butterfly Valves of the styles and sizes shown on the Drawings shall conform to the following:

1. All butterfly valves shall be manufactured in accordance with AWWA C504 for Class 150B service.

2. Valve bodies shall be constructed of cast iron ASTM A126 Class B and conform to AWWA C504 in terms of laying lengths and minimum body shell thickness.

3. Direct bury valves shall have mechanical joint ends. Mechanical joint bolts and nuts shall be stainless steel.

4. Valve discs shall be made from cast iron ASTM A126 Class B or ASTM A48 Class 40 in sizes 24" and smaller.

   a. Sizes 30" and larger shall be built from ductile iron in conformance to ASTM A536.

   b. Disc shall be furnished with 316 stainless steel seating edge to mate with the rubber seat on the body.

5. Valve seat shall be Buna-N rubber located on the valve body.

   a. In sizes 20" and smaller, valves shall have bonded seats that meet test procedures outlined in ASTM D429 Method B.

   b. Sizes 24" and larger shall be retained in the valve body by mechanical means without use of metal retainers or other devices located in the flow stream.

6. Valve shafts shall be 18-8 type 304 stainless steel conforming to ASTM A276.

   a. Shaft seals shall be standard self-adjusting split V packing.

   b. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

7. Valve bearings shall be sleeve type that are corrosion resistant and self-lubricating.

8. All direct bury butterfly valves shall be furnished with valve actuators.

   a. Valve actuators shall be fully grease packed and have stops in the open/close position.

   b. The actuator shall have a mechanical stop which will withstand an input torque of 450-ft. lbs. against stop.

   c. The traveling nut shall engage alignment grooves in the housing.

   d. The actuators shall have a built-in packing leak bypass to eliminate possible packing leakage into the actuator housing.

   e. The actuators shall be suitable for submerged or buried service.

9. Each valve shall be equipped with an operating nut extension, when necessary, which extends the 2-inch operating nut to within 7 feet of finish grade.

10. The stem shall be constructed of 1-inch square stock or 7/8 inch round stock and shall include a centering disk near the top.

11. The valve interior and exterior surfaces, except for seating, shall be coated with fusion bonded epoxy both interior and exterior, complying with AWWA C550 and be NSF 61 approved including Annex G.

B. Technical Provisions

1. Reserved.

33.2.04 BALL VALVES

A. Ball Valves of the styles and sizes shown on the Drawings shall conform to the following:

1. All ball valves shall be manufactured for 150 psi service.

2. Valves shall be constructed of the following materials:

a. Body: Cast Bronze

b. Tailpiece: Cast Bronze

c. Ball: 316 Stainless Steel

d. Seat: RPTFE

e. Stem: 316 Stainless Steel

f. Thrust Washer: RPTFE

g. Packing: PTFE

h. Packing Nut: Brass

i. Handle: Steel with Zinc Plating

j. Handle Grip: Vinyl

k. Handle Nut: Steel with Zinc Plating

B. Technical Provisions

1. Reserved.

2. Ball valves shall be as manufactured by:

a. Val-Matic

b. Milwaukee Valve

c. Or prior approved equal

33.2.05 CHECK VALVES

A. Check Valves of the styles and sizes shown on the Drawings shall conform to the following:

1. Check valves 2” through 12” shall be full body flanged type with domed access cover and only one moving part.

2. The valve body shall have full flow equal to nominal pipe diameter at any point through the valve.

3. Seating surface shall be on a 45-degree angle.

4. Top access port shall be full sized, allowing the removal of the disc without removing the valve from the pipeline.

5. The disc shall be one piece construction with an integral O-ring type sealing surface and contain steel and nylon reinforcement. The disc shall be precision molded Buna-N (NBR) ASTM D2000-BG.

6. Backflow capabilities shall be provided by means of a mechanical backflow actuator.

7. Valve body shall be ASTM A126 Class B cast iron.

8. Disc shall be Buna-N rubber.

9. The valve interior and exterior surfaces, except for seating, shall be coated with fusion bonded epoxy both interior and exterior, complying with AWWA C550 and be NSF 61 approved including Annex G.

B. Technical Provisions

1. Reserved.

33.2.06 VALVE BOXES

A. The valve boxes furnished may be two or three pieces with sufficient length to provide eight (8) feet of cover or more if listed on the plans. Covers shall be marked "Water". Valve boxes shall include separate base.

B. All valve boxes shall be capable of a minimum 6-inch top adjustment in either direction, up or down, to or from, the finished curb grades shown on the plans.

C. If any valve box extension pieces are required to make the above-mentioned adjustment, they shall be considered incidental to the price bid for Gate Valve and Box.

D. Valve boxes shall be installed to match final grades and adjusted to finished subgrade during utility installation. Final valve box elevations shall be adjusted during roadway grading and asphalt placement operations. No separate payment will be made for minor vertical adjustments to the valve boxes.

E. Technical Provisions

1. Reserved.

2. Valve boxes shall be as manufactured by:

a. Tyler Union 6860 Series (screw type)

3. Valve box base shall be as manufactured by:

a. Tyler Union #6 base for valves up to 12”

4. Valve box must be installed onto the valve with the use of a gate valve adaptor.

a. Valve adaptor must be as manufactured by Adaptor Inc.

b. Or approved equal

5. Valve box must include a debris plug. Plug must be push-in, pull-out type with an attached handle. Plug must be constructed of a flexible, non-cracking, compressible material to form a tight seal.

33.2.07 FIRE HYDRANTS

A. Fire Hydrants shall meet or exceed ANSI/AWWA C502, latest revision. Rated working pressure shall be 250 psig, test pressure shall be 500 psig, and hydrants shall include the

following specific design criteria: the nozzle section, upper and lower standpipes, and hydrant base shall be ductile iron. External surfaces above grade shall be factory coated and catalyzed two-part epoxy primer and polyurethane top coating. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure. Nozzle section to be designed for easy 360-degree rotation by the loosening of no more than four bolts. The valve-opening diameter shall be 5-inches for all 6-inch pipe connections, and 6-inches for 8-inch pipe connections. Hydrant shall be designed so that the removal of all working parts can be accomplished without excavating. The bronze seat shall be threaded into mating threads of bronze for easy field repair. Bolting below-grade shall be stainless steel.

B. The draining system of the hydrant shall be bronze and be positively activated by the main operating rod. Hydrant to be furnished with a sliding bronze drain valve. Sliding drain valves made of rubber, plastic or leather will not be allowed. Hydrant must have an internal travel stop nut located in the top housing of the hydrant. Hydrant operating threads to be factory lubricated. O-rings shall be furnished to help keep operating threads lubricated and protected from line fluid and from the weather. Hydrant must have a traffic flange design allowing for quick and economical repair of damage resulting from a vehicles impact. The traffic flange bolts shall be located above the final grade per the manufacturer's recommendation and the bury line indicated on the standpipe.

C. Hydrants shall be Double Discharge & Pumper. The hydrants shall be equipped with breakaway type flanges and two (2) two and one-half (2 ½) inch inside diameter hose connections with seven and one-half (7 ½) threads per inch and one (1) four and one-half (4 ½) inch inside diameter pumper connection with four (4) threads per inch. Hydrants shall have mechanical joint connections with stainless steel nuts and bolts. Hydrants shall include nozzle chains. Hydrants shall be painted red.

D. The depth of earth cover over the connecting pipe shall be not less than seven and one-half (7 ½) feet. The Contractor shall supply necessary extensions, which will be incidental to hydrant unit price. Hydrant drain area shall be surrounded by 10 cubic feet of washed gravel meeting the following specification:

Sieve Opening	% Passing
3 Inch	100
No. 4	0-25
No. 8	0-10

E. Scoria will not be permitted for use as any aggregate material. Washed gravel shall be placed at least 6-inches below, 1 foot on all sides of the hydrant, and 6 inches above the drain hole so that the hydrant will readily take up all water from the drip valves. Hydrants shall be set on a concrete pad 6 inches thick and 18 inches square. Weep holes shall be located above the seasonal ground water table.

F. One hydrant operating wrench and one hydrant disassembly wrench shall be provided per project, incidental to the price bid for hydrants.

G. Technical Provisions

1. Reserved.

2. Hydrant must include a flexible marker that can be attached to the upper portion of the hydrant. Marker must match color of hydrant. Marker must be a minimum of 48-inches in length.

3. The hydrant nozzle must be no less than two and one-half (2 ½) feet above the final grade.

4. Hydrants shall be:

   a. American Flow Control's Waterous Pacer (Model WB67-250) with 7532/40524 DDP-NST, and 22-inch break off.

   b. Or approved equal

PART 3 EXECUTION

33.3.01 GENERAL

A. Construction requirements shall be in accordance with the provisions of SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications.

B. All direct buried iron hydrants, valves, valve boxes, and other metal parts shall be wrapped in polyethylene encasement in accordance with the provisions of SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications.

C. Flanged pipe and fittings shall not be used for buried lines unless noted otherwise on the Drawings.

D. Anchor for Valves: Wherever a slip-on type joint water main is used, all gate valves shall be anchored and tied down with steel and concrete. The anchors and tie downs shall be placed in a manner and of a size according to the manufacturer's recommendations. The size, location and procedure shall be acceptable to the Engineer. The concrete mix shall contain a minimum of 6 sacks of cement per cubic yard of concrete, poured in place with sufficient time allowed for curing. Steel shall be #5 rebar, Grade 60. The concrete, steel, and labor for anchoring purposes shall be considered incidental to the Price Bid for water main valves.

E. Marking Valve Box Locations: The Contractor will be required to furnish and install a steel fence post by each valve box subject to the Engineer's request. Steel fence posts to be used for valve locations shall be a "Tee" or "U" post having a minimum length of 5½ feet. The post shall be located 2 feet from the valve box in a direction toward the street.

   1. The cost of the steel fence post and the installations shall be considered incidental to other bid items.

F. All hydrants shall be set plumb with the pumper nozzle facing the street. The hydrant shall be set relative to the ground line as shown on the Drawings or as indicated by the manufacturer.

33.3.02 TESTING

A. Valves shall be pressure tested at the same time that the adjacent pipeline is tested. Joints shall be watertight at test pressures before acceptance. The Contractor will be responsible for any damage caused by testing.

B. The valves shall be disinfected with the adjacent piping. They shall be installed and operable during the disinfection testing.

END OF SECTION

SECTION 33 3111 – PUBLIC SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

31.1.01 DESCRIPTION OF THE WORK

A. This Specification includes the installation of all public sanitary utility sewerage piping, appurtenant equipment, and all work incidental thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Pol(Vinyl Chloride) (PVD) Compounds
ASTM D2241	Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
ASTM D3034	Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679	Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In.

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 05 97.16	MARKERS FOR UTILITY IDENTIFICATION

31.1.04 SUBMITTALS

A. Shop drawings and product data shall be submitted for Piping, Fittings, and Lubricants in accordance with SUBMITTAL PROCEDURES of these Specifications.

1. A manufacturer's certification shall be included, certifying that all materials furnished meet applicable standards as specified herein.

PART 2 PRODUCTS

31.2.01 GRAVITY SEWER PIPE

A. Gravity sewer pipe and fittings for sanitary sewer applications shall be constructed of the materials as shown on the Drawings. The respective materials shall conform to the following:

B. PVC Gravity Sewer Main

1. Polyvinyl chloride pipe for gravity sanitary sewers shall conform to the standards and specifications of ASTM D3034 for sizes 4 inch to 15 inch and ASTM F679 for sizes 18 inch to 27 inch.

2. Material for PVC pipe from 4" to 15" shall conform to the requirements of ASTM D1784 for cell classifications 12454-B or 12454-C. Material for PVC pipe from 18" to 27" shall conform to the requirements of ASTM D1784 for cell classifications 12364-B or 12454-C. Maximum filler content shall be 10 percent.

3. All pipe shall have an SDR of 35 and a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412. Where pipe depth is greater than 20 ft., provide pipe in SDR 26 with minimum pipe stiffness of 115 psi.

4. The bell of each pipe shall consist of an integral bell and spigot with a factory installed elastomeric seal conforming to the requirements of ASTM D3212 and ASTM F477. Lubricant for gasketed joints shall be water soluble, non-toxic, non-supporting of bacteria growth, having no deteriorating effect on PVC or elastomer.

5. The gasket shall be securely locked into position to prevent its displacement when the pipes are assembled.

6. The pipe shall be of solid-wall construction and be available in laying lengths not exceeding 20 feet.

7. The pipe shall be colored green for identification as sewer pipe.

8. Technical Provisions

a. Reserved.

b. Polyvinyl chloride pipe as specified in Part B.1 of this Subsection shall conform to the standards and specifications of ASTM D2241 for sizes 4 inch to 12 inch.

c. All pipe as specified in Part B.3 of this Subsection shall have an SDR of 26 and a minimum pipe stiffness of 115 psi, regardless of installation depth.

d. The bell of each pipe as specified in Part B.4 of this Subsection shall consist of an integral bell and spigot with a factory installed elastomeric seal conforming to the requirements of ASTM D2241, ASTM D3139, and ASTM F477.

C. Non-Metallic Restrained Joint Polyvinyl Chloride (PVC) Gravity Sewer Main

1. Pipe shall be manufactured only from water distribution pipe and couplings conforming to AWWA C900 (4-inch through 60-inch). The restrained pipe

joint system shall meet all short and long-term pressure test requirements of AWWA C900.

2. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 degrees F., in accordance with the requirements of ASTM D2837.

3. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900, having a maximum dimension ratio (DR) of 25. Pipe shall be furnished in standard lengths of 20 feet, except where space constraints won't allow this length, subject to approval by the Engineer.

4. Green or white pipe shall be supplied, unless otherwise approved by the Engineer.

5. Pipe and couplings shall be made from unplasticized PVC compounds having minimum cell classification of 12454, as defined in ASTM D1784.

6. Pipes shall be joined using non-metallic couplings which have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mating precision-machined grooves in the pipe and coupling to provide full 360-degree restraint with evenly distributed loading. No external pipe-to-pipe restraining devices, which clamp onto or otherwise damage the pipe surface as a result of point-loading, shall be permitted.

7. Couplings shall be designed for use at the rated pressures of the pipe with which they are utilized and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage requirements of ASTM D3139.

8. Every pipe and machined coupling shall pass AWWA C900 hydrostatic proof test requirements.

9. Pipe shall be legibly and permanently marked in ink with the following information as a minimum:

   a. Manufacturer and Trade Name

   b. Nominal Size

   c. DR Rating/Pressure Class

   d. Hydrostatic Proof Pressure

   e. Manufacturing Date Code

D. Fusible Polyvinyl Chloride (FPVC) Gravity Sewer Main

1. Fusible PVC pipe shall be permitted for only 4" through 16" diameter gravity sewer pipe.

2. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.

3. Fusible polyvinyl chloride pipe shall conform to ASTM D3034 or ASTM F679.

4. Fusible polyvinyl chloride pipe may instead conform to AWWA C900, if applicable. Testing shall be in accordance with AWWA standards for any of these

pipe types. If the AWWA standards are used, pipe diameters shall be in Ductile Iron Pipe Sizes (DIPS).

5. All pipe shall have an SDR of 35 and a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412. Where pipe depth is greater than 20 ft., provide pipe in SDR 26 with minimum pipe stiffness of 115 psi.
6. Fusible polyvinyl chloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
7. Fusible polyvinyl chloride pipe shall be manufactured in a standard 20', 30', or 40' nominal length.
8. Fusible polyvinyl chloride pipe shall be green in color for wastewater use.
9. Pipe shall be legibly and permanently marked in ink with the following information as a minimum:
    a. Manufacturer and Trade Name
    b. Nominal Size
    c. Dimension Ratio
    d. Pressure Class
    e. Hydrostatic Proof Pressure
    f. Extrusion Production-Record Code
10. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
11. Unless otherwise specified, fusible polyvinyl chloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed with the following minimum requirements:
    a. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
    b. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
    c. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine.
    d. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process.
12. Handling and storage shall be in accordance with the pipe manufacturer's recommendations.
13. Technical Provisions
    a. Reserved.
    b. Fusible Polyvinyl Chloride (FPVC) Gravity Sewer Main as specified in Part D of this Subsection will not be permitted.

E. High Density Polyethylene (HDPE) Gravity Sewer Main

1. HDPE pipe shall have a light interior color.

2. Pipe and Fittings: The pipe shall meet the requirements of AWWA C906, ASTM F714, and ASTM D3350. Pipe shall be in ductile iron pipe sizes (DIPS). The pressure rating shall be 125 psi with a maximum dimension ratio (DR) of 17. Laying lengths shall be 40-ft standard.

3. Allowable Pipe Sizes:

Pipe Diameter to be Replaced (Inches)	DR17 (DIPS)	Minimum I.D. (Inches)
8	8	7.92
12	14*	12
15	16*	15

* Size for size is not allowed for this diameter due to the reduced hydraulic capacity.

4. Pipe shall be legibly and permanently marked in ink with the following information as a minimum:

   a. Manufacturer and Trade Name

   b. Nominal Size

   c. OD base (ie: 12-inch ductile iron pipe sizing, DIPS)

   d. Dimension Ratio

   e. Pressure Class

   f. AWWA C906

   g. Extrusion Production-Record Code

5. The pipe shall be homogeneous throughout and free from visible defects such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, cracks, holes, foreign material, blisters, and other deformities. Pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site. Pipe shall be provided as uniform as commercially practical in color, opacity, density, and other physical properties.

6. Technical Provisions

   a. Reserved.

   b. High Density Polyethylene (HDPE) Gravity Sewer Main as specified in Part E of this Subsection will not be permitted.

F. PVC Gravity Sanitary Sewer Services

1. Polyvinyl chloride pipe for gravity sanitary sewer services shall conform to the requirements of subpart 33.2.01.A of this Section.

2. The minimum pipe size shall be 4" diameter. When connecting a new PVC sewer service to an existing service, the inside diameter of the new PVC pipe shall be equal to or greater than the existing pipe.

3. When separation distance requirements cannot be achieved between sanitary sewer services and water mains or water services as specified, sanitary sewer service pipe material must be SDR 21, conforming to the standards and specifications of ASTM D2241, ASTM D3139, and ASTM F477.

G. HDPE Gravity Sanitary Sewer Services

1. High density polyethylene pipe for gravity sanitary sewer services shall conform to the requirements of subpart 33.2.01.D of this Section.

2. The minimum pipe size shall be 4" diameter. When connecting a new HDPE sewer service to an existing service, the inside diameter of the new HDPE pipe shall be equal to or greater than the existing pipe.

3. Technical Provisions

a. Reserved.

b. High Density Polyethylene (HDPE) Gravity Sewer Services as specified in Part G of this Subsection will not be permitted.

H. Connections and Fittings for PVC Gravity Sanitary Sewers

1. Connections to existing sanitary sewer pipe of different material shall be via an appropriately sized rubber coupling with stainless steel worm gear drive clamps.

a. Technical Provisions

i. Reserved.

ii. Couplings must include stainless steel shear rings.

iii. Couplings must be Fernco or approved equal.

2. Fittings for PVC gravity sanitary sewers shall be as manufactured by the pipe supplier or approved equal and shall have bell and spigot configurations compatible with that of the pipe.

3. Services on new sanitary sewer mains shall be via a wye fitting.

4. Services tapped into existing mains shall be via a full perimeter service saddle or an insertable tee.

a. Technical Provisions

i. Reserved.

ii. Full perimeter saddles must be Romac CB series sewer saddles or approved equal.

iii. Insertable tees must be InsertaTEE® or approved equal.

5. All fittings shall be for SDR 35 pipe and shall conform to the standards and specifications of ASTM D3034 or ASTM F679. The stiffness of the fittings shall not be less than the stiffness of the adjoining pipe.

I. Connections and Fittings for HDPE Gravity Sanitary Sewers

1. Connections to existing sanitary sewer pipe of different material shall be via an appropriately sized rubber coupling with stainless steel worm gear drive clamps.
    a. Technical Provisions
        i. Reserved.
        ii. Couplings must include stainless steel shear rings.
        iii. Couplings must be Fernco or approved equal.
2. Fittings shall be molded polyethylene and shall be pressure rated for the same internal pressure rating as the mating pipe.
3. Fittings shall be designed for pipe bursting or pipe jacking applications.
4. Inside diameter of fittings shall match the inside diameter of adjoining pipe.
5. Molded fittings shall be manufactured and tested in accordance with ASTM D3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

PART 3 EXECUTION

31.3.01 GENERAL

A. Refer to SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications for provisions common to utility construction.

B. Excavation and backfilling of utility trenches shall be in conformance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILLING of these Specifications.

31.3.02 SEWER LINE CONSTRUCTION

A. Alignment and Grade
1. All sewer lines shall be installed at the grades shown on the Drawings.
2. Installation shall begin at the lowest point in the line. Bell end of each pipe shall point upstream.
3. Sewer services shall be sloped at a grade of no less than ¼ inch rise per foot of run.
4. Sewer lines shall be installed with a cover of no less than 6 feet without requiring insulation for frost protection.
5. The Contractor shall furnish and install pipe bends to bring sewer services to their proper alignment. Pipe bends shall not exceed 22½ degrees.
6. Sewer mains shall be laid with straight alignment between manholes. Straight alignment must be checked by either using a laser beam or lamping.

B. Connection to Existing Sewers
1. Where new sewer lines are to be connected to existing sewer lines, a flexible coupling shall be used should the existing pipe material differ from the new.
2. Where the two pipes are alike, a rigid gasketed coupling approved by the Owner's Representative shall be used to join the pipes.
3. Connections to existing sewer mains shall be made with rigid gasketed transition couplings as approved by the Owner's Representative.

31.3.03 TESTING

A. Sewer mains shall be subject to acceptance testing after backfilling has been completed, but prior to the placement of the finished surface material.

B. Low Pressure Air Loss Procedure for Gravity Sewer Pipelines

1. All sewer mains shall pass the low-pressure air test before final acceptance. Contractor shall carefully observe safety precautions during air testing; no one shall be allowed in the manholes during testing.

2. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

3. Pipe air supply to pipeline to be tested so that air supply may be shut off, pressure observed, and air pressure released from the pipe without entering the manhole.

4. Install a branched valve in the supply line past the shut-off valve terminating in a 1/4” female pipe thread for installation of the test gauge.

5. Add air slowly to portion of pipe under test until test gauge reads at least 4 psig but less than 5 psig greater than the average back pressure of any groundwater above the pipe.

6. Shut the air supply valve and allow at least two minutes for internal pressure to stabilize.

7. When the internal air pressure has stabilized and is at or above test pressure (4.0 psig minimum, plus groundwater back pressure), disconnect the air hose from the control panel to the air supply. The test may commence with an initial pressure reading between 3.5 psig and 4.0 psig (greater than the average groundwater back pressure).

8. If the pressure drops more than 1.0 psig during the test period, the line is presumed to have failed. Test may be discontinued when the prescribed test time has been reached.

9. The time required for the pressure to decrease 1.0 psig shall be not less than the time shown for the diameter given in the following table. Times shown are based on loss of air not to exceed 0.0015 cubic feet per minute per square foot of internal pipe surface. Compare observed time with minimum allowable times in the following chart for pass/fail determination. Service lateral lengths may be disregarded when calculating test time.

Pipe Diameter (in)	Minimum Time (min:sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)
4	3:46	597	.380 L
6	5:40	398	.854 L
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470 L
24	22:40	99	13.674 L

10. Where groundwater level is above the invert of the pipe being tested, divide the average vertical height, in feet of groundwater above the invert of the pipe to be tested by 2.31. The result gives the air pressure correction in pounds per square inch to be added. In no case should the starting test pressure exceed 9.0 psig.

11. Air Testing Safety Requirements: Securely brace plugs used to close the sewer pipe for the air test; this is to prevent the unintentional release of a plug which can become a high velocity projectile. For example: four pounds (gauge) air pressure develops a force against the plug in a 12" diameter pipe of approximately 450 pounds; this force can propel a 12-inch plug weighing 10 pounds to supersonic speeds.

12. Locate gauges, air piping manifolds, and valves at the top of the ground. Entry by anyone into a manhole where a plugged pipe is under pressure is strictly prohibited.

13. Do not use the air test on gravity sewer pipes larger than 24" in diameter because of the difficulty of adequately blocking the plugs.

14. Sanitary sewers failing to meet the requirements of the low-pressure air test shall be tested again after the Contractor has located and remedied defects causing this failure. No sanitary sewer shall be accepted until the requirements of the test procedure are satisfied. No separate payment for work performed under this item. Include the cost in the contract unit price bid for the item of which this work is a component.

15. Technical Provisions

    a. Reserved.

C. Deflection Test

1. All sewer mains shall pass the short-term deflection test before final acceptance. The Contractor shall perform the deflection test per ASTM D-3034 standards. Deflection testing for acceptance will not be permitted until a minimum of 30 days after final backfilling to allow for soil and pipe stabilization.

2. A 9-arm deflection mandrel shall be pulled through the sewer main by hand.

3. Any part of the installation which shows deflection in excess of 5% of the nominal inside diameter of the HDPE or PVC pipe shall be corrected.

4. After acceptance but prior to the termination of the warranty period, the Owner may test the long-term deflection of the sewer. If the Owner determines that the deflection has exceeded 7.5% of the average inside diameter, that portion of the installation shall be corrected by the Contractor at no cost to the Owner.

5. A preliminary certificate of substantial completion may be issued prior to deflection testing, assuming the balance of the project is substantially complete per the Engineer. If a preliminary certificate of substantial completion is issued prior to deflection testing, time will not be counted against the contract during the required waiting period.

6. A final certificate of substantial completion may be issued upon the successful passing of all deflection tests.

D. T.V. Inspection

1. All sewer mains shall be inspected using a television camera before final acceptance. T.V. inspection for acceptance will not be permitted until a minimum of 30 days after final backfilling to allow for soil and pipe stabilization. A sewer line is deficient and unacceptable if (1) the alignment is outside the specified limits, (2) water ponds in any section, or (3) the pipe has visible defects such as open joints, pinched gaskets, cracked barrels or bell, or similar defects. The inspection shall be done in the presence of the Owner or his representative.

2. No separate payment will be made for the T.V. Inspection. All costs incurred in any television inspection shall be those of the Contractor. The Contractor shall be responsible for costs associated with finding and repairing all breaks, leaks or deficiencies revealed by the test or inspection.

3. The camera shall have the following attributes and capabilities: high-resolution color, adjustable iris focus, pan and tilt functions, integral lighting suitable to provide proper illumination, and ability to operate in 100% humidity conditions.

4. The Contractor shall clean and flush the line prior to television inspection. Water must be visibly running through the pipe during the inspection. The camera shall be pulled through the sewer at 30 feet per minute maximum. If the camera is pulled by attaching to the hose of a hydraulic sewer cleaner, ensure the hose is not active during the pulling process.

5. All television inspections shall be recorded in DVD format or an alternate form acceptable to the Owner and delivered to the Engineer.

6. A preliminary certificate of substantial completion may be issued prior to T.V. inspections, assuming the balance of the project is substantially complete per the Engineer. If a preliminary certificate of substantial completion is issued prior to T.V. inspections, time will not be counted against the contract during the required waiting period.

7. A final certificate of substantial completion may be issued upon the successful passing of all T.V. inspections.

END OF SECTION

SECTION 33 4616 – SUBDRAINAGE PIPING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes the installation of all subsurface permeable drainage pipes and all appurtenances thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM D4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EARTHWORK
SECTION 32 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES

31.1.04 SUBMITTALS

A. Shop Drawings shall be submitted for Pipe, Fittings, Fabric, and Appurtenances in accordance with SECTION 01 33 00 – SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 SUBDRAIN PIPE

A. Subdrain pipe shall be of the type and sizes indicated on the Drawings. Subdrain pipe and fittings shall be constructed of corrugated polyethylene and shall conform to AASHTO M252 for pipes 3 to 10 inches. Pipe shall have a sock installed on it. PVC is also allowed as drainage pipe, it must be of the size and schedule as shown on the Drawings with a minimum wall thickness of PVC Schedule 40 and must conform to ASTM D1785 and ASTM D2665.

1. Pipe Perforations:

a. Water inlet area shall be a minimum of 0.5 square inch per linear foot.

b. Perforations in pipe shall be slotted. Circumferential slots shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced along the length and circumference of the tubing. Width of slots shall not exceed 1/8 inch nor be less than 1/32 inch. The length of individual slots shall not exceed 1-1/4 inches on 3 inch diameter tubing, 10 percent of the tubing inside nominal

circumference on 4 to 8 inch diameter tubing, and 2-1/2 inches on 10 inch diameter tubing. Rows of slots shall be symmetrically spaced so that they are fully contained in 2 quadrants of the pipe. Slots shall be centered in the valleys of the corrugations of profile wall pipe.

31.2.02 FILTER FABRIC

A. Filter fabric shall consist of a geotextile material that meets NDDOT Specification Type S.

B. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed.

C. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.

D. The edges of the fabric shall be salvaged or otherwise finished to prevent the outer material from pulling away from the fabric.

31.2.03 BEDDING AND FILTER MATERIAL

A. Technical Provisions

1. Reserved.

2. Subdrain bedding and filter material shall meet the following gradation requirements.

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	Porous Material No. 1
1-1/2 inch (37.5 mm)	
1 inch (25.0 mm)	
3/8 inch (9.5 mm)	**100**
No. 4 (4.75 mm)	**95 – 100**
No. 8 (2.36 mm)	
No. 16 (1.18 mm)	**45 – 80**
No. 50 (300 µm)	**10 – 30**
No. 100 (150 µm)	**0 – 10**

PART 3 EXECUTION

31.3.01 EXCAVATION AND BEDDING

A. Trenching and excavation, including removal of rock and unstable material, shall be in accordance with SECTION 31 23 00 – EXCAVATION AND FILL of these Specifications. Bedding material shall be placed in the trench and compacted as indicated.

31.3.02 FILTER FABRIC

A. One layer of filter fabric shall be wrapped around perforated or slotted collector pipes in such a manner that longitudinal overlaps of fabric are in unperforated or unslotted quadrants of the pipes. The overlap shall be at least 2 inches. The fabric shall be secured

to the pipe in such a manner that backfill material will not infiltrate through any fabric overlaps.

31.3.03 PIPE LAYING

A. Pipe shall be installed in accordance with the manufacturer's specifications and as specified herein. No pipe shall be laid when the trench conditions or weather is unsuitable for such work. The pipe shall be laid to the grades and alignment as indicated. The pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe.

31.3.04 BACKFILL

A. After pipe for subdrains has been laid, filter material shall be placed around and over the pipe to the depth indicated. The filter material shall be placed in layers not to exceed 8 inches thick, and each layer shall be thoroughly compacted by mechanical tampers or rammers to obtain the required density. Compaction of filter material and the placement and compaction of overlying backfill material shall be in accordance with the applicable provisions specified in SECTION 31 23 00 – EXCAVATION AND FILL.

END OF SECTION

SECTION 33 4211 – STORMWATER GRAVITY PIPING

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes the installation of all storm sewer and culverts and all appurtenances thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C361	Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other Sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES

31.1.04 SUBMITTALS

A. Shop Drawings shall be submitted for Pipe, Fittings, and Appurtenances in accordance with SUBMITTAL PROCEDURES of these Specifications.

PART 2 PRODUCTS

31.2.01 GENERAL

A. Drainage pipe and fittings for storm sewers and culverts shall be constructed of the materials, types, and sizes as shown on the Drawings.

31.2.02 REINFORCED CONCRETE PIPE

A. Concrete pipe shall be of the class required by the manufacturer for the cover loadings and bedding shown on the Drawings and specified herein.

B. Precast concrete pipe for storm sewer applications shall be manufactured to meet the standards and specifications of ASTM C76 and ASTM C655.

1. Class: Class III.

2. Wall Type: A, B, or C wall based on concrete strength per ASTM C76.

C. Joints for storm sewer and culvert extensions shall conform to the joint type of the existing pipe. The Contractor shall verify the type of existing pipe joints prior to the preparation of shop Drawings.

D. Joints must be soil-tight and silt-tight.

E. Technical Provisions

1. Reserved.

2. Concrete pipe joints must include flexible joint sealant conforming to the requirements of ASTM C990, or;

3. Concrete pipe joints must include rubber gaskets conforming to the requirements of ASTM C443 and ASTM C361.

4. Concrete pipe joints must include a minimum 24" wide filter fabric securely wrapped around and centered on the joint. Fabric must meet the requirements of subsurface drainage fabric as described in SECTION 32 05 19 – GEOSYNTHETICS FOR EXTERIOR IMPROVEMENTS.

F. Galvanized joint ties shall be bolted through the sidewall of the pipe for each apron and the adjacent two sections of pipe so that the end three joints of a culvert or storm sewer outlet shall be tied.

1. A minimum of two pipe ties must be used per section.

31.2.03 CORRUGATED METAL PIPE

A. Galvanized steel and aluminized steel pipe must meet the requirements of AASHTO M36.

B. Aluminum pipe must meet the requirements of AASHTO M196.

C. Coupling bands and hardware of the same base metal and coating as the pipe must be furnished and installed at to provide a soil-tight connection at each joint.

1. Coupling bands must not be more than three nominal sheet thicknesses lighter than the thickness of the pipe to be connected.

2. Coupling bands must match the corrugation shape of the pipe ends being connected.

31.2.04 POLYVINYL CHLORIDE PIPE

A. Polyvinyl Chloride pipe, when allowed, shall be of quality conforming to the requirements of ASTM D2241 in accordance with ASTM D1784 and the requirements of NSF Standards 14 and 61 including Annex G.

B. Polyvinyl Chloride pressure pipe with diameters 4" through 60" shall meet the requirements of AWWA C900 DR 18, Pressure Class 235, made to ductile iron outside diameters for "Push-On" joints.

C. Pipe joints shall be bell and spigot, having elastomeric gaskets.

D. Blue pipe shall be supplied, unless otherwise approved by the Engineer.

E. Pipe shall be legibly and permanently marked in ink with the following information as a minimum:

1. Manufacturer and Trade Name
2. Nominal Size
3. DR Rating/Pressure Class
4. Hydrostatic Proof Pressure
5. Manufacturing Date Code

F. Fusible Polyvinyl Chloride pipe shall also conform to the provisions of SECTION 33 05 31.19 – FUSIBLE POLYVINYL CHLORIDE PIPE.

G. Non-Metallic Restrained Joint Polyvinyl Chloride (PVC) Pressure Pipe shall conform to the following:

1. Restrained Joint Polyvinyl Chloride pipe shall be used with elastomeric gaskets.
2. Pipe shall be manufactured only from water distribution pipe and couplings conforming to AWWA C900 (4-inch through 60-inch). The restrained pipe joint system shall meet all short and long-term pressure test requirements of AWWA C900.
3. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 degrees F., in accordance with the requirements of ASTM D2837.
4. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900, having a maximum dimension ratio (DR) of 25. Pipe shall be furnished in standard lengths of 20 feet, except where space constraints won't allow this length, subject to approval by the Engineer.
5. Pipe and couplings shall be made from unplasticized PVC compounds having minimum cell classification of 12454, as defined in ASTM D1784.
6. Pipes shall be joined using non-metallic couplings which have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into mating precision-machined grooves in the pipe and coupling to provide full 360-degree restraint with evenly distributed loading. No external pipe-to-pipe restraining devices, which clamp onto or otherwise damage the pipe surface as a result of point-loading, shall be permitted.
7. Couplings shall be designed for use at the rated pressures of the pipe with which they are utilized and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage requirements of ASTM D3139.
8. Every pipe and machined coupling shall pass AWWA C900 hydrostatic proof test requirements.
9. Technical Provisions
    a. Reserved.

b. Restrained Joint Certa-Lok C900 type pipe is not allowed.

31.2.05 HDPE PIPE

A. Drainage pipe and fittings for storm sewers and culverts shall be constructed of the materials as shown on the Drawings. The respective materials shall conform to the following:

a. 4- through 10-inch (100 to 250 mm) pipe shall meet AASHTO M252, Type S or SP.

b. 12- through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or SP, or ASTM

B. Pipe shall be joined with coupling bands covering at least two full corrugations on each end of the pipe. Standard connections shall meet or exceed the soil-tight requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

C. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306.

31.2.06 TRASH GUARDS

A. Galvanized trash guards shall be as shown on the Drawings.

PART 3 EXECUTION

31.3.01 GENERAL

A. Refer to SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES of these Specifications for provisions common to utility construction.

B. Excavation and backfilling of utility trenches shall be in conformance with the provisions of SECTION 31 23 33 – TRENCHING AND BACKFILLING of these Specifications.

31.3.02 ALIGNMENT

A. Underground stormwater piping shall be installed to the lines and grades shown on the Drawings and as specified herein.

31.3.03 TESTING

A. Stormwater piping must be visually inspected for excessive water infiltration and soil leakage.

B. The Contractor shall repair/correct any infiltration or soil leakage that is considered excessive by the Owner's Representative.

END OF SECTION

SECTION 33 4231 – STORMWATER AREA DRAINS AND INLETS

PART 1 GENERAL

31.1.01 DESCRIPTION

A. This Specification includes the installation of all sanitary manholes, catch basins, frames, covers, appurtenant equipment and all work included thereto as shown on the Drawings and specified herein.

31.1.02 REFERENCES

A. The current publications listed below form a part of this Specification.

B. Standards

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D4101	Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

31.1.03 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of related work are specified and included in other sections of these Specifications:

SECTION 31 05 00	COMMON WORK RESULTS FOR EXTERIOR IMPROVEMENTS
SECTION 33 05 00	COMMON WORK RESULTS FOR UTILITIES
SECTION 33 05 61	CONCRETE MANHOLES
SECTION 33 42 11	STORMWATER GRAVITY PIPING

31.1.04 SUBMITTALS

A. Shop drawings shall be submitted in accordance with SUBMITTAL PROCEDURES of these Specifications for all stormwater inlet materials, including:

1. Structures
2. Boots
3. Frames, Grates, and Covers
4. Mortar
5. Steps
6. Gaskets

PART 2 PRODUCTS

31.2.01 MORTAR

A. Mortar (non-shrink) shall be a combination of one part Portland Cement to two parts of sand by volume to which lime can be added not to exceed ten (10%) percent of cement

by weight

31.2.02 PRECAST REINFORCED CONCRETE MANHOLES

A. Where Precast Reinforced Concrete Manholes are specified for drainage inlets, they must be constructed in accordance with SECTION 33 05 61 – CONCRETE MANHOLES of these Specifications, with grates/covers as shown on the Drawings.

31.2.03 PRECAST DRAINAGE CATCH BASIN

A. Dimensions and construction shall be as shown on Plans.

B. Grates and curb boxes be as shown on the Plans.

C. Structures with full depth of structure walls and a loose top slab shall not be considered acceptable.

33.3.05 PVC SURFACE DRAINAGE

A. Drain basins required for this shall be manufactured from PVC pipe Stock, utilizing a thermoforming process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. Joint tightness shall conform to ASTM D3212. Flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the drain basin. Material used to manufacture the body and stubs shall conform to ASTM D1784 cell class 12454.

PART 3 EXECUTION

31.3.01 CONNECTIONS

A. Pipe connections to storm manholes must be fully grouted.

B. All joints in drainage structures for storm sewers must provide a soil-tight and silt-tight seal.

1. Joints must include flexible joint sealant conforming to the requirements of ASTM C990 or a rubber gasket conforming to the requirements of ASTM C443.

31.3.02 ADJUST RING FRAME AND CASTING

A. Adjusting Frames and Ring Castings in Paved Areas

1. After completion of the bituminous base course, the Contractor shall uncover and raise all castings as specified.

2. The castings shall be set within 1/4 to 1 inch below the proposed finished grade of the street.

3. Aggregate base shall be placed around the casting to match the adjacent section and shall be compacted to the required density.

4. Final street surface course material shall then be placed and compacted flush with the adjacent wearing course.

5. The cost of the materials required for backfilling around the castings and/or water valve boxes shall be included in the bid price for the contract and no direct compensation will be made therefor.

B. Adjusting Frame and Ring Castings in Areas with Aggregate Surfacing or Turf

1. In areas with aggregate surfacing, the top of casting shall be approximately 3 to 6 inches below the top of the surface.

2. In areas where there is turf around the casing, the casing shall be flush with the ground.

C. Adjusting castings of new and existing drainage structures shall be considered part of the bid price and no measurement will be made and no additional compensation will be made therefor.

END OF SECTION

BUFFALO MANOR
APARTMENT COMPLEX
1105 25TH ST. SW
JAMESTOWN, NORTH DAKOTA 58401

GENERAL

G001 COVER SHEET - BUFFALO MANOR
G002 LIFE SAFETY PLANS - BUFFALO MANOR
G003 ARCHITECTURAL SITE PLAN
G004 GARAGE PLANS, SECTIONS & ELEVATIONS

CIVIL

C100 EXISTING CONDITIONS / DEMOLITION PLAN
C200 EROSION CONTROL / SEEDING PLAN
C201 LANDSCAPING PLAN
C300 UTILITY PLAN - STORM SEWER
C301 UTILITY PLAN - SANITARY SEWER / WATERMAIN
C400 GRADING PLAN - SPOT ELEVATIONS
C401 GRADING PLAN - CONTOURS & SLOPES
C500 PAVING PLAN
C501 DIMENSION PLAN
C502 JOINTING PLAN
C600 LOMR-F PLAN
C700 DETAILS
C701 DETAILS
C702 DETAILS

STRUCTURAL

S001 STRUCTURAL GENERAL NOTES, LOADS & MATERIAL NOTE TABLES
S002 SPECIAL INSPECTION TABLES
S201 FIRST FLOOR FOUNDATION/SLAB PLAN
S202 SECOND FLOOR FRAMING PLAN
S203 THIRD FLOOR FRAMING PLAN
S204 ROOF FRAMING PLAN
S205 GARAGE FOUNDATION PLANS
S206 GARAGE ROOF FRAMING PLANS
S301 FIRST FLOOR BRACED WALL PLAN
S302 SECOND FLOOR BRACED WALL PLAN
S303 THIRD FLOOR BRACED WALL PLAN
S304 GARAGE BRACED WALL PLAN
S601 FOUNDATION DETAILS
S701 FRAMING DETAILS

ARCHITECTURAL

A001 GENERAL ARCHITECTURAL INFORMATION
A021 WALL, FLOOR & ROOF TYPES
A201 FIRST FLOOR PLAN
A202 SECOND FLOOR PLAN
A203 THIRD FLOOR PLAN
A221 ROOF PLAN
A301 FIRST FLOOR REFLECTED CEILING PLAN
A302 SECOND FLOOR REFLECTED CEILING PLAN
A303 THIRD FLOOR REFLECTED CEILING PLAN
A401 BUILDING ELEVATIONS
A421 BUILDING SECTIONS
A422 BUILDING SECTIONS
A441 WALL SECTIONS
A442 WALL SECTIONS, CANOPY SECTIONS @ DETAILS
A501 UNIT PLANS AND INTERIOR ELEVATIONS
A502 UNIT PLANS AND INTERIOR ELEVATIONS
A503 UNIT PLANS AND INTERIOR ELEVATIONS
A504 ENLARGED FLOOR PLANS AND INTERIOR ELEVATIONS
A521 STAIR PLANS AND SECTIONS, DETAILS & ELEVATOR SECTIONS
A801 DOOR SCHEDULE, DOOR AND WINDOW ELEVATIONS
A901 FIRST FLOOR FINISH PLAN
A902 SECOND FLOOR FINISH PLAN
A903 THIRD FLOOR FINISH PLAN
A921 EQUIPMENT SCHEDULE
A931 SIGNAGE PLAN AND SCHEDULE
A932 SIGNAGE PLAN AND SCHEDULE
A933 SIGNAGE PLAN AND SCHEDULE

FIRE PROTECTION, PLUMBING & MECHANICAL

FPM01 MECHANICAL SYMBOLS & LEGEND SHEET

FIRE PROTECTION

F201 FIRST FLOOR FIRE PROTECTION PLAN & DETAILS
F202 SECOND FLOOR FIRE PROTECTION PLAN
F203 THIRD FLOOR FIRE PROTECTION PLAN

PLUMBING

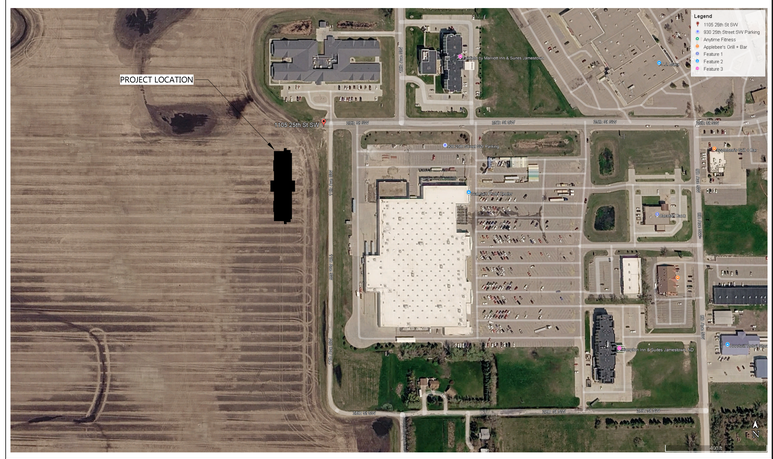
P200 UNDERGROUND PLUMBING & RADON PLANS
P201 FIRST FLOOR PLUMBING PLANS
P202 SECOND FLOOR PLUMBING PLAN
P203 THIRD FLOOR PLUMBING PLAN
P204 ROOF PLUMBING PLAN
P801 PLUMBING DETAILS & SCHEDULES

MECHANICAL

M201 FIRST FLOOR HYDRONICS PLAN
M202 SECOND FLOOR HYDRONICS PLAN
M203 THIRD FLOOR HYDRONICS PLAN
M301 FIRST FLOOR VENTILATION PLAN
M302 SECOND FLOOR VENTILATION PLAN
M303 THIRD FLOOR VENTILATION PLAN
M400 MECHANICAL ROOF PLAN
M501 MECHANICAL FLOW DIAGRAM
M601 MECHANICAL DETAILS
M801 MECHANICAL SCHEDULES

ELECTRICAL

E001 ELECTRICAL SYMBOLS & ABBREVIATIONS LEGEND
E100 ELECTRICAL SITE PLAN
E201 FIRST FLOOR POWER, SYSTEMS & FIRE ALARM PLAN
E202 SECOND FLOOR POWER, SYSTEMS & FIRE ALARM PLAN
E203 THIRD FLOOR POWER, SYSTEMS & FIRE ALARM PLAN
E204 ELECTRICAL ATTIC POWER PLAN
E301 FIRST FLOOR LIGHTING PLAN
E302 SECOND FLOOR LIGHTING PLAN
E303 THIRD FLOOR LIGHTING PLAN
E601 UNIT PLANS
E602 UNIT PLANS
E801 DETAILS, SCHEDULES & RISER DIAGRAMS
E802 LIGHTING SCHEDULES & DETAILS
E803 DETAILS, SCHEDULES & RISER DIAGRAMS
E901 SCHEDULES
E902 SCHEDULES



PROJECT LOCATION MAP - NOT TO SCALE

STAMPS

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.

Signature: _____

Date: 05-26-2026 REG. NO. : 1565

REGISTERED PROFESSIONAL ENGINEER — SAMUEL J. WILKE PE-6697 DATE 05-26-2026 — NORTH DAKOTA

REGISTERED PROFESSIONAL ENGINEER — TYLER COULOMBE PE-7492 DATE 05-26-2026 — NORTH DAKOTA

REGISTERED PROFESSIONAL ENGINEER — LEONARD S. SCHAFF PE-2044 DATE 05-26-2026 — NORTH DAKOTA

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CONSULTANTS

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR
APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20245211
DRAWN BY: BRJ
CHECKED BY: SS

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DRAWING TITLE
COVER SHEET - BUFFALO MANOR

G001

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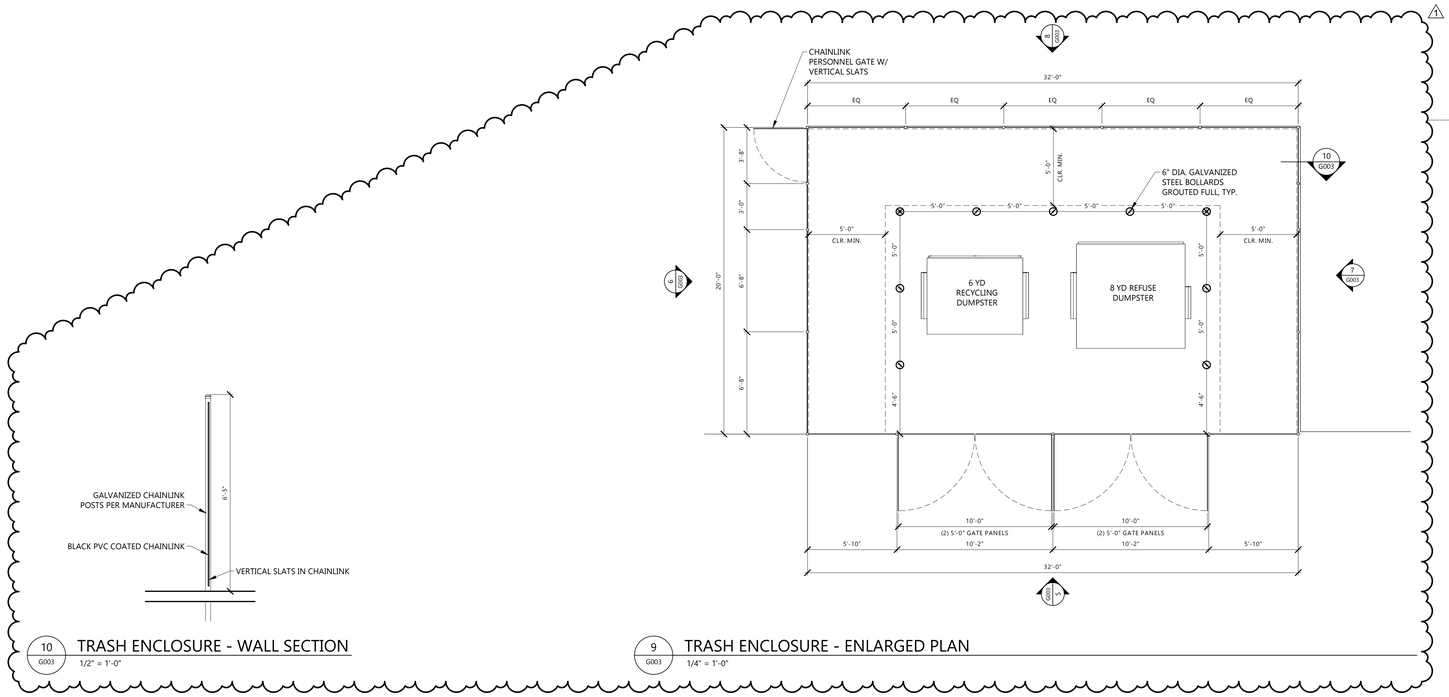
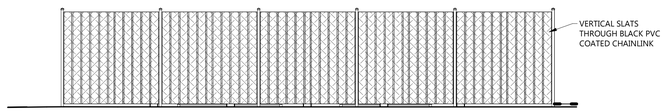


10 G003 TRASH ENCLOSURE - WALL SECTION
1/2" = 1'-0"

9 G003 TRASH ENCLOSURE - ENLARGED PLAN
1/4" = 1'-0"



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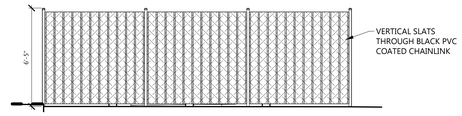

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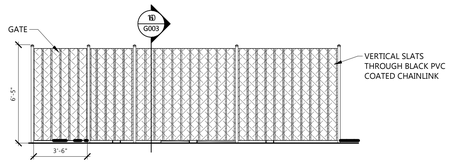

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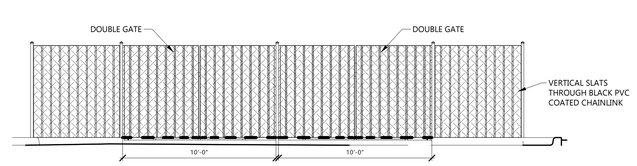

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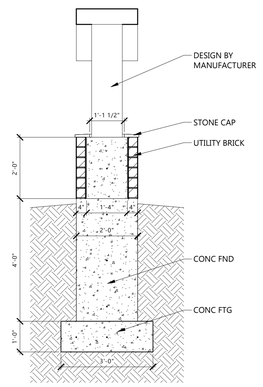

4 G003 MONUMENT SIGN SECTION
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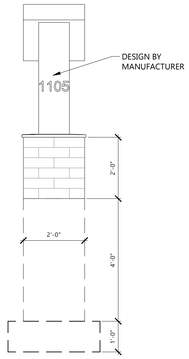
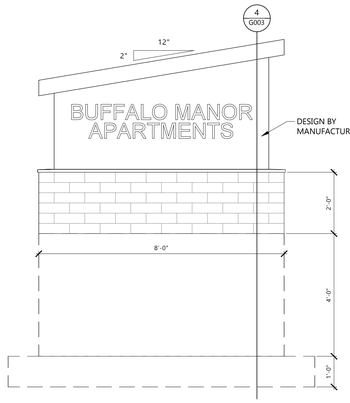


3 G003 MONUMENT SIGN ELEVATION
1/2" = 1'-0"



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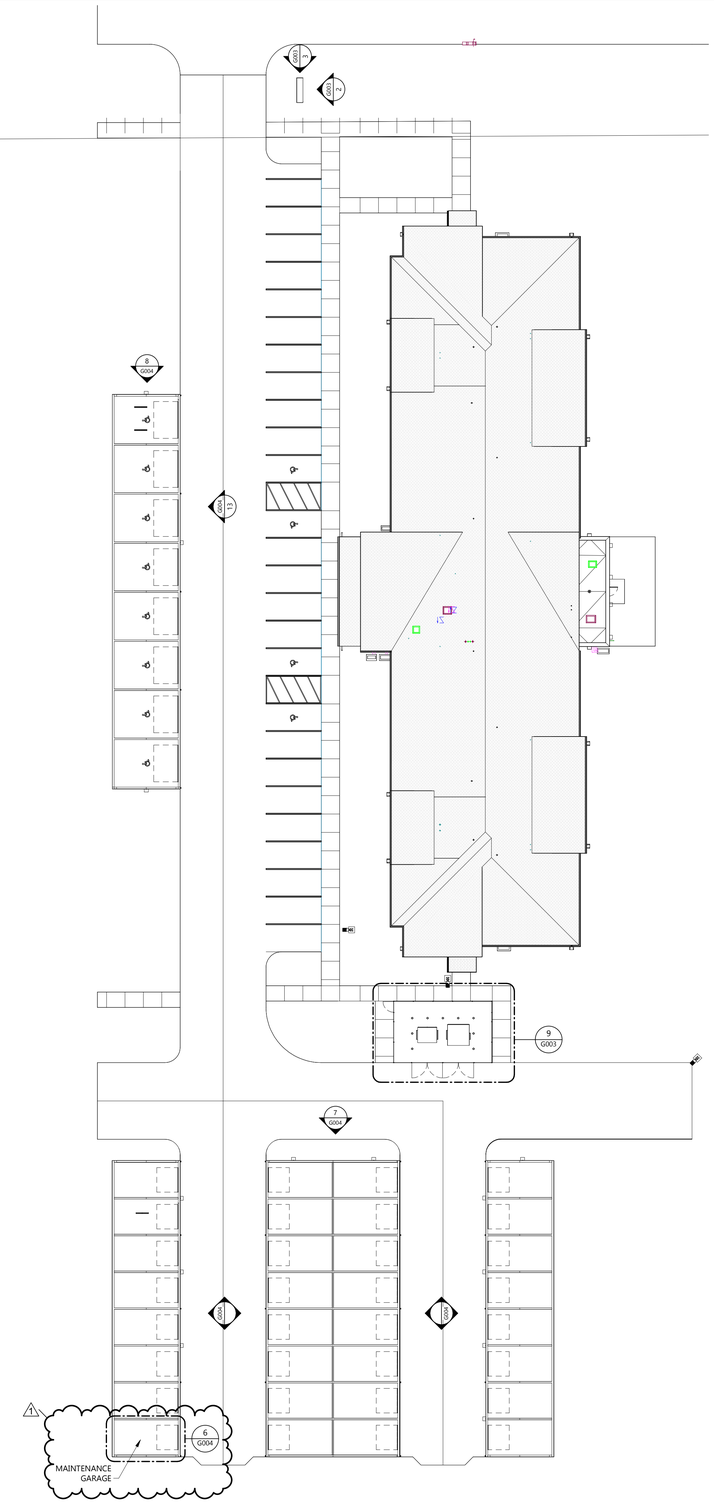

1 G003 ARCHITECTURAL SITE PLAN - BUFFALO MANOR
1" = 20'-0"

N

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CONSULTANTS

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ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
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PROJECT NO: 20245211
DRAWN BY: BRJ
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STAMP

DRAWING TITLE
ARCHITECTURAL SITE PLAN

G003

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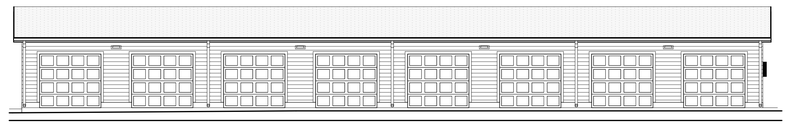
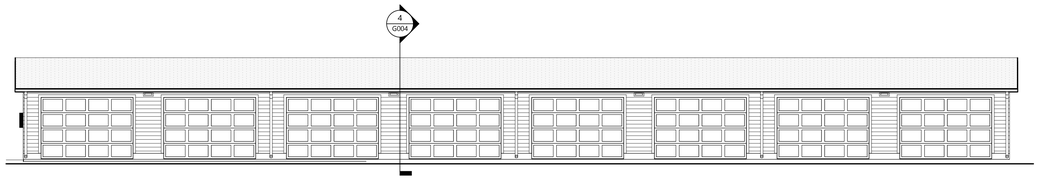


12 G004 TYP. GARAGE ELEVATION
1/8" = 1'-0"



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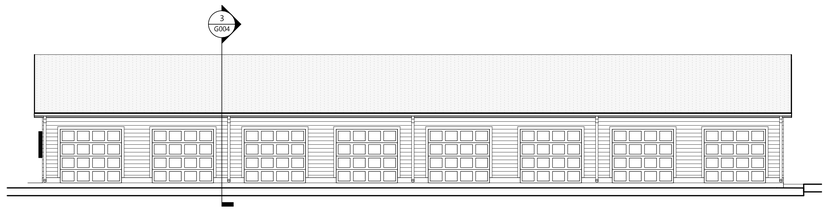
1/8" = 1'-0"



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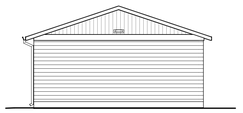
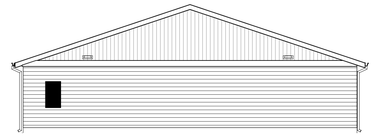
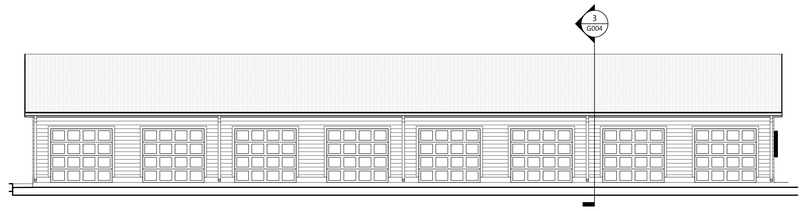
1/8" = 1'-0"



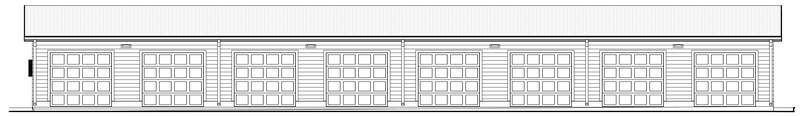
8 G004 TYP. END WALL ELEVATION - SINGLE GARAGE
1/8" = 1'-0"



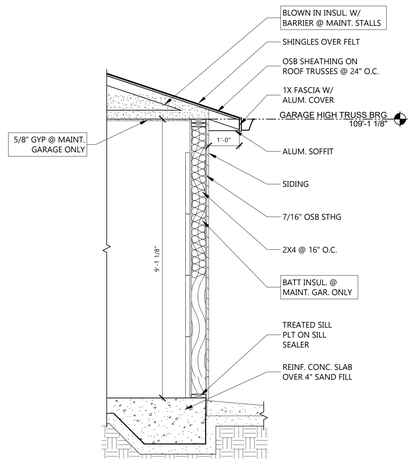
7 G004 TYP. END WALL ELEVATION - DOUBLE GARAGE
1/8" = 1'-0"



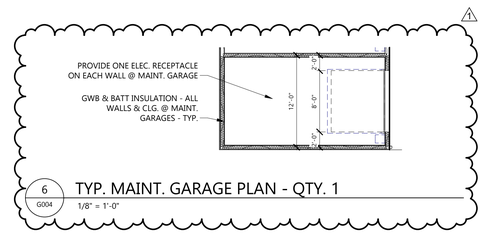
10 G004 TYP. GARAGE ELEVATION
1/8" = 1'-0"



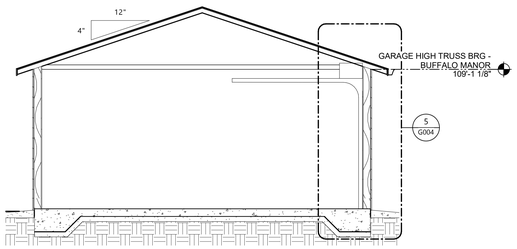
9 G004 TYP. GARAGE ELEVATION
1/8" = 1'-0"



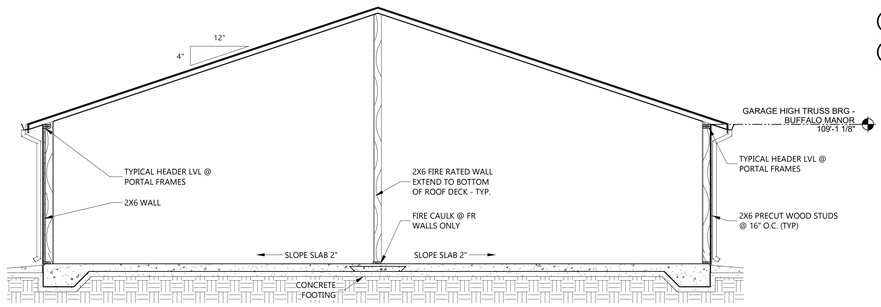
5 G004 TYP. GARAGE SECTION
1/2" = 1'-0"



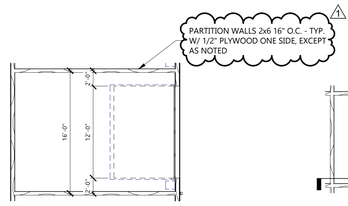
6 G004 TYP. MAINT. GARAGE PLAN - QTY. 1
1/8" = 1'-0"



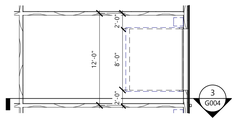
4 G004 TYP. SINGLE GARAGE SECTION
1/4" = 1'-0"



3 G004 TYP. DOUBLE GARAGE SECTION
1/4" = 1'-0"



2 G004 TYP. HDCP GARAGE PLAN
1/8" = 1'-0"



1 G004 TYP. GARAGE PLAN
1/8" = 1'-0"

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CONSULTANTS

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR
APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20245211
DRAWN BY: BRJ
CHECKED BY: SS

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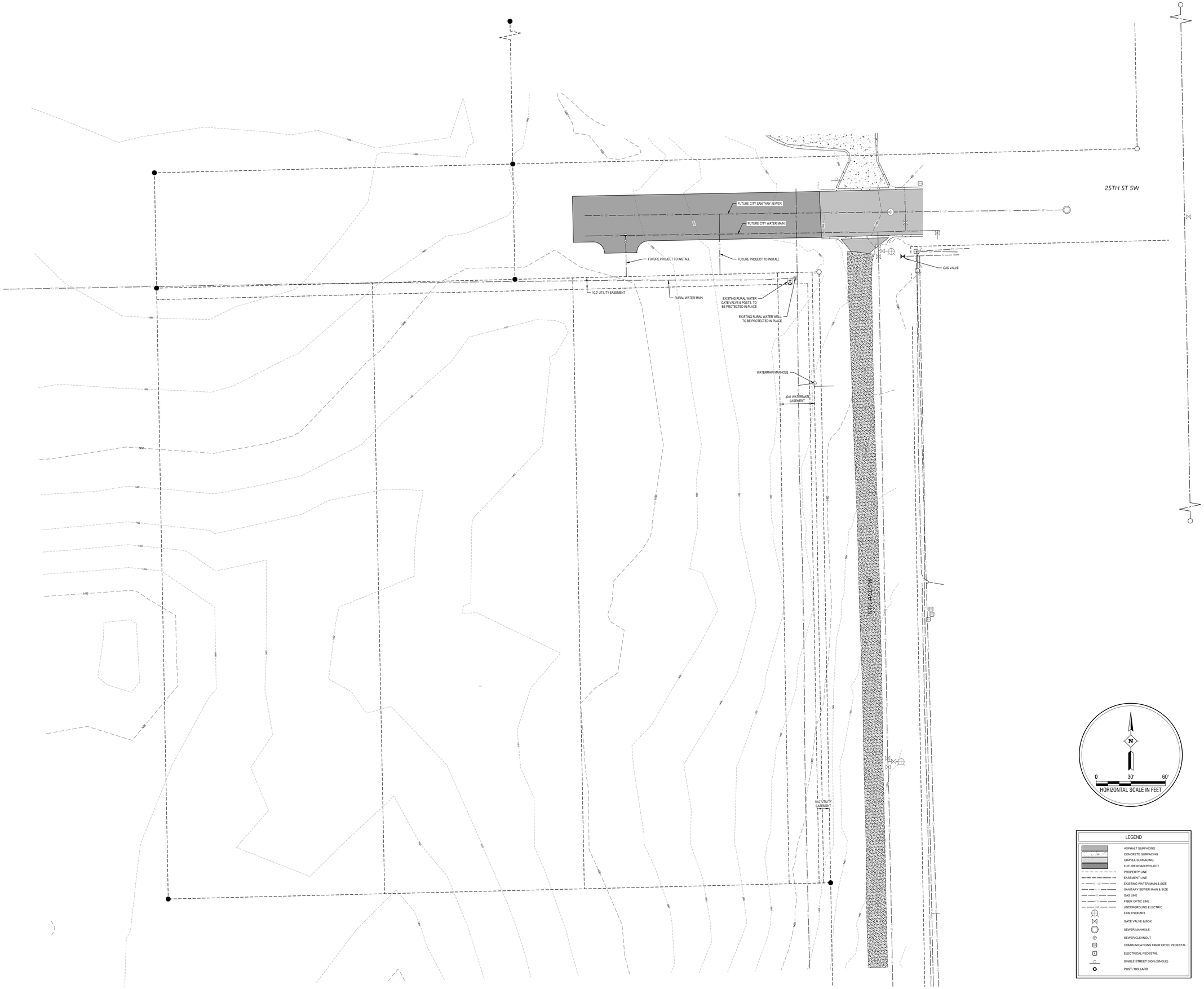
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.

Signature: _____
Date: 05-26-2026 REG. NO. : 1565

DRAWING TITLE
GARAGE PLANS, SECTIONS & ELEVATIONS

G004

Revit Version:
Print Date: 5/26/2026 1:18:49 PM



Revit Version:
Plot Date:

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PROJECT DESCRIPTION
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CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

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CD	CONSTRUCTION DOCUMENTS	5/26/2026
MARK	DESCRIPTION	DATE

PROJECT NO: 20245211
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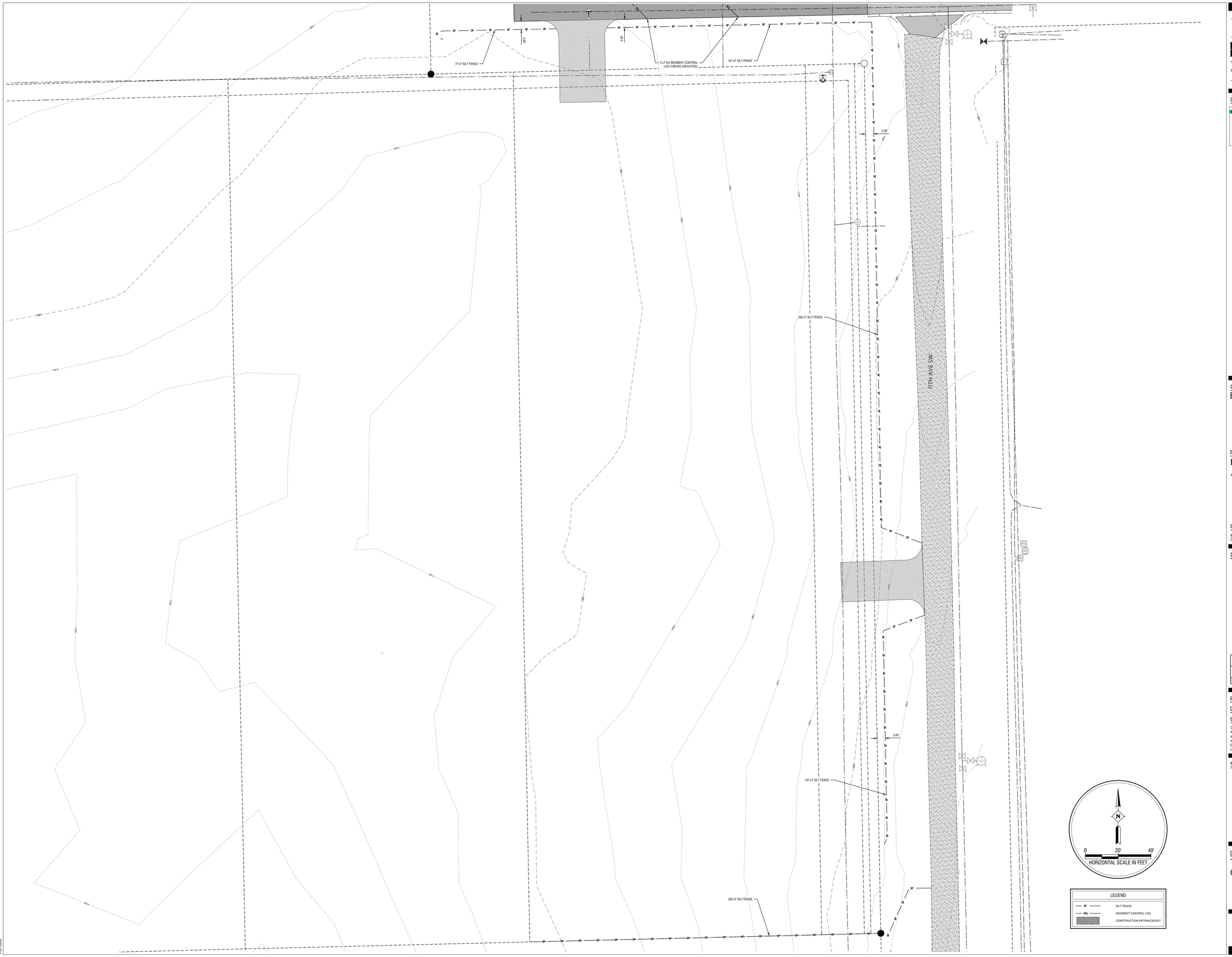
BENJAMIN B. AASETH
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
EXISTING CONDITIONS & DEMOLITION

C100



Revit Version:
Plot Date:

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BUFFALO MANOR APARTMENTS

CITY JAMESTOWN
STATE NORTH DAKOTA

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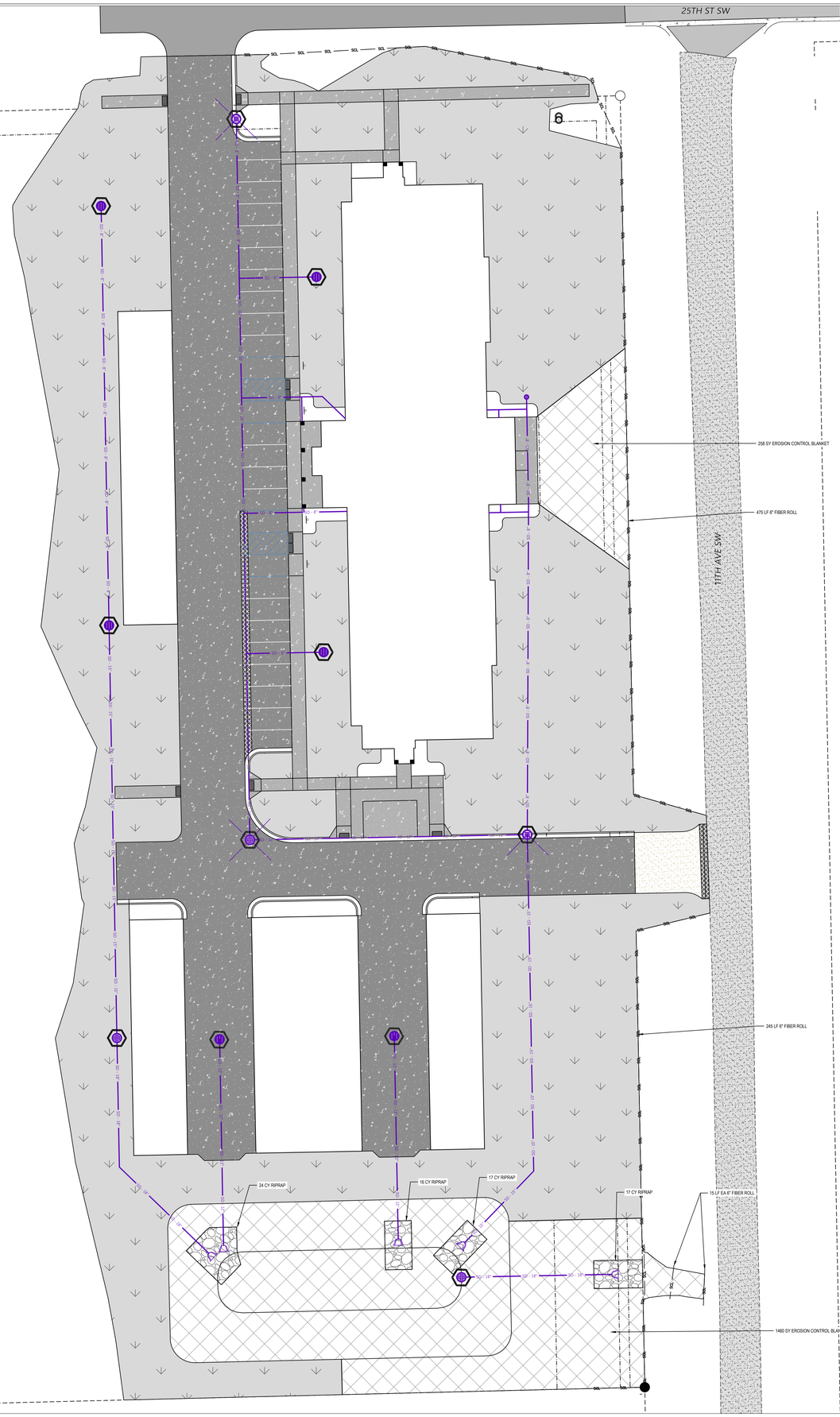
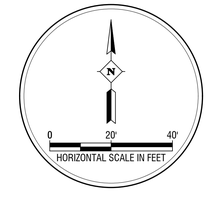
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
TEMPORARY EROSION CONTROL

C200





LEGEND

- EROSION CONTROL BLANKET W/ SEEDING
- SEEDING & HYDROMULCHING
- RIPRAP
- INLET PROTECTION
- SOL — SEDIMENT CONTROL LOG (8" FIBER ROLLS)

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PROJECT DESCRIPTION
BUFFALO MANOR APARTMENTS

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	5/26/2026
CD	CONSTRUCTION DOCUMENTS	5/26/2026

PROJECT NO: 20245211
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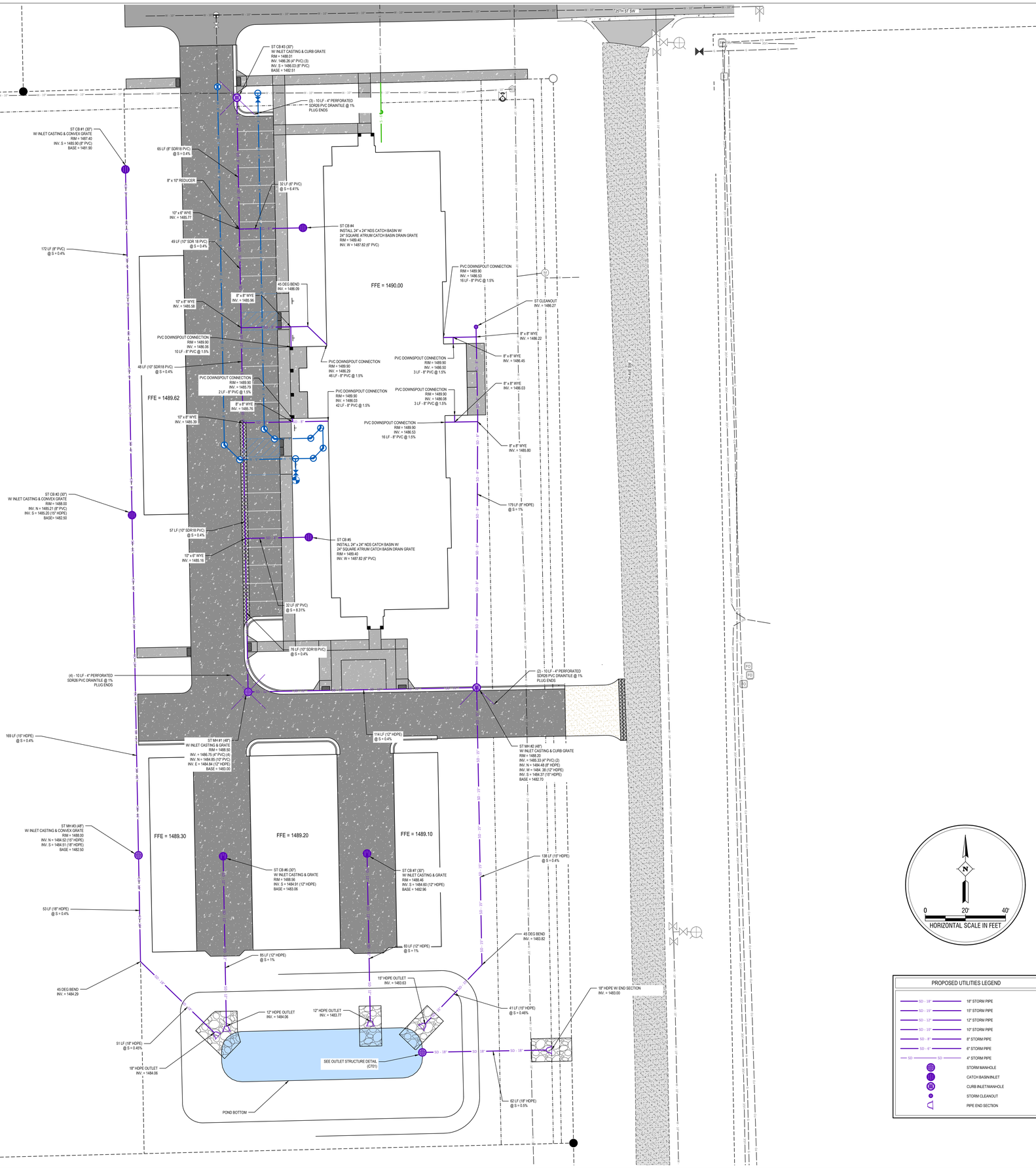
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
PERMANENT EROSION CONTROL

C201

Revit Version:
Plot Date:



0 20' 40'
HORIZONTAL SCALE IN FEET

PROPOSED UTILITIES LEGEND

- SD - 18" — 18" STORM PIPE
- SD - 15" — 15" STORM PIPE
- SD - 12" — 12" STORM PIPE
- SD - 10" — 10" STORM PIPE
- SD - 8" — 8" STORM PIPE
- SD - 6" — 6" STORM PIPE
- SD — SD — 4" STORM PIPE
- STORM MANHOLE
- CATCH BASIN/INLET
- CURB INLET/MANHOLE
- STORM CLEANOUT
- PIPE END SECTION

Revit Version:
Print Date:

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STATE NORTH DAKOTA

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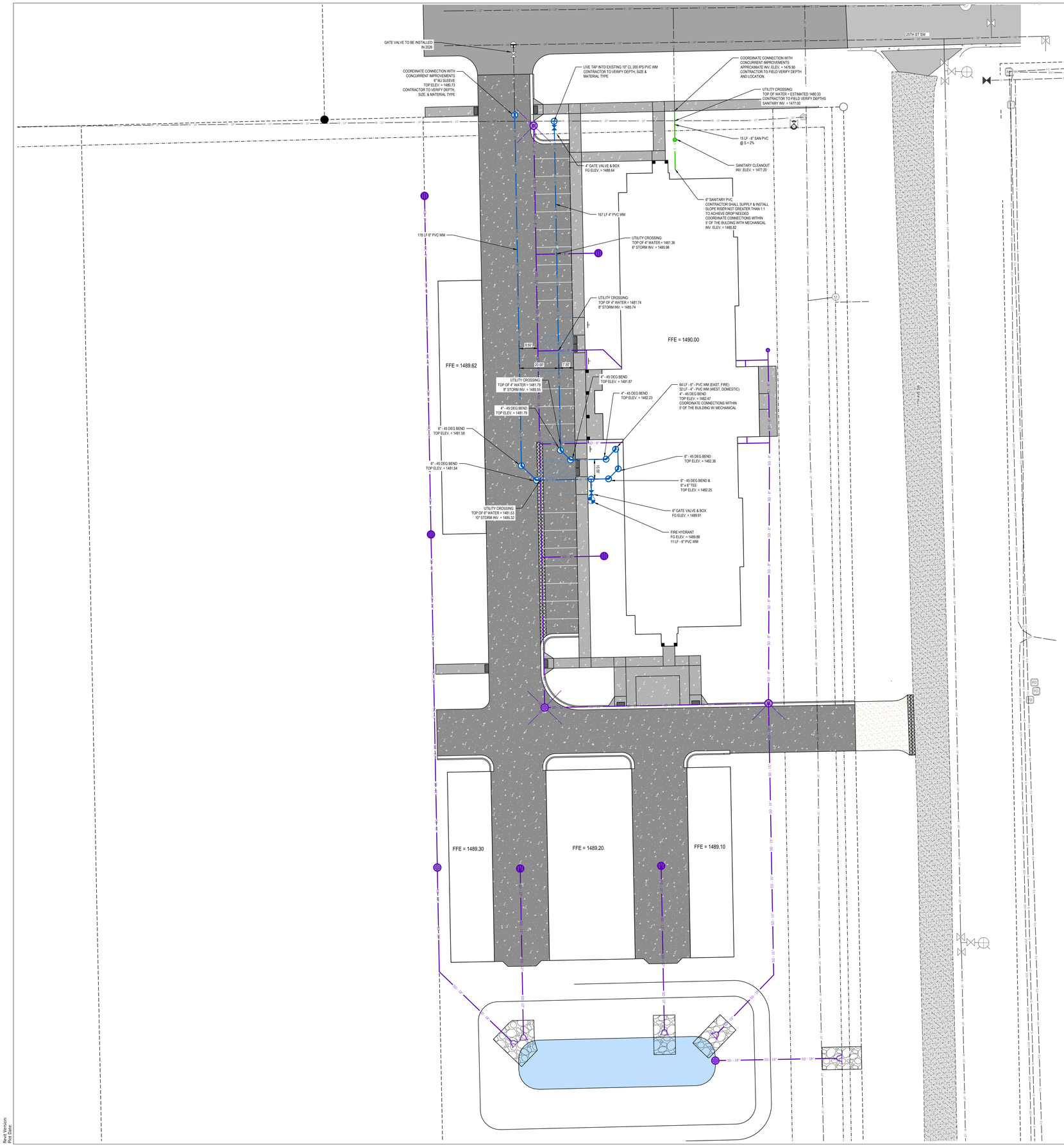
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
UTILITY PLAN - STORM SEWER

C300



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PROJECT DESCRIPTION
BUFFALO MANOR APARTMENTS

CITY JAMESTOWN
STATE NORTH DAKOTA

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BENJAMIN B. AASETH
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
UTILITY PLAN - SANITRY SEWER & WATER

C301

FFE = 1489.62
FFE = 1490.00
FFE = 1489.30
FFE = 1489.20
FFE = 1489.10
RIM ELEV. = 1488.01
RIM ELEV. = 1487.40
RIM ELEV. = 1489.40
RIM ELEV. = 1488.00
RIM ELEV. = 1488.50
RIM ELEV. = 1488.20
RIM ELEV. = 1485.75
8' BERM AROUND OUTER EDGE OF POND
TOP OF POND ELEV. = 1488.50
BOTTOM OF POND 100' LONG x 25' WIDE
CONCENTRATED FLOW PATH
TBC = 1486.10'
FL = 1485.41'
GRV = 1483.85'
GRV = 1483.22'
ME = ±1483.23'
ME = ±1483.01'
GRV = 1483.01'
GRV = 1483.51'
ME = ±1482.50'
ME = ±1482.50'
CON = 1485.14'
CON = 1484.86'
CON = 1488.30'
FG = 1483.00'
FG = 1483.61'
FG = 1483.56'
FG = 1483.00'
FG = 1484.88'
FG = 1484.77'
FG = 1484.49'
FG = 1483.70'
FG = 1485.06'
FG = 1485.56'
FG = 1484.56'
FG = 1484.49'
FG = 1483.31'
FG = 1483.77'
FG = 1488.50'
FG = 1488.50'
FG = 1488.50'
FG = 1488.50'
8.00'
24.5%
19.7%
-3.3%
-9.2%
-11.3%
-12.1%
-7.4%
-8.6%
-6.8%
-7.9%
-5.5%
-7.0%
-12.2%
-6.9%
-5.2%
-4.5%
-4.6%
-5.3%
-4.5%
-5.2%
-4.5%
-4.6%
-12.9%
-10.7%
-1.7%
-7.8%
-10.1%
-2.4%
-2.0%
-3.8%
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-2.8%
-2.8%
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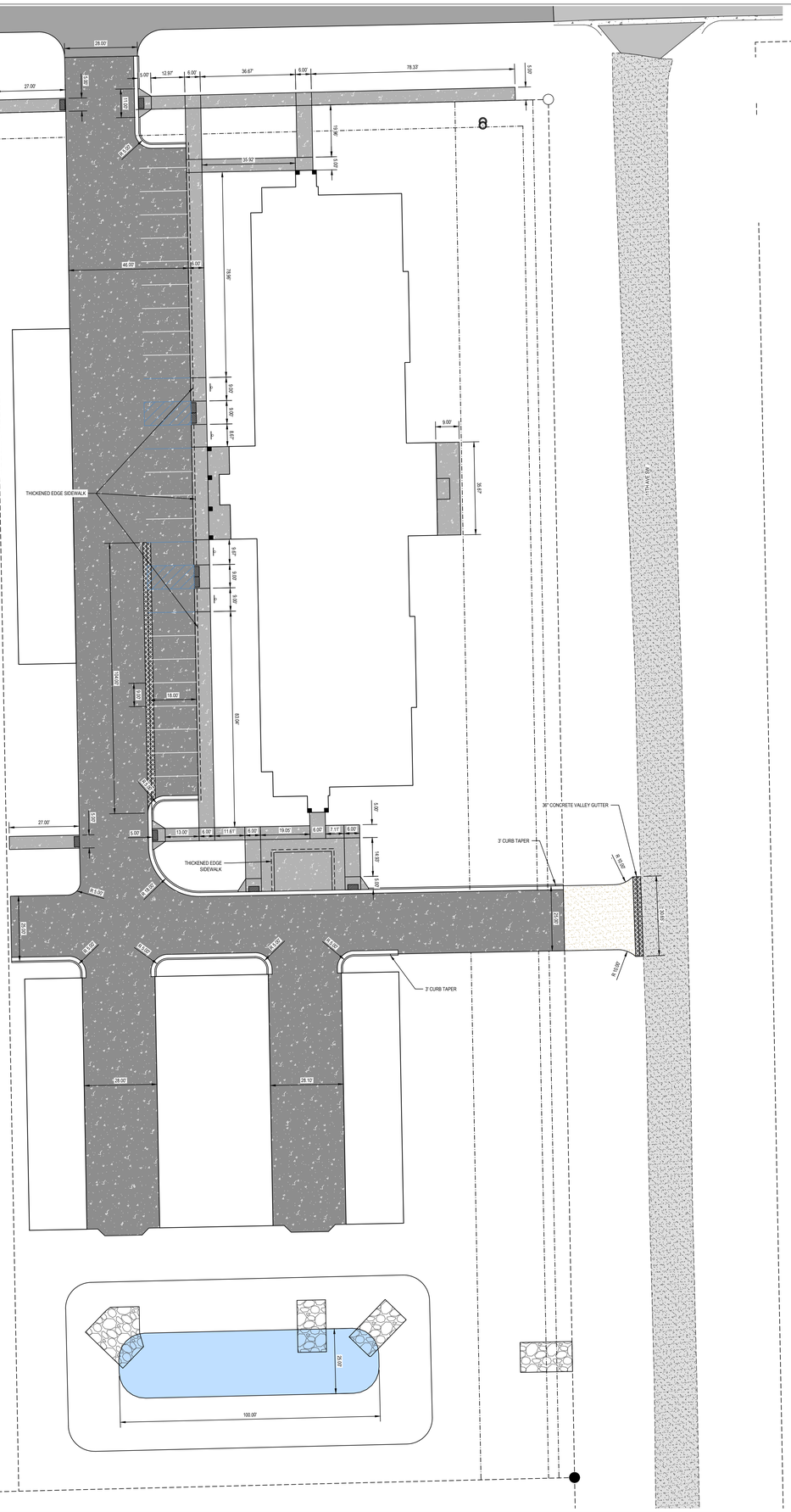
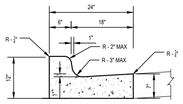
-3.2%
-3.2


26.00'
27.00'
5.00'
12.97'
6.00'
36.67'
6.00'
78.33'
0.5%
2.00%
4.17%
36.5'
35.92'
45.00'
45.00'
7.5%
7.5%
7.5%



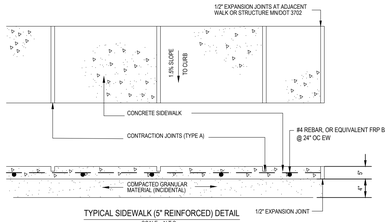
SEE GRADING PLAN FOR DETERMINATION OF GUTTER SLOPE

CURB AND GUTTER
SCALE = N.T.S.

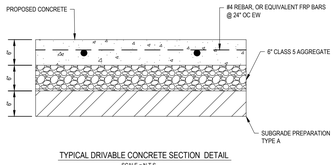
NOTES:

1. CONTRACTION JOINTS: USE 1/8"-1/4" ASPHALTIC MASTIC BOARD EMBEDDED 1 1/2" INTO THE GUTTER AND THROUGH THE CURB, OR SCORE THE CURB AND GUTTER 2" AS SHOWN IN THE DETAIL.
2. EXPANSION JOINTS - EXPANSION JOINT MATERIAL SHALL BE 3/4" PRE MOLDED CONFORMING TO THE STANDARD SPECIFICATIONS. THE OPENING FOR THE BACKER ROD AND JOINT SEALANT SHALL BE FORMED BY A PRECUT PIECE OF WOOD OR OTHER MATERIAL APPROVED BY THE ENGINEER. DOWEL SUPPORTS ARE NOT REQUIRED ON THE SECOND POUR AT A COLD JOINT. THE METAL CAP AND GREASED DOWEL SHALL BE ON THE SECOND POUR.
3. JOINT SPACING - THE CURB AND GUTTER JOINTS SHALL MATCH THE PAVEMENT JOINTS ON PCC PAVEMENTS.
4. JOINT SEALING - ALL CONTRACTION JOINTS AND EXPANSION JOINTS SHALL BE SEALED AS SHOWN IN THE DETAILS. THE JOINT SEALANT SHALL BE LOW MODULUS SILICONE OR POLYURETHANE.
   TENSILE STRENGTH AT BREAK (ASTM D412): 125 psi
   MOVEMENT CAPABILITY: ±50% EXPANSION/CONTRACTION
   TT-S-00230G, COLOR SHALL BE GRAY
   THE SEALANT SHALL BE TOOLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

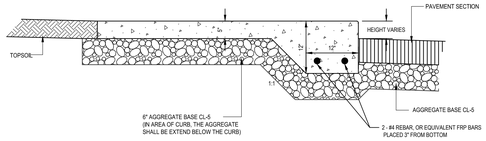
CURB AND GUTTER DETAILS
SCALE = N.T.S.



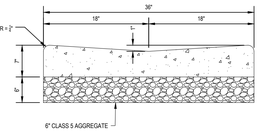
TYPICAL SIDEWALK (5" REINFORCED) DETAIL
SCALE = N.T.S.



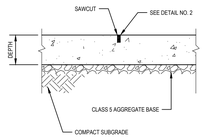
TYPICAL DRIVABLE CONCRETE SECTION DETAIL
SCALE = N.T.S.



CONCRETE SIDEWALK THICKENED EDGE DETAIL
SCALE = N.T.S.



TYPICAL CONCRETE VALLEY GUTTER SECTION DETAIL
SCALE = N.T.S.



TYPE A JOINT
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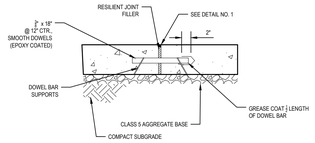

TYPE B JOINT
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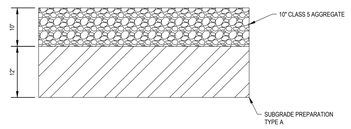
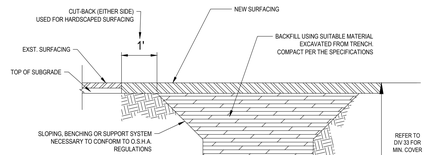
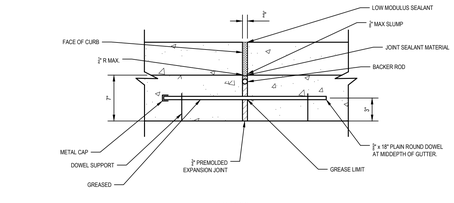


TYPICAL GRAVEL SURFACING SECTION DETAIL
SCALE = N.T.S.



NOTES:
1. SEE CONTRACT SPECIFICATIONS FOR ANY MODIFICATIONS TO STANDARD TRENCH MATERIALS AND/OR TRENCH DESIGN FEATURES.
2. THE COST FOR ALL TYPE I BEDDING/BACKFILL MATERIALS TO BE INCLUDED IN THE PRICE BID FOR THE PIPE.
3. PIPE INSTALLED VIA "OPEN CUT" METHODS SHALL BE FURNISHED AND INSTALLED WITH DETECTABLE WARNING TAPE. PIPE SHALL INCLUDE MAINS, SERVICES, AND HYDRANT LEADS AS APPLICABLE.
4. DETECTABLE WARNING TAPE SHALL BE PLACED 24" TO 36" ABOVE THE PIPE, OR AS APPROVED BY OWNER/ENGINEER

TRENCHING DETAILS
SCALE = N.T.S.



SECTION C-C

DOWEL EXPANSION JOINT DETAIL
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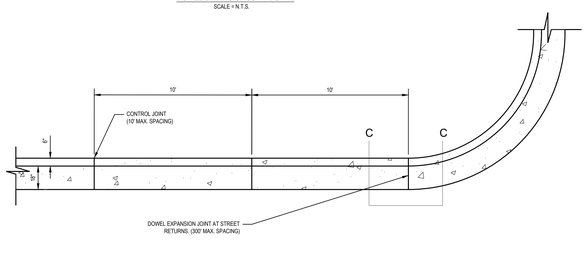
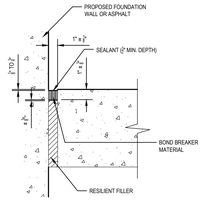
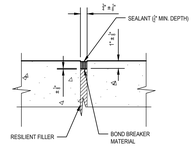


CURB AND GUTTER DETAIL @ RADIUS
SCALE = N.T.S.



TYPE C JOINT
SCALE = N.T.S.



DETAIL NO. 1
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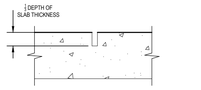

DETAIL NO. 2
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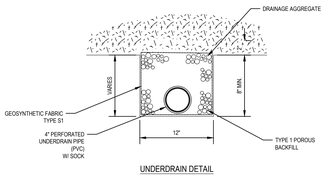
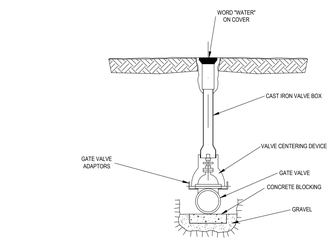


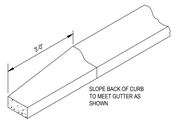
UNDERDRAIN DETAIL
SCALE = N.T.S.

ADA RAMP DETAILS
SCALE = N.T.S.

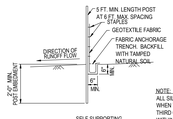


GATE VALVE DETAIL
SCALE = N.T.S.

*ALL DUCTILE IRON JOINTS TO BE MEGALUG JOINT RESTRAINT OR EQUIVALENT

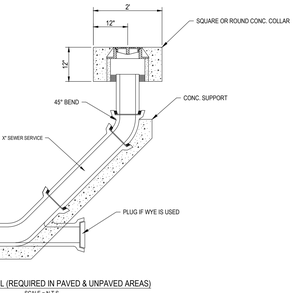


TAPERED CURB END SECTION
SCALE = N.T.S.

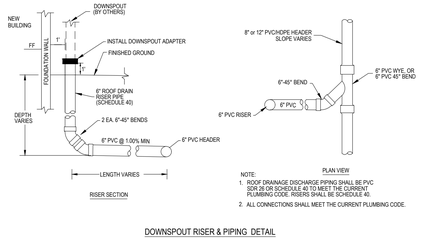


NOTE:
ALL SILT FENCES MUST BE REPAIRED, REPLACED OR SUPPLEMENTED WHEN THEY BECOME NONFUNCTIONAL OR THE SEDIMENT REACHES ONE THIRD OF THE HEIGHT OF THE FENCE. THESE REPAIRS MUST BE MADE WITHIN 24 HOURS OF DISCOVERY, OR AS SOON AS FIELD CONDITIONS ALLOW ACCESS.

PERIMETER CONTROL SILT FENCE DETAILS
SCALE = N.T.S.

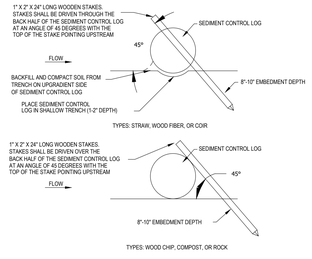


CLEANOUT DETAIL (REQUIRED IN PAVED & UNPAVED AREAS)
SCALE = N.T.S.

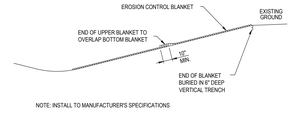


NOTE:
1. ROOF DRAINAGE DISCHARGE PIPING SHALL BE PVC SDR 26 OR SCHEDULE 40 TO MEET THE CURRENT PLUMBING CODE. RISERS SHALL BE SCHEDULE 40.
2. ALL CONNECTIONS SHALL MEET THE CURRENT PLUMBING CODE.

DOWNSPOUT RISER & PIPING DETAIL
SCALE = N.T.S.

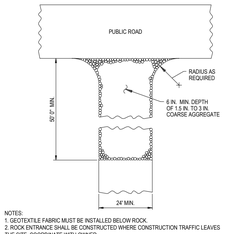


SEDIMENT CONTROL LOG
SCALE = N.T.S.



NOTE: INSTALL TO MANUFACTURER'S SPECIFICATIONS

EROSION CONTROL BLANKET
SCALE = N.T.S.



NOTES:
1. GEOTEXTILE FABRIC MUST BE INSTALLED BELOW ROCK.
2. ROCK ENTRANCE SHALL BE CONSTRUCTED WHERE CONSTRUCTION TRAFFIC LEAVES THE SITE. COORDINATE WITH OWNER.

TEMPORARY CONSTRUCTION ENTRANCE/EXIT
SCALE = N.T.S.

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Plot Date:

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112 No.Roberts Street, Suite 300, Fargo ND 58102
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CONSULTANTS

INTERSTATE ENGINEERING

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR APARTMENTS

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	5/26/2026
CD	CONSTRUCTION DOCUMENTS	5/26/2026

PROJECT NO: 20245211
DRAWN BY: AF
CHECKED BY: BA

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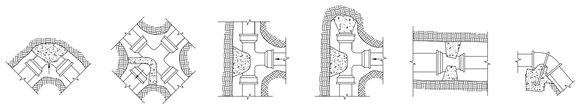
REGISTERED PROFESSIONAL ENGINEER
BENJAMIN B. AASETH
PE-10085
DATE 5/26/26
NORTH DAKOTA

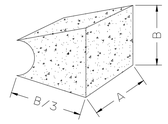
DRAWING TITLE
DETAILS

C700

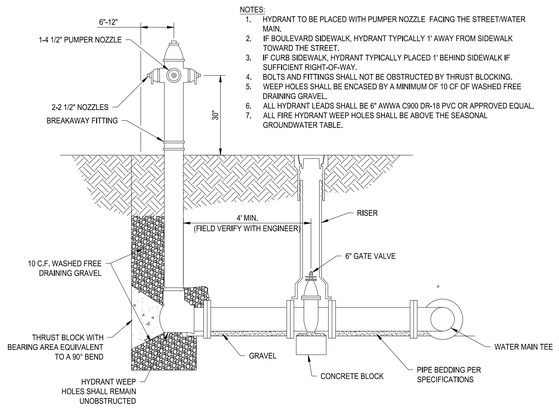
STANDARD DIMENSIONS FOR THRUST BLOCKS (FT)								
FITTING SIZE	TEES/DEAD ENDS		90° BEND		45° BEND		22.5° BEND	
	A	B	A	B	A	B	A	B
4	1.79	1.19	2.13	1.42	1.57	1.04	1.12	0.75
6	2.69	1.79	3.19	2.13	2.35	1.57	1.68	1.12
8	3.58	2.39	4.26	2.84	3.13	2.09	2.24	1.49
10	4.48	2.98	5.32	3.55	3.92	2.61	2.80	1.86
12	5.37	3.58	6.39	4.26	4.70	3.13	3.35	2.24
14	6.27	4.18	7.45	4.97	5.48	3.65	3.91	2.61
16	7.16	4.77	8.52	5.68	6.26	4.18	4.47	2.98
18	8.06	5.37	9.58	6.39	7.05	4.70	5.03	3.35



NOTES:
1. TABLE IS BASED ON MAIN PRESSURE OF 150 PSI AND SOIL BEARING PRESSURE OF 1500 PSF.
2. ALL DUCTILE IRON FITTINGS SHALL BE WRAPPED IN POLYETHYLENE ENCASEMENT.
3. JOINT RESTRAINTS SHALL BE USED IN TANDEM WITH THRUST BLOCKS UNLESS OTHERWISE APPROVED BY OWNER/ENGINEER.

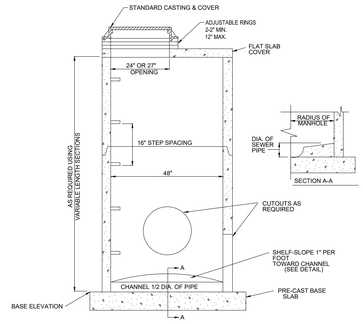


THRUST BLOCKING DETAIL
SCALE = N.T.S.



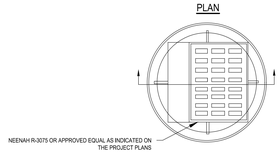
NOTES:
1. HYDRANT TO BE PLACED WITH PUMPER NOZZLE FACING THE STREET/WATER MAIN.
2. IF BOULEVARD SIDEWALK, HYDRANT TYPICALLY 1' AWAY FROM SIDEWALK TOWARD THE STREET.
3. IF CURB SIDEWALK, HYDRANT TYPICALLY PLACED 1' BEHIND SIDEWALK IF SUFFICIENT RIGHT-OF-WAY.
4. BOLTS AND FITTINGS SHALL NOT BE OBSTRUCTED BY THRUST BLOCKING.
5. WEEP HOLES SHALL BE ENCASED BY A MINIMUM OF 10 CF OF WASHED FREE DRAINING GRAVEL.
6. ALL HYDRANT LEADS SHALL BE 6" AWWA C900 DR-18 PVC OR APPROVED EQUAL.
7. ALL FIRE HYDRANT WEEP HOLES SHALL BE ABOVE THE SEASONAL GROUNDWATER TABLE.

HYDRANT DETAIL
SCALE = N.T.S.

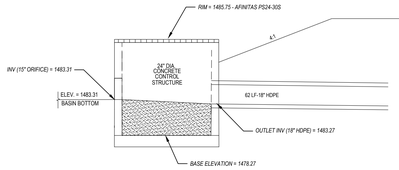


STORM CONCRETE MANHOLE DETAIL
SCALE = N.T.S.

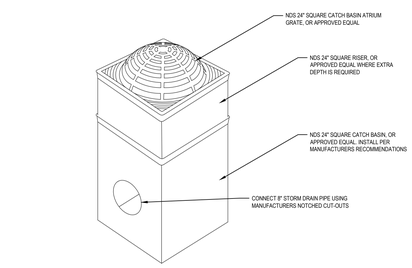
PLAN

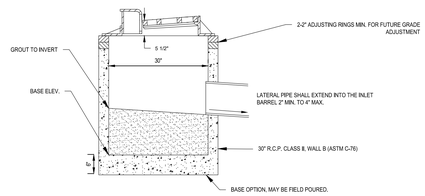


NEENAH R-3075 OR APPROVED EQUAL AS INDICATED ON THE PROJECT PLANS

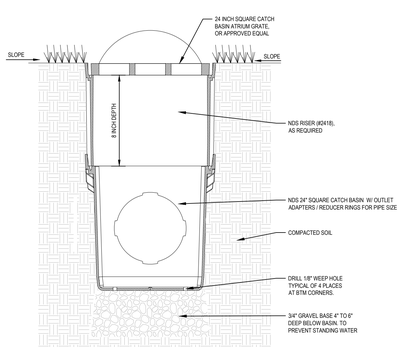


OUTLET STRUCTURE DETAIL
SCALE = N.T.S.



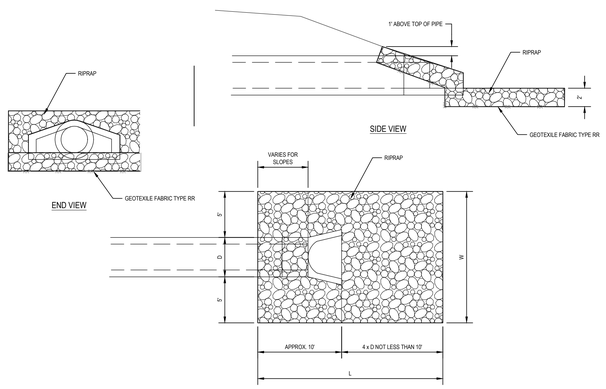


STORM CATCH BASIN DETAIL
SCALE = N.T.S.



NOTES:
1. GRATE TO BE ATTACHED TO CATCH BASIN WITH SCREW PROVIDED AT TIME OF INSTALLATION.
2. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

NDS 24" SQUARE CATCH BASIN DETAIL
SCALE = N.T.S.



PLAN VIEW

RIPRAP DETAIL
SCALE = N.T.S.

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STATE NORTH DAKOTA

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DRAWN BY: AF
CHECKED BY: BA

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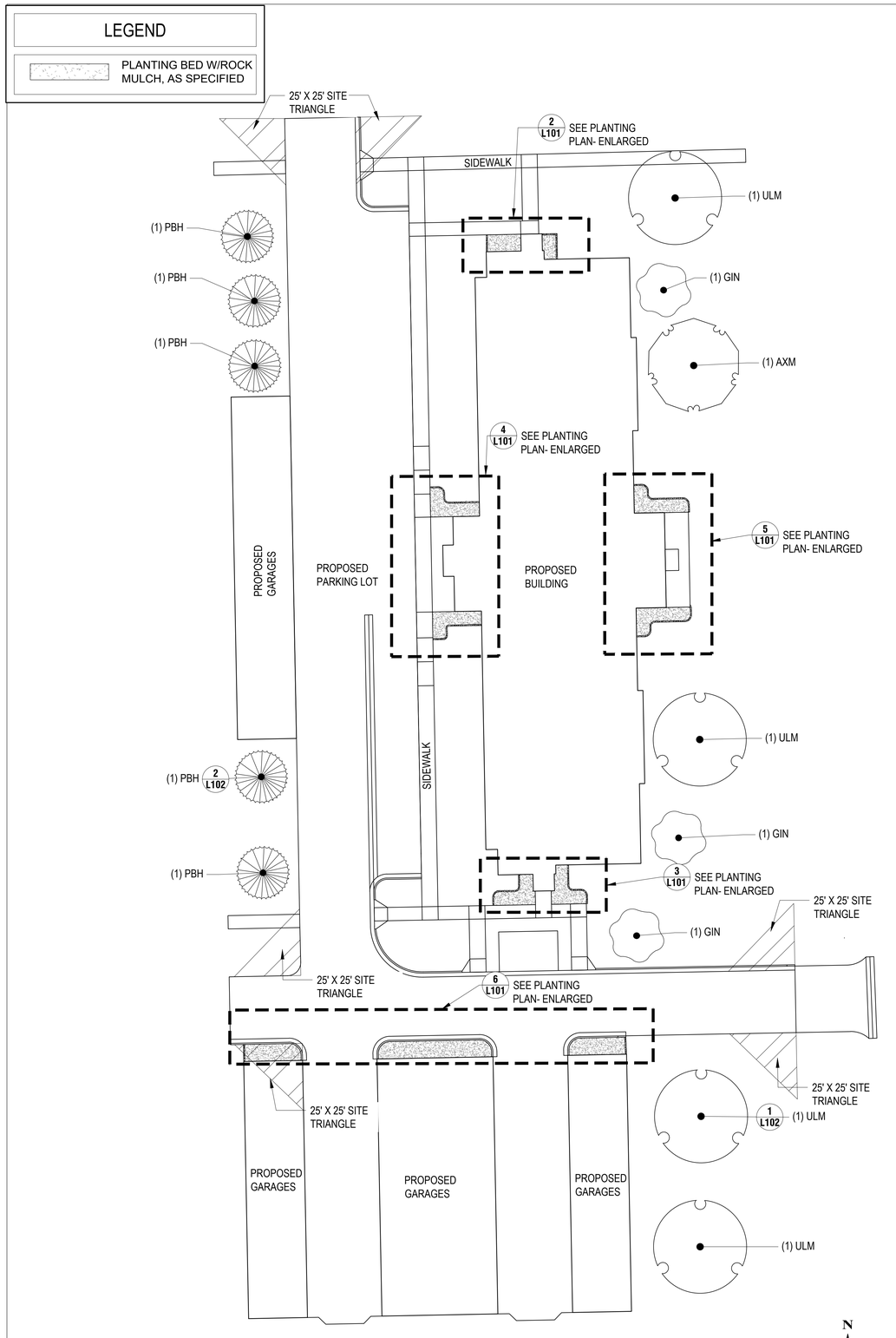
REGISTERED PROFESSIONAL ENGINEER
BENJAMIN B. AASETH
PE-10085
DATE 5/26/26
NORTH DAKOTA

DRAWING TITLE
DETAILS

C701

Revit Version:
Plot Date:

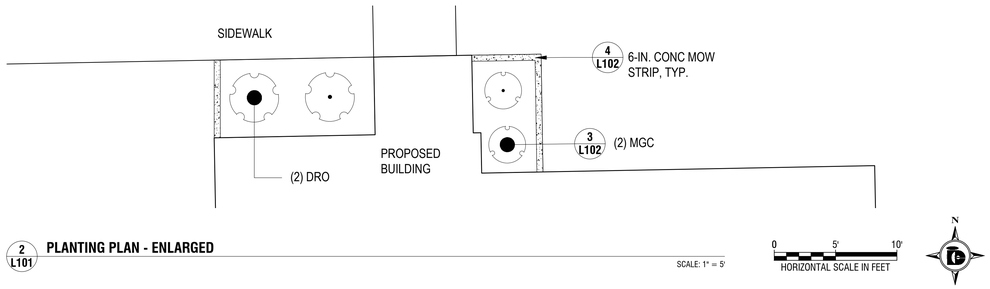


1 L101 **PLANTING PLAN**

SCALE: 1" = 20'

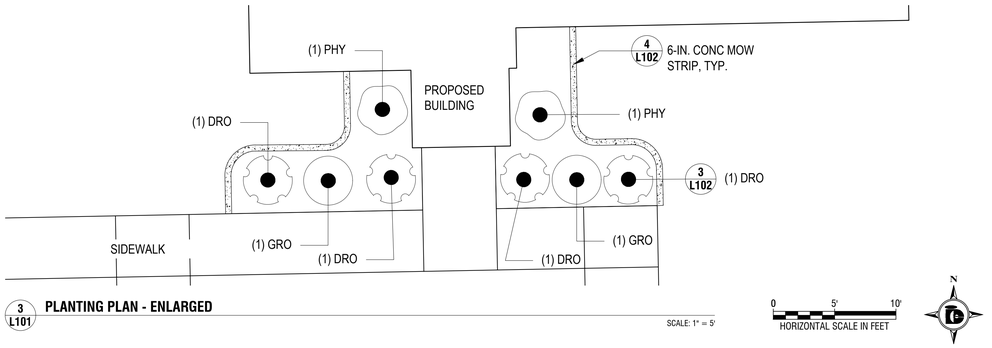
GENERAL NOTES

1. REFER TO CIVIL SHEETS FOR UTILITIES, SITE LAYOUT, & SITE GRADING.
2. SEE SHEET L102 FOR LANDSCAPE DETAILS & NOTES
3. PROVIDE ROCK MULCH AS SPECIFIED, IN ALL PLANTING BEDS UNLESS INDICATED OTHERWISE.
4. SEE SHEET L102 FOR LANDSCAPE CODE MINIMUM REQUIRMENTS



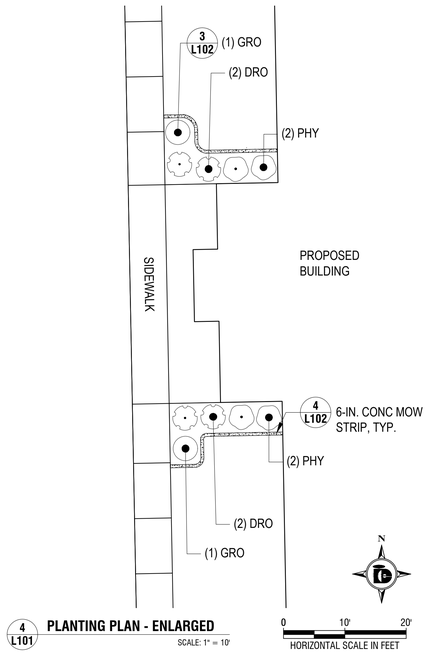
2 L101 **PLANTING PLAN - ENLARGED**

SCALE: 1" = 5'



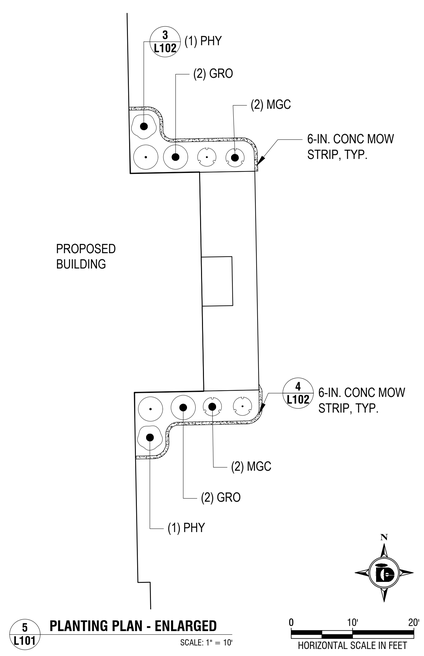
3 L101 **PLANTING PLAN - ENLARGED**

SCALE: 1" = 5'



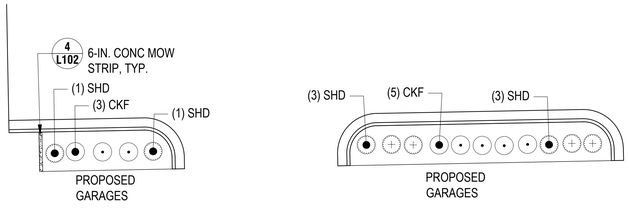
4 L101 **PLANTING PLAN - ENLARGED**

SCALE: 1" = 10'



5 L101 **PLANTING PLAN - ENLARGED**

SCALE: 1" = 10'



6 L101 **PLANTING PLAN - ENLARGED**

SCALE: 1" = 10'

N
0 10' 20'
HORIZONTAL SCALE IN FEET

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CHECKED BY: AK

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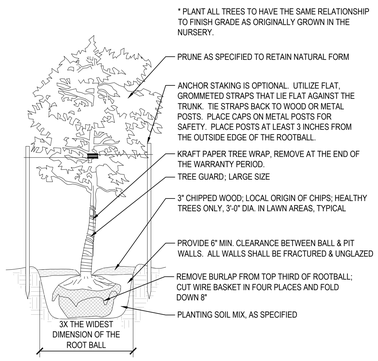
LICENSED LANDSCAPE ARCHITECT
AMY KRONBECK
(195)
Date: 5 26 2026
STATE OF NORTH DAKOTA

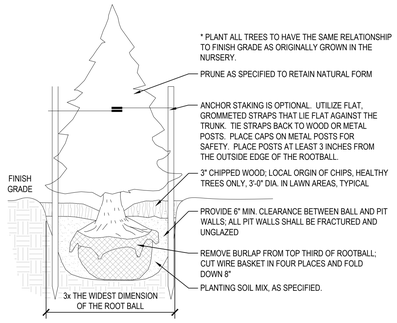
DRAWING TITLE
PLANTING PLAN

L101



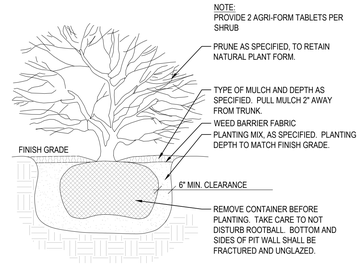
1 L102 **DECIDUOUS TREE**

NOT TO SCALE



2 L102 **CONIFEROUS TREE**

NOT TO SCALE



3 L102 **SHRUB**

NOT TO SCALE

PLANT SCHEDULE							
CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	MATURE HEIGHT	MATURE WIDTH
TREES							
AXM	2	ACER X FREEMANII	FREEMAN MAPLE	2" CAL.	B&B	40 - 65FT. HT.	25 - 40FT. W.
GIN	3	GINKGO BILOBA 'PRINCETON SENTRY"	PRINCETON SENTRY MAIDENHAIR TREE	2" CAL.	B&B	40 - 65FT. HT.	15 - 25FT. W.
ULM	4	ULMUS DAVIDIANA JAPONICA 'DISCOVERY"	DISCOVERY ELM	2" CAL.	B&B	25 - 40FT. HT.	25 - 40FT. W.
EVERGREEN TREES							
PBH	4	PICEA GLAUCA 'DENSATA'	BLACK HILLS SPRUCE	8` HT.	B&B	40 - 65FT. HT.	15 - 25FT. W.
SHRUBS							
PHY	8	PHYSOCARPUS OPULIFOLIUS	TINY WINE NINEBARK	#1	CONT.	3 - 6FT. HT.	3 - 6FT. W.
DRO	10	POTENTILLA FRUTICOSA 'GOLD DROP"	GOLD DROP BUSH CINQUEFOIL	#1	CONT.	18 - 36IN. HT.	3 - 6FT. W.
GRO	8	RHUS AROMATICA 'GRO-LOW"	GRO-LOW FRAGRANT SUMAC	#1	CONT.	18 - 36IN. HT.	3 - 6FT. W.
MGC	6	SPIRAEA X BUMALDA 'WALBUMA'	MAGIC CARPET SPIREA	#1	CONT.	18 - 36IN. HT.	1 - 3FT. W.
ORN GRASSES							
CKF	11	CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER"	KARL FOERSTER FEATHER REED GRASS	#1	CONT.	3 - 6FT. HT.	1 - 3FT. W.
SHD	10	SPOROBOLUS HETEROLEPIS	PRAIRIE DROPSEED	#1	CONT.	18 - 36IN. HT.	1 - 3FT. W.

NOTE:
1. PROVIDE EXPANSION JOINTS AT 16' O.C. AND CONTROL JOINTS AT 4' O.C.

4 L102 **6-IN. CONCRETE MOWSTRIP**

NOT TO SCALE

5 L102 **MULCH**

NOT TO SCALE

PLANTING NOTES

1. VERIFY WITH THE PROJECT MANAGER AND UTILITY COMPANIES THE LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO START. REPAIR ALL DAMAGES TO EXISTING UTILITIES, CURBS, PAVEMENTS AND STRUCTURES WHICH OCCUR DURING THE CONSTRUCTION OF THE PROJECT OR AS A RESULT OF THE CONTRACTOR'S ACTIVITIES, AT NO ADDITIONAL COST TO THE OWNER.
2. SAFEGUARD ALL BUILDING SURFACES, EQUIPMENT AND FURNISHINGS. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE OR INJURY TO PERSONS OR PROPERTY WHICH MAY OCCUR AS A RESULT OF NEGLIGENCE IN THE EXECUTION OF WORK.
3. COORDINATE WITH ARCHITECTURE/ENGINEERING PLANS TO BECOME THOROUGHLY FAMILIAR WITH GRADING, SURFACE AND UNDERGROUND CONDITIONS AND UTILITIES.
4. ALL GRADES, DIMENSIONS AND EXISTING CONDITIONS SHALL BE VERIFIED BY THE CONTRACTOR ON-SITE BEFORE CONSTRUCTION BEGINS. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING WORK.
5. ENSURE THAT THE LANDSCAPING WORK DOES NOT INTERRUPT ESTABLISHED OR PROPOSED DRAINAGE PATTERNS. OBTAIN APPROVAL ON THE FINAL GRADE BY THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING PLANTING OPERATIONS. FINISH GRADE BEFORE MULCHING SHALL BE +/- 3" BELOW FINISH SURFACE OF ADJACENT PAVING.
6. FINE GRADE AND SLOPE ALL LANDSCAPED AREAS TO A MINIMUM OF 2.0% TO DRAIN. POSITIVELY NO SETTLEMENT, EROSION, SEDIMENTATION OR OFF-PROPERTYDRAINAGE NUISANCE SHALL BE ACCEPTED.
7. ALL FILL MATERIAL FOR BACKFILLING TRENCHES OR EXCAVATIONS SHALL BE FREE-DRAINING, GRANULAR MATERIAL APPROVED BY THE OWNER'S REPRESENTATIVE. THE GRANULAR MATERIAL SHALL BE LEFT A MINIMUM OF 12" BELOW FINISH GRADE.
8. PROVIDE TOPSOIL THAT IS LOOSE, FRIABLE AND SHALL CONTAIN AN ORDINARY AMOUNT OF ORGANIC MATTER. IT SHALL CONTAIN NO LUMPS OF SOIL OR ROCKS LARGER THAN 1". IT SHALL BE SUFFICIENTLY FERTILE TO SUSTAIN NORMAL, HEALTHY PLAN GROWTH. PROVIDE A MINIMUM OF [4"][6"] OF TOPSOIL IN ALL LAWN AREAS.
9. TEST THE TOPSOIL AFTER ROUGH GRADING IS COMPLETE TO DETERMINE THE SOIL AMENDMENTS REQUIRED IN ORDER TO PROVIDE A GROWING MEDIUM AS DESCRIBED. SUBMIT A COPY OF ANALYSIS AND RECOMMENDATIONS TO THE OWNER'S REPRESENTATIVE FOR APPROVAL.
10. UTILIZE A PLANTING MIX OF TWO (2) PARTS TOPSOIL, ONE (1) PART AGED COMPOST, AND ONE (1) PART SAND IN ALL PLANTING BEDS FROM 12" BELOW FINISHED GRADE TO FINISHED GRADE.
11. COORDINATE WITH OTHER CONTRACTORS, AS NECESSARY, REGARDING LOCATION AND TIMING OF INSTALLATION OF PLANT MATERIALS.
12. PLANT MATERIALS SHALL BE FURNISHED IN THE QUANTITIES AND/OR SPACING AS SHOWN OR NOTED. IN CASE OF DISCREPANCIES BETWEEN THE PLAN AND THE PLANT SCHEDULE, THE PLAN SHALL DICTATE.
13. PLANT MATERIALS ARE DRAWN AT OR NEAR THEIR MATURE SIZE. UTILIZE THE CENTER POINT OF THE SYMBOL TO DETERMINE PROPER PLANT LAYOUT AND PLACEMENT.
14. LAYOUT PLANT LOCATIONS AND PLANTING BED EDGES AND OBTAIN APPROVAL BY THE OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.
15. ALL PLANTS ARE TO MEET OR EXCEED 'AMERICAN STANDARDS FOR NURSERY STOCK,' CURRENT EDITION, BY THE AMERICAN NURSERY & LANDSCAPE ASSOCIATION. ALL PLANTS SHALL BE NURSERY-GROWN UNLESS OTHERWISE NOTED.
16. 6" CONCRETE MOW STRIP, TO BE PLACED BETWEEN LANDSCAPE BEDS AND LAWNS AS INDICATED ON THE DRAWINGS.
17. PLACE TYPAR 3301 WEED FABRIC IN ALL PLANTING BEDS.
18. PLANT FERTILIZER SHALL BE AGRIFORM (21 GRAM), 20-10-5 BY WEIGHT, APPLIED AT THE RATE RECOMMENDED BY SOIL TESTING AND SUITED TO THE SPECIFIED PLANTS.
19. PROVIDE 1-1/2" MINUS ROCK MULCH, 3" MINIMUM DEPTH FOR PLANTING BEDS. PROVIDE SOURCE AND SAMPLE FOR APPROVAL BY THE OWNER'S REPRESENTATIVE.
20. TREES LOCATED IN GRASS AREAS TO HAVE BARK MULCH RINGS AS PER DETAILS.
21. STAKE AND GUY ALL TREES IMMEDIATELY AFTER PLANTING. THE STABILITY AND PLUMB CONDITIONS OF ALL PLANT STOCK IS THE RESPONSIBILITY OF THE CONTRACTOR THROUGH THE WARRANTY PERIOD AND THE CONTRACTOR IS LIABLE FOR ANY DAMAGE CAUSED BY INSTABILITY OF ANY PLANT MATERIALS.
22. COORDINATE THE PLANTING WITH IRRIGATION SYSTEM LAYOUT. THE OWNER IS NOT RESPONSIBLE FOR DAMAGE CAUSED BY OTHER TRADES WHILE COMPLETING THIS WORK.
23. ALL SUBSTITUTIONS AND PLAN CHANGES MUST BE APPROVED BY THE LANDSCAPE ARCHITECT. NO SUBSTITUTIONS SHALL BE MADE WITHOUT WRITTEN CONSENT OF THE OWNER'S REPRESENTATIVE.
24. ANY WORK OR MATERIAL WHICH IN THE OPINION OF THE OWNER'S REPRESENTATIVE DOES NOT MEET THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS WILL BE CAUSE FOR REJECTION. ALL REJECTED WORK AND MATERIALS SHALL BE IMMEDIATELY REMOVED, DISPOSED AND REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
25. BEGIN MAINTENANCE AFTER EACH PLANT HAS BEEN INSTALLED AND CONTINUE UNTIL FINAL ACCEPTANCE BY THE OWNER'S REPRESENTATIVE. MAINTENANCE INCLUDES WATERING, PRUNING, WEEDING, MULCHING, REPLACEMENT OF SICK OR DEAD PLANTS AND ANY OTHER CARE NECESSARY FOR THE PROPER GROWTH OF PLANT STOCK.
26. DURING THE COURSE OF THIS WORK, REMOVE EXCESS WASTE MATERIAL DAILY FROM THE SITE AND UPON COMPLETION OF ALL WORK.
27. UPON COMPLETION OF ALL LANDSCAPING, A SUBSTANTIAL COMPLETION WALK-THROUGH OF THE WORK WILL BE HELD. THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR SCHEDULING THE WALK-THROUGH AT LEAST SEVEN (7) DAYS PRIOR O THE ANTICIPATED DATE.
28. WARRANTY ALL PLANT STOCK AND WORKMANSHIP FOR 12 MONTHS FROM THE DATE OF FINAL ACCEPTANCE. REPLACEMENT PLANTS SHALL BE WARRANTED FOR AN ADDITIONAL 90 DAYS.
29. THE CONTRACTOR SHALL NOT BE RESPONSIBLE AT ANY TIME TO REPLACE OR HONOR ANY WARRANTY FOR THE LOSS OF ANY TREES, PLANTS, GROUND COVERS OR SOD CAUSED BY FIRE, FLOODS, LIGHTNING, WINDS ABOVE 70 MILES PER HOUR OR ANY OTHER NATURAL DISASTER, NOR SHALL THE CONTRACTOR BE HELD RESPONSIBLE FOR ACTS OF VANDALISM OR NEGLIGENCE ON THE PART OF THE OWNER.
30. PROVIDE TO THE OWNER'S REPRESENTATIVE A WRITTEN ANNUAL MAINTENANCE PROGRAM TO PROPERLY CARE FOR AND MAINTAIN THE LANDSCAPING. INCLUDE CONTACT INFORMATION REGARDING THE INSTALLERS AND SUPPLIERS OF THE MATERIALS ALONG WITH A WARRANTY CERTIFICATE.
31. SAFELY PRUNE AND PROTECT ALL LIMBS AND ROOT MASS OF EXISTING TREES TAGGED 'TO REMAIN'.

CODE COMPLIANCE TABLE		
SEC. 2-92 THRU SEC. 2-96		
CODE	REQUIREMENT	PROVIDED
2-92-2Cii: TREE DIVERSITY FOR NO. OF TREES PROVIDED ON PLAN	11 TO 20 TREES = 3 SPECIES (MIN.)	4 SPECIES
SEC. 2-94		
2-94-1: PROVIDE ONE (1) 2" CAL. TREE AND TWO (2) SHRUBS FOR EVERY 2,500 SQ. FT. OF IMPERVIOUS SURFACE.	13 TREES AND 26 SHRUBS	13 TREES AND 32 SHRUBS

Revit Version:
Plot Date:

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Interior Design | Industrial
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CONSULTANTS

INTERSTATE ENGINEERING

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR APARTMENTS

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	5/26/2026
CD	CONSTRUCTION DOCUMENTS	5/26/2026

PROJECT NO: 20245211
DRAWN BY: TB
CHECKED BY: AK

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STAMP

LICENSED LANDSCAPE ARCHITECT
AMY KRONBECK
(195)
DATE: 5 26 2026
STATE OF NORTH DAKOTA

DRAWING TITLE
PLANTING DETAILS

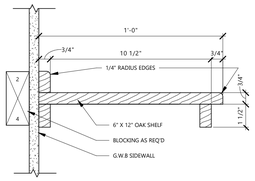
L102

UNIT 2/2A DOOR SCHEDULE							
MARK	LOCATION	SIZE	DOOR				NOTES
			TYPE	MATL.	FRAME	HDW GP	
A1	BEDROOM	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
B1	BATH	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
C1	CLOSET	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	
C3	CLOSET	1'-6" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	
C4	CLOSET	(2) 3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	

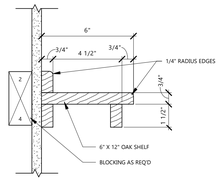
UNIT 1 DOOR SCHEDULE							
MARK	LOCATION	SIZE	DOOR				NOTES
			TYPE	MATL.	FRAME	HDW GP	
A1	BEDROOM	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
B1	BATH	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
C1	CLOSET	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	
C2	CLOSET	2'-6" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	

GENERAL NOTES

1. PROVIDE UNDERCOUNTER SUPPORTS AS NECESSARY FOR COUNTERTOPS AND WORK SURFACES.
2. REFER TO ELECTRICAL DRAWINGS FOR CABINET-MOUNTED SWITCHES, RECEPTACLES, ETC. INDICATED IN THE ELEVATIONS.
3. REFER TO MECHANICAL DRAWING FOR PLUMBING FIXTURES INDICATED IN THE ELEVATIONS.
4. PROVIDE SCRIBE PANELS ADJACENT TO CABINETS TO FILL IN VOID SPACES ADJACENT TO WALLS AND SOFFITS. SCRIBE PANELS SHALL NOT EXCEED 3" IN WIDTH. UNLESS SHOWN OTHERWISE.
5. SEE SHEET A001 FOR TYPICAL TOILET FIXTURE AND ACCESSORY MOUNTING HEIGHTS.
6. ITEMS INDICATED BY DASHED LINES ARE EQUIPMENT PROVIDED BY OWNER, REFER TO INTERIOR ELEVATION KEY LEGEND.
7. INSTALL CORNER GUARDS AT ALL OUTSIDE CORNERS IN EACH ACCESSIBLE UNIT AND IN COMMON AREAS.
8. PROVIDE IN-WALL BACKING FOR GRAB BARS IN ALL UNITS.
9. PROVIDE BLOCKING AT ALL SHOWER UNITS FOR FUTURE SEAT AND GRAB BAR LOCATIONS AND AS PER SHOWER MANUFACTURER RECOMMENDATIONS.
10. PROVIDE BLOCKING AT ALL TOILET LOCATIONS FRO GRAB BARS AND TOILET ACCESSORY LOCATIONS.
11. ALL GRAB BARS, INCLUDING IN SHOWERS, TO BE PROVIDED BY GENERAL WORK AND LABOR CONTRACTOR.
12. FOR ALL WALL OVEN CABINETS, SOV3384B_SPEC586, FIELD ACCOMMODATIONS MAY BE NECESSARY.



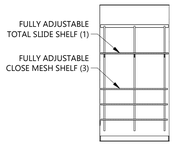
FRONT SECTION



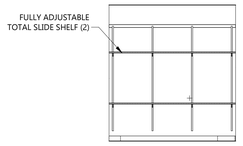
CROSS SECTION

30 A501 WOOD SHELF DETAIL
3" = 1'-0"

29 A501 TYP. CLOSET SHELVING
1/4" = 1'-0"



27 A501 UNIT 2A - ENTRY CLOSET
1/4" = 1'-0"



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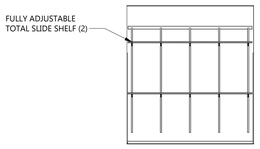

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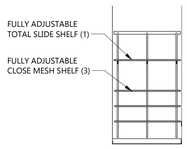

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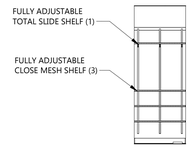

9 A501 UNIT 1 ENTRY CLOSET
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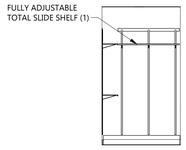

8 A501 UNIT 1 BEDROOM WIC 2
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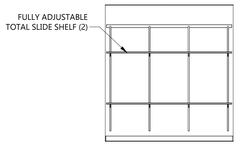

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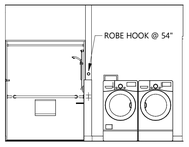

24 A501 UNIT 2-A BATHROOM ELEV. 3
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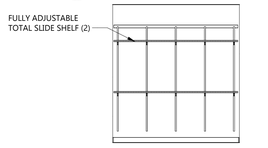
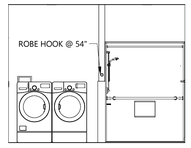


16 A501 UNIT 2 MASTER BED CLOSET
1/4" = 1'-0"



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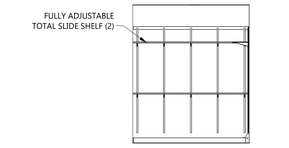

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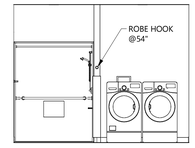

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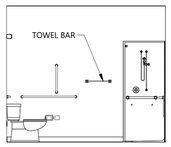
1/4" = 1'-0"



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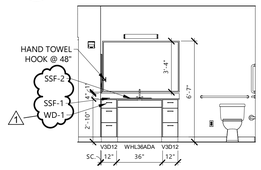

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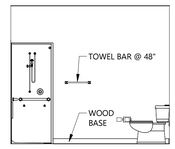

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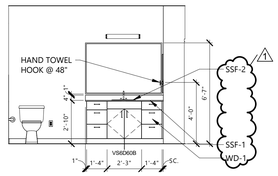

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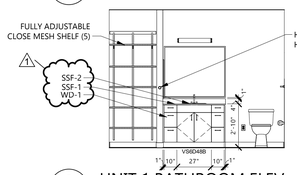

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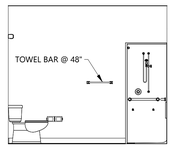

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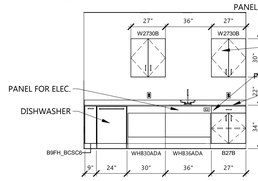

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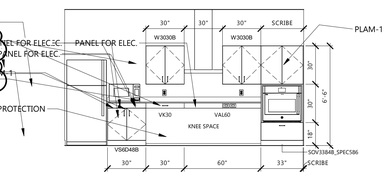

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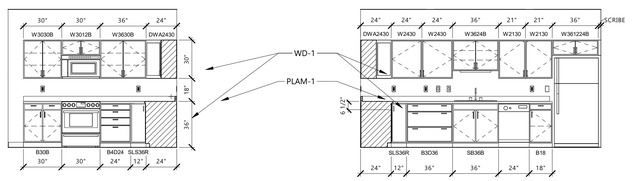

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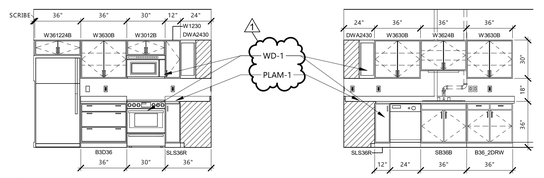
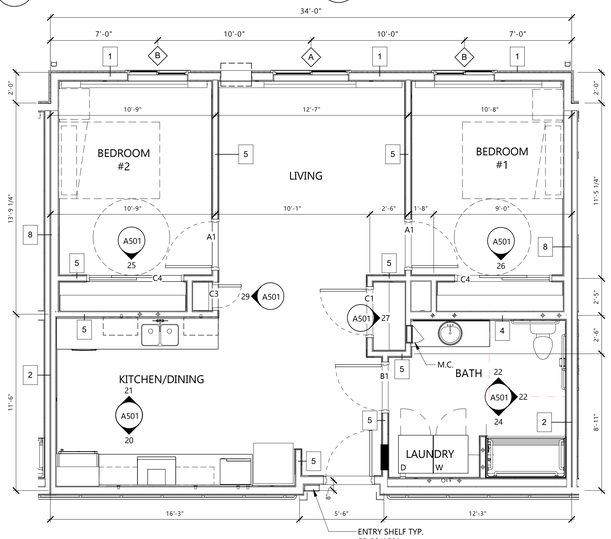


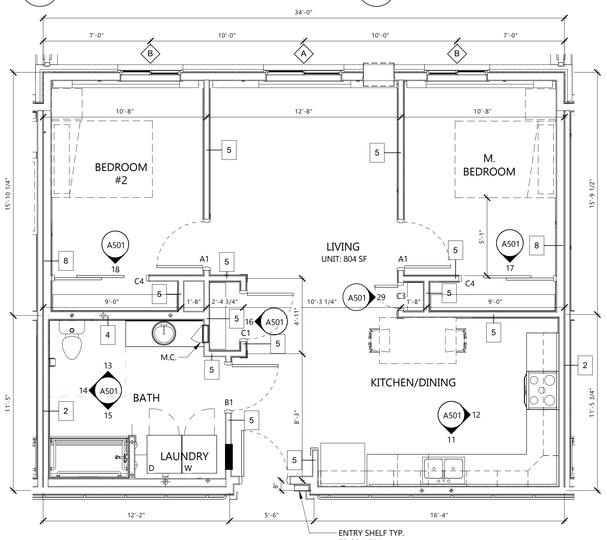
3 A501 UNIT 1 KITCHEN ELEV. 1
1/4" = 1'-0"

2 A501 UNIT 1 KITCHEN ELEV. 2
1/4" = 1'-0"



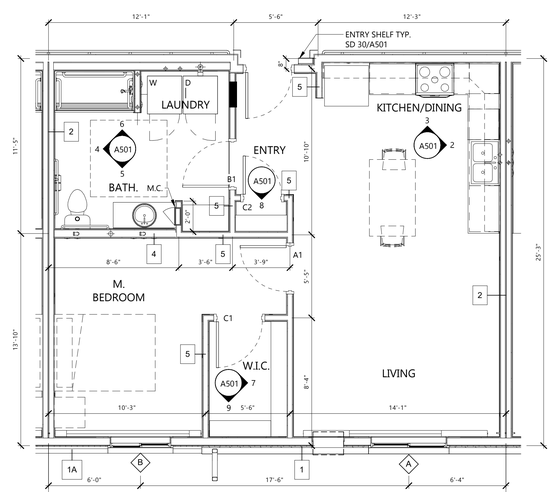
19 A501 UNIT 2-A (ACCESSIBLE)
1/4" = 1'-0"

804 SF



10 A501 UNIT 2
1/4" = 1'-0"

804 SF



1 A501 UNIT 1
1/4" = 1'-0"

642 SF

EAPC

Architecture	Engineering
Interior Design	Industrial

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www.eapc.net

CONSULTANTS

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR
APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20244261
DRAWN BY: BRJ/JN
CHECKED BY: SS

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.

Signature: _____

Date: 05-26-2026 REG. NO. : 1565

DRAWING TITLE
UNIT PLANS AND
INTERIOR ELEVATIONS

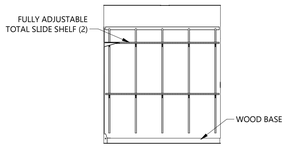
A501

Revit Version:
Plot Date: 5/26/2026 1:19:08 PM

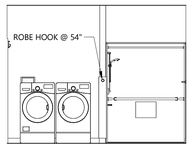
UNIT 3/3A DOOR SCHEDULE							
			DOOR				
MARK	LOCATION	SIZE	TYPE	MATL.	FRAME	HDW GP	NOTES
A1	BEDROOM	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
B1	BATH	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A	
C1	CLOSET	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	
C2	CLOSET	2'-6" X 6'-8" X 1 3/4"	F	WDSC	REDI	B	

GENERAL NOTES

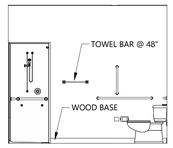
1. PROVIDE UNDERCOUNTER SUPPORTS AS NECESSARY FOR COUNTERTOPS AND WORK SURFACES.
2. REFER TO ELECTRICAL DRAWINGS FOR CABINET-MOUNTED SWITCHES, RECEPTACLES, ETC. INDICATED IN THE ELEVATIONS.
3. REFER TO MECHANICAL DRAWING FOR PLUMBING FIXTURES INDICATED IN THE ELEVATIONS.
4. PROVIDE SCRIBE PANELS ADJACENT TO CABINETS TO FILL IN VOID SPACES ADJACENT TO WALLS AND SOFFITS. SCRIBE PANELS SHALL NOT EXCEED 3" IN WIDTH, UNLESS SHOWN OTHERWISE.
5. SEE SHEET A001 FOR TYPICAL TOILET FIXTURE AND ACCESSORY MOUNTING HEIGHTS.
6. ITEMS INDICATED BY DASHED LINES ARE EQUIPMENT PROVIDED BY OWNER, REFER TO INTERIOR ELEVATION KEY LEGEND.
7. INSTALL CORNER GUARDS AT ALL OUTSIDE CORNERS IN EACH ACCESSIBLE UNIT AND IN COMMON AREAS.
8. PROVIDE IN-WALL BACKING FOR GRAB BARS IN ALL UNITS.
9. PROVIDE BLOCKING AT ALL SHOWER UNITS FOR FUTURE SEAT AND GRAB BAR LOCATIONS AND AS PER SHOWER MANUFACTURER RECOMMENDATIONS.
10. PROVIDE BLOCKING AT ALL TOILET LOCATIONS FRO GRAB BARS AND TOILET ACCESSORY LOCATIONS.
11. ALL GRAB BARS, INCLUDING IN SHOWERS, TO BE PROVIDED BY GENERAL WORK AND LABOR CONTRACTOR.



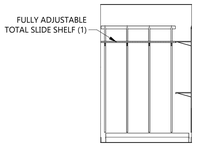
16 A502 UNIT 3A WIC 2
1/4" = 1'-0"



13 A502 UNIT 3-A BATHROOM ELEV. 3
1/4" = 1'-0"



12 A502 UNIT 3-A BATHROOM ELEV.2
1/4" = 1'-0"



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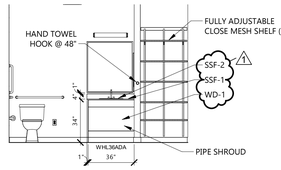

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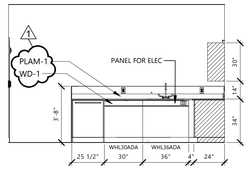
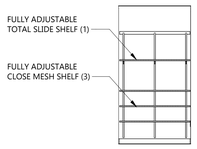
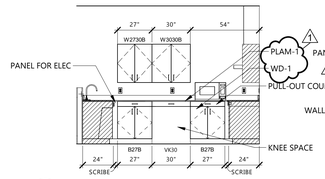


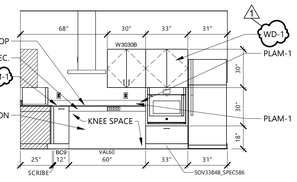
9 A502 UNIT 3-A KITCHEN ELEV. 3
1/4" = 1'-0"



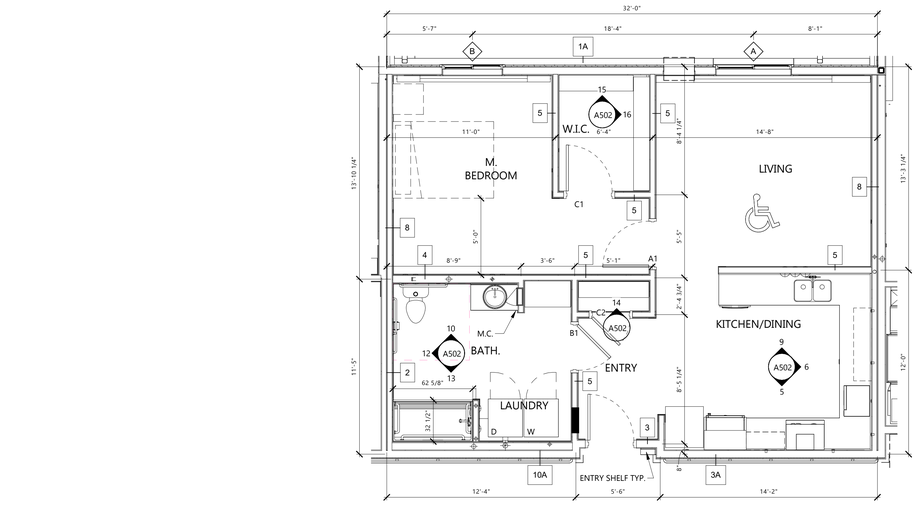
14 A502 UNIT 3A ENTRY CLOSET
1/4" = 1'-0"



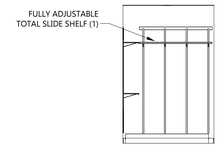
6 A502 UNIT 3-A KITCHEN ELEV. 2
1/4" = 1'-0"



5 A502 UNIT 3-A KITCHEN ELEV. 1
1/4" = 1'-0"



2 A502 UNIT 3-A (ACCESSIBLE)
1/4" = 1'-0"
689 SF



18 A502 UNIT 3 WIC 1
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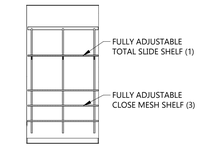
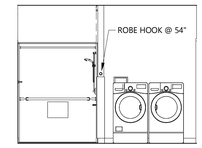
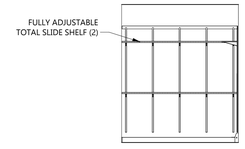


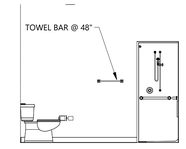
17 A502 UNIT 3 - ENTRY CLOSET
1/4" = 1'-0"



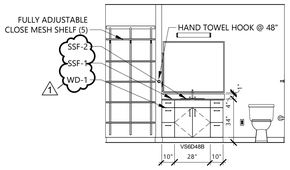
11 A502 UNIT 3 BATHROOM ELEV. 3
1/4" = 1'-0"



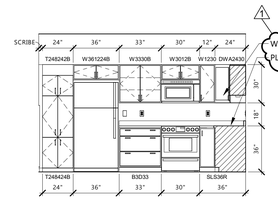
19 A502 UNIT 3 WIC 2
1/4" = 1'-0"



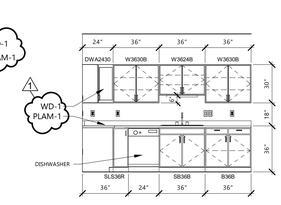
8 A502 UNIT 3 BATHROOM ELEV. 2
1/4" = 1'-0"



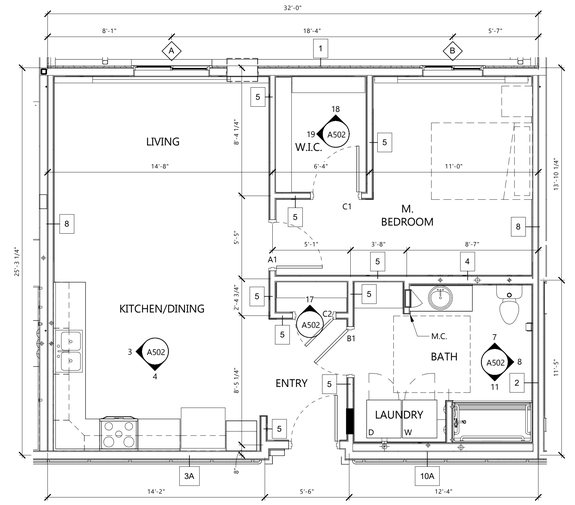
7 A502 UNIT 3 BATHROOM ELEV. 1
1/4" = 1'-0"



4 A502 UNIT 3 KITCHEN ELEV. 1
1/4" = 1'-0"



3 A502 UNIT 3 KITCHEN ELEV. 2
1/4" = 1'-0"



1 A502 UNIT 3
1/4" = 1'-0"
689 SF

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TELEPHONE 701.461.7222
112 No.Roberts Street, Suite 300, Fargo ND 58102
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PROJECT DESCRIPTION
BUFFALO MANOR
APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20244261
DRAWN BY: BRJ/JN
CHECKED BY: SS

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STAMP

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.

Signature: _____

Date: 05-26-2026 REG. NO. : 1565

DRAWING TITLE
UNIT PLANS AND
INTERIOR ELEVATIONS

A502

Revit Version:
Print Date: 5/26/2026 1:19:23 PM

UNIT 4/4A DOOR SCHEDULE						
			DOOR			
MARK	LOCATION	SIZE	TYPE	MATL.	FRAME	
A1	BEDROOM	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A
B1	BATH	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	B
C1	CLOSET	3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A
C2	CLOSET	2'-6" X 6'-8" X 1 3/4"	F	WDSC	REDI	B
C3	CLOSET	1'-6" X 6'-8" X 1 3/4"	F	WDSC	REDI	B
C4	CLOSET	(2) 3'-0" X 6'-8" X 1 3/4"	F	WDSC	REDI	A

GENERAL NOTES

1. PROVIDE UNDERCOUNTER SUPPORTS AS NECESSARY FOR COUNTERTOPS AND WORK SURFACES.
2. REFER TO ELECTRICAL DRAWINGS FOR CABINET-MOUNTED SWITCHES, RECEPTACLES, ETC. INDICATED IN THE ELEVATIONS.
3. REFER TO MECHANICAL DRAWING FOR PLUMBING FIXTURES INDICATED IN THE ELEVATIONS.
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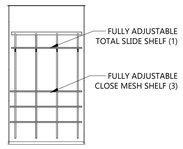
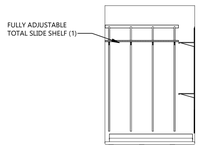
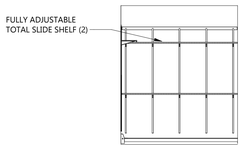
5. SEE SHEET A001 FOR TYPICAL TOILET FIXTURE AND ACCESSORY MOUNTING HEIGHTS.
6. ITEMS INDICATED BY DASHED LINES ARE EQUIPMENT PROVIDED BY OWNER, REFER TO INTERIOR ELEVATION KEY LEGEND.
7. INSTALL CORNER GUARDS AT ALL OUTSIDE CORNERS IN EACH ACCESSIBLE UNIT AND IN COMMON AREAS.
8. PROVIDE IN-WALL BACKING FOR GRAB BARS IN ALL UNITS.
9. ALL UPPER CABINETS IN ACCESSIBLE/UNIVERSAL DESIGN UNITS SHOULD HAVE PULL DOWN SHELVING
10. FOR ALL WALL OVEN CABINETS, SOV33848_SPEC586, FIELD ACCOMMODATIONS MAY BE NECESSARY.



14 A503 UNIT 4A ENTRY CLOSET
1/4" = 1'-0"



16 A503 UNIT 4A WIC 2
1/4" = 1'-0"



15 A503 UNIT 4A WIC 1
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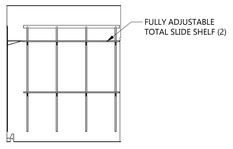

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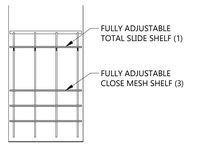
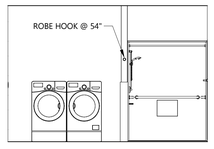
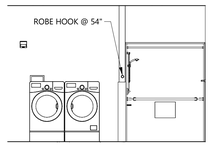


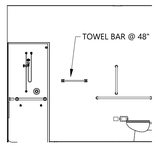
17 A503 UNIT 4 ENTRY CLOSET
1/4" = 1'-0"



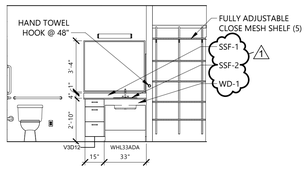
11 A503 UNIT 4 BATHROOM ELEV. 3
1/4" = 1'-0"



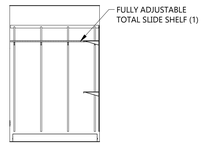
12 A503 UNIT 4-A BATHROOM ELEV. 3
1/4" = 1'-0"



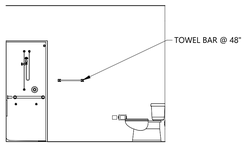
10 A503 UNIT 4-A BATHROOM ELEV. 2
1/4" = 1'-0"



9 A503 UNIT 4-A BATHROOM ELEV. 1
1/4" = 1'-0"



19 A503 UNIT 4 WIC 2
1/4" = 1'-0"



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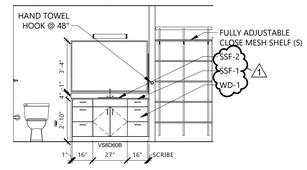
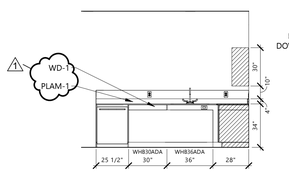
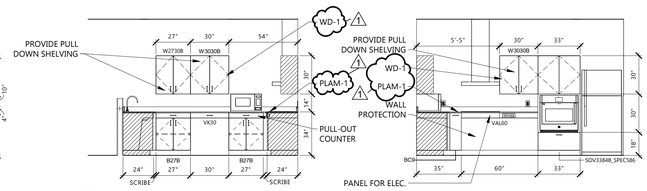


7 A503 UNIT 4 BATHROOM ELEV. 1
1/4" = 1'-0"

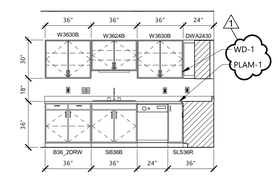


13 A503 UNIT 4-A KITCHEN ELEV. 3
1/4" = 1'-0"

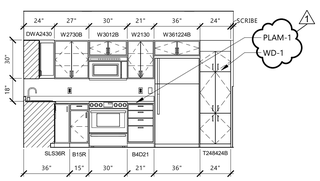


6 A503 UNIT 4-A KITCHEN ELEV. 2
1/4" = 1'-0"

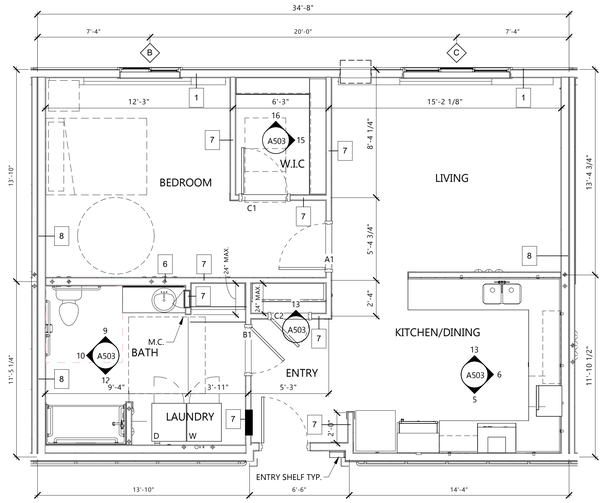
5 A503 UNIT 4-A KITCHEN ELEV. 1
1/4" = 1'-0"



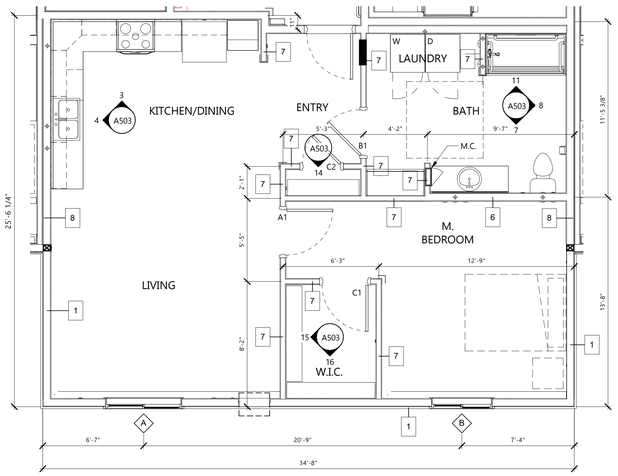
4 A503 UNIT 4 KITCHEN ELEV. 2
1/4" = 1'-0"



3 A503 UNIT 4 KITCHEN ELEV. 1
1/4" = 1'-0"



2 A503 UNIT 4-A (ACCESSIBLE) 747 SF
1/4" = 1'-0"



1 A503 UNIT 4 747 SF
1/4" = 1'-0"

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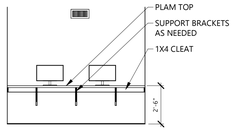
STAMP

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.
Signature: _____
Date: 05-26-2026 REG. NO.: 1565

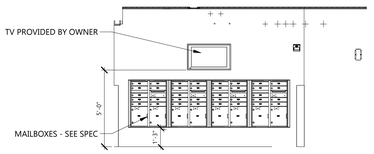
DRAWING TITLE
UNIT PLANS AND
INTERIOR ELEVATIONS

A503

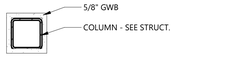
Revit Version:
Plot Date: 5/26/2026 1:19:36 PM



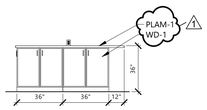
16 A504 WORKSTATION
1/4" = 1'-0"



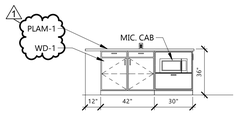
14 A504 MAILBOX ELEV.
1/4" = 1'-0"



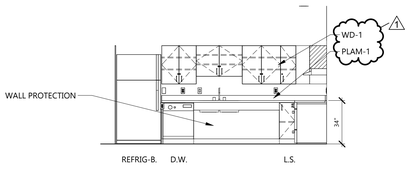
15 A504 WRAPPED COLUMN DETAIL
1 1/2" = 1'-0"



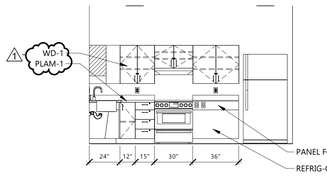
13 A504 KITCHEN ISLAND BACK
1/4" = 1'-0"



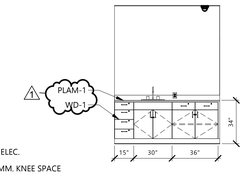
12 A504 COMM.KITCHEN ELEV.
1/4" = 1'-0"



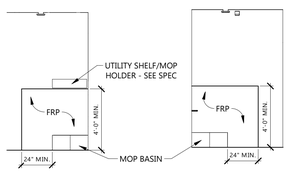
11 A504 COMM. KITCHEN ELEV
1/4" = 1'-0"



10 A504 COMM. KITCHEN ELEV.
1/4" = 1'-0"

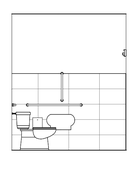


9 A504 COMM. KITCHEN ELEV.
1/4" = 1'-0"

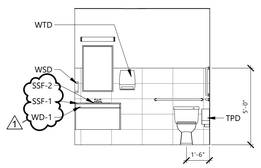


8 A504 MOP SINK ELEV.
1/4" = 1'-0"

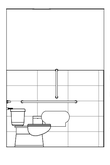
7 A504 MOP SINK ELEV.
1/4" = 1'-0"



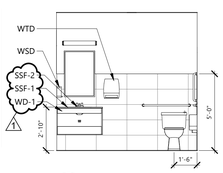
6 A504 INT. ELEV.
1/4" = 1'-0"



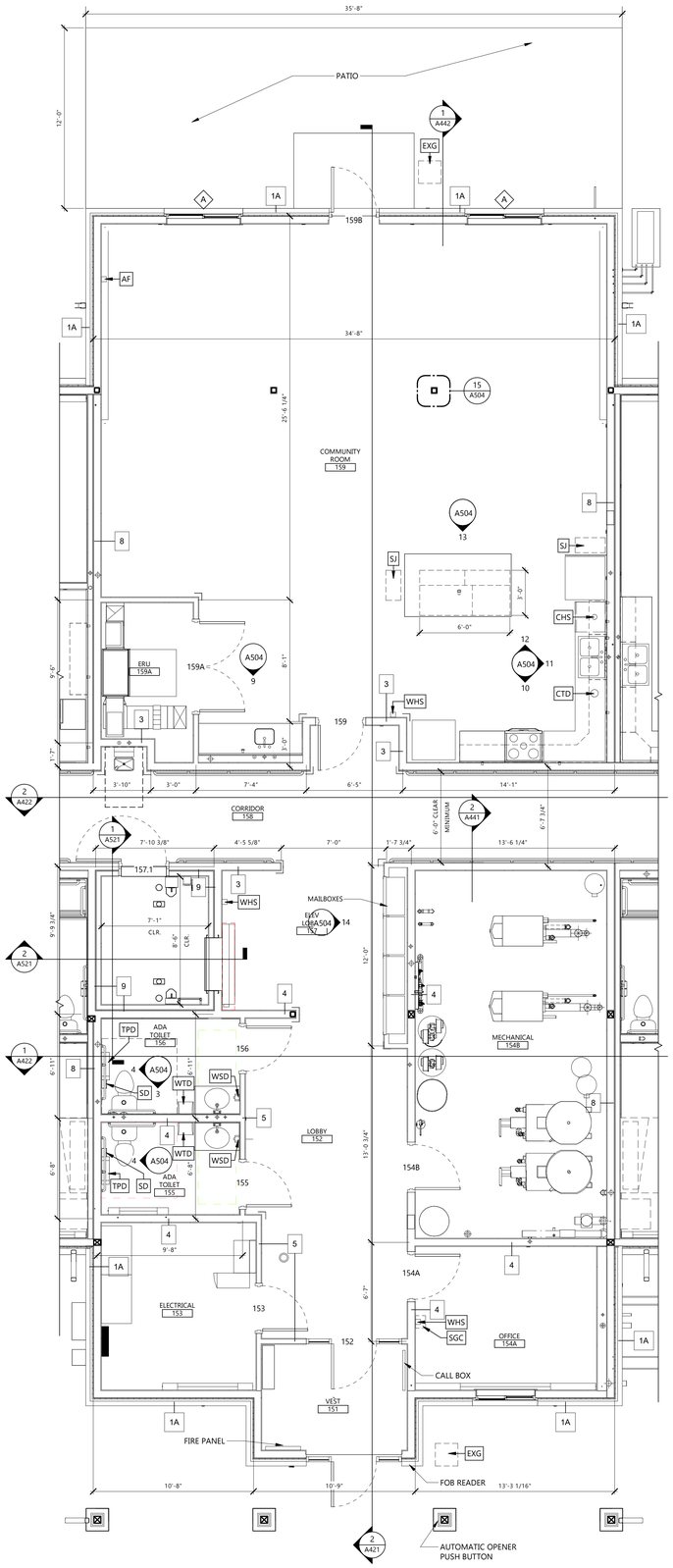
5 A504 INT. ELEV.
1/4" = 1'-0"



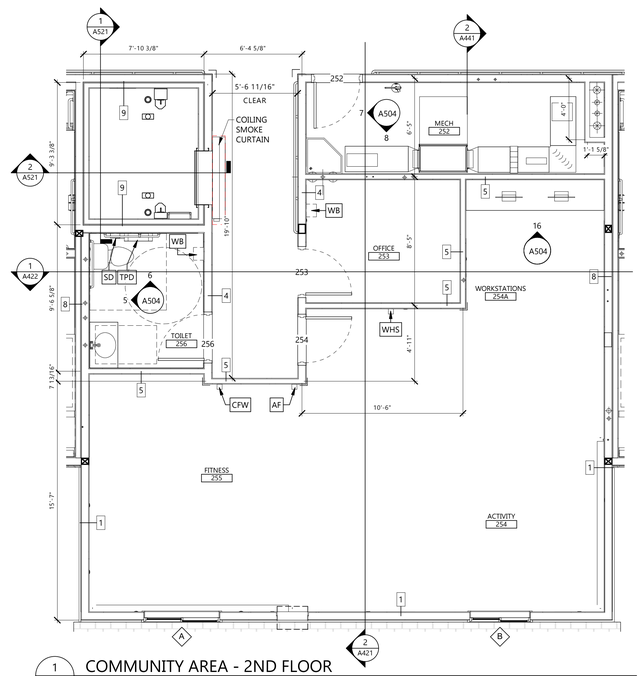
4 A504 INT. ELEV.
1/4" = 1'-0"



3 A504 INT. ELEV.
1/4" = 1'-0"



2 A504 COMMUNITY AREA - 1ST FLOOR
1/4" = 1'-0"



1 A504 COMMUNITY AREA - 2ND FLOOR
1/4" = 1'-0"

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GENERAL NOTES

1. PROVIDE UNDERCOUNTER SUPPORTS AS NECESSARY FOR COUNTERTOPS AND WORK SURFACES.
2. REFER TO ELECTRICAL DRAWINGS FOR CABINET-MOUNTED SWITCHES, RECEPTACLES, ETC. INDICATED IN THE ELEVATIONS.
3. REFER TO MECHANICAL DRAWING FOR PLUMBING FIXTURES INDICATED IN THE ELEVATIONS.
4. PROVIDE SCRIBE PANELS ADJACENT TO CABINETS TO FILL IN VOID SPACES ADJACENT TO WALLS AND SOFFITS. SCRIBE PANELS SHALL NOT EXCEED 3" IN WIDTH. UNLESS SHOWN OTHERWISE.
5. SEE SHEET A001 FOR TYPICAL TOILET FIXTURE AND ACCESSORY MOUNTING HEIGHTS.
6. ITEMS INDICATED BY DASHED LINES ARE EQUIPMENT PROVIDED BY OWNER, REFER TO INTERIOR ELEVATION KEY LEGEND.
7. INSTALL CORNER GUARDS AT ALL OUTSIDE CORNERS IN EACH ACCESSIBLE UNIT AND IN COMMON AREAS.
8. PROVIDE IN-WALL BACKING FOR GRAB BARS IN ALL UNITS.
9. ALL UPPER CABINETS IN ACCESSIBLE/UNIVERSAL DESIGN UNITS SHOULD HAVE PULL DOWN SHELVING
10. FOR ALL WALL OVEN CABINETS, SOV3384B_SPEC586, FIELD ACCOMMODATIONS MAY BE NECESSARY.

ACCESSORIES LEGEND

SYMBOL	QTY.	DESCRIPTION
EXG	2	EXTERIOR SQUARE OUTSIDE CONTAINER
WHS	4	BUCKEYE SYMMETRY 1250ML MAVRIK ALPINE DISP, WHITE WITH BLACK
CTD	1	TORK XPRESS 302028 COUNTERTOP TOWEL DISPENSER, BLACK
SJ	2	3540-60 SLIM JIM WASTEBASKET GREY, SLIM + LINERS
CHS	1	COUNTER HAND SOAP
AF	2	OURFRESH DISPENSER, #6110
WTD	3	TORK 5511284 ELEV INTUITION, HAND TOWEL DISPENSER, BLACK
TPD	3	TORK 565728 TWIN BATH TISSUE, DISPENSER FOR OPTIC-CORE, BLACK
SD	3	6140 SANITARY NAPKIN RECEPTACLE, RUBBERMAID
WB	3	3540-60 WASTEBASKET GREY, SLIM
WBL	3	RCP-267360 GREY, SLIM LIM LID
WSD	3	SYMMETRY 1250ML MAVRIK PRESTIGE DISP, BLACK
CFW	1	CLOROX FACILITY WIPES DISPENSER
SGC	2	2957 WASTEBASKET, GREY + LINERS

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CONSULTANTS

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20244261
DRAWN BY: BRJ/JN
CHECKED BY: SS

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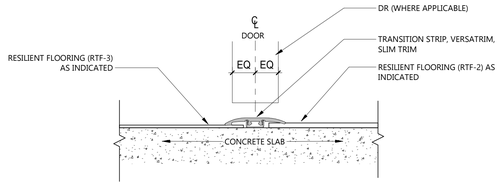
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Architect under the laws of the State of North Dakota.

Signature: _____

Date: 05-26-2026 REG. NO. : 1565

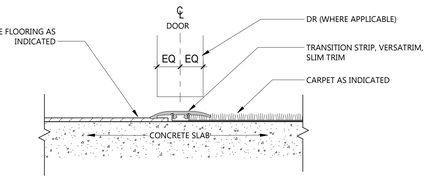
DRAWING TITLE
ENLARGED FLOOR PLANS AND INTERIOR ELEVATIONS

A504



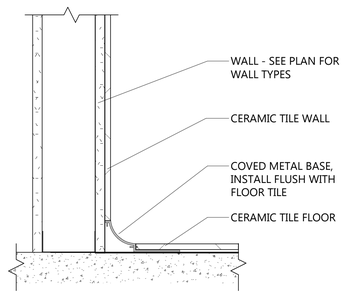
7 A901 — TS-6 RESILIENT FLOORING TO RESILIENT FLOORING

6" = 1'-0"



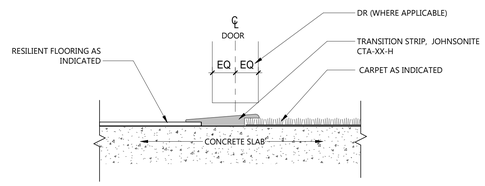
5 A901 — TS-3 RESILIENT FLOORING TO CARPET

6" = 1'-0"



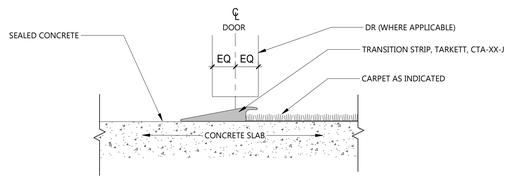
9 A901 — DETAIL - CERAMIC WALL TILE TO CERAMIC FLOOR TILE

3" = 1'-0"



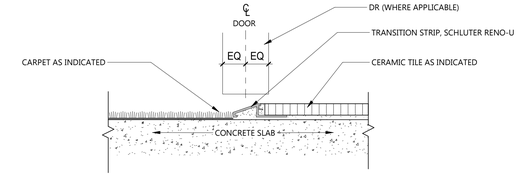
6 A901 — TS-4 RESILIENT FLOORING TO CARPET -JOHNSONITE

6" = 1'-0"



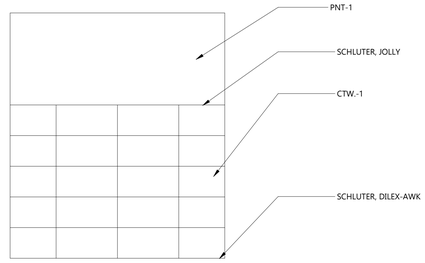
4 A901 — TS-2 CARPET TO CONCRETE FLOORING

6" = 1'-0"



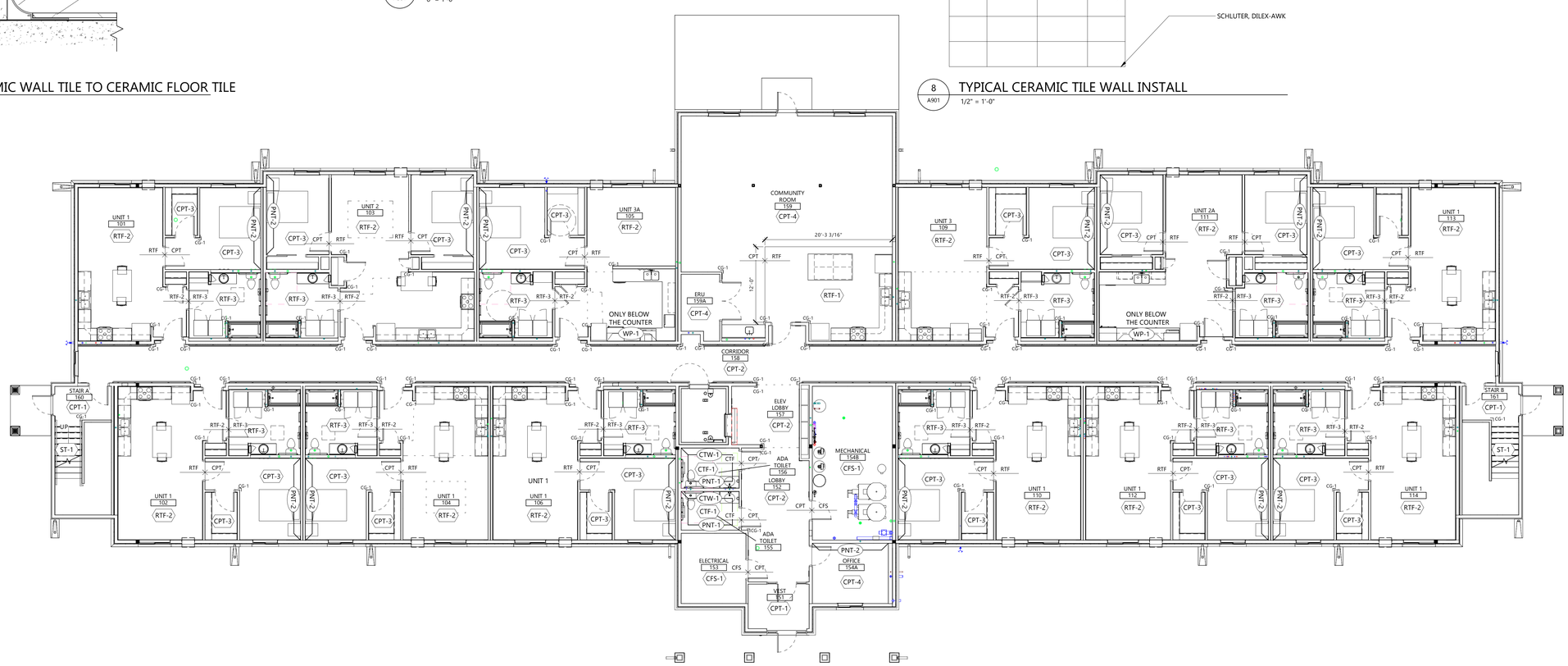
3 A901 — TS-1 CARPET TO CERAMIC TILE - SCHLUTER RENO-U

6" = 1'-0"



8 A901 — TYPICAL CERAMIC TILE WALL INSTALL

1/2" = 1'-0"



1 A901 — FIRST FLOOR FINISH PLAN - BUFFALO MANOR

1/8" = 1'-0"

N

09 0000 MATERIAL IDENTIFICATION CODES

06 8316	FRP	FIBERGLASS REINFORCED PANELING
	FRP-1	MARLITE, STANDARD FRP, TBD
09 3013	CTW, CTF	CERAMIC TILING
	CTW-1	AMERICAN OLEAN, THEORETICAL EVOLVED, BALANCED BEIGE, TEB2, 12"X24"
	CTF-1	SHAW CONTRACT, LUNAR MANTLE, INK 00550, 24"X24",
09 5113	ACT	ACOUSTICAL PANEL CEILINGS
	ACT-1	ARMSTRONG, DUNE 1775, 24"X24"X5/8", 9/16" BEVELED TEGULAR, SUSPENSION: ARMSTRONG, SUPRAFINE, 9/16"
09 6513	RB, TS	RESILIENT BASE AND ACCESSORIES
	TS-1	TERSATRIM, SLT-127758, SLIM TRIM, ECRU, 466-104
	TS-2	RTF-2 TO RTF-3
	TS-3	CTF TO CPT
	TS-4	RSF TO CPT
	ST-1	TARKETT, JOHNSONITE, ANGLE FIT RUBBER STAIR TREADS,
09 6516	RSF	RESILIENT SHEET FLOORING
	RSF-1	MANNINGTON COMMERCIAL, ASSURANCE III, INTEGRAL BASE UP THE WALL 6" WHERE THIS FLOOR IS BEING USE
09 6519	RTF	RESILIENT TILE FLOORING
	RTF-1	J&J FLOORING GROUP, STIR V5060, COMBINATION 1197,
	RTF-2	AVA BY NOVALIS, 2SPRK, FRONT STOOP 2SP031 18"X18"
09 6813	CPT	CARPET TILING
	CPT-1	J&J FLOORING GROUP, INCOGNITO 7069, INTELLIGENCE 1841, 24"X24", INSTALLED: ASHLAR
	CPT-2	J&J FLOORING GROUP, WELL VERSED II 7072, FROST 2022, 24"X24", INSTALLED: ASHLAR
	CPT-3	J&J FLOORING GROUP, BOUCLE II 7081, TEXTURED 2703, 12"X48", INSTALLED: ASHLAR
	CPT-4	J&J FLOORING GROUP, BOUCLE II 7081, STRAND 2706, 12"X48", INSTALLED: ASHLAR
09 9123	PNT	INTERIOR/EXTERIOR PAINTING
	PNT-1	SHERWIN WILLIAMS, DRIFT OF MIST SW 9166
	PNT-2	SHERWIN WILLIAMS, REQUISITE GRAY SW 7023
	CFS-1	SEALED CONCRETE
10 2600	CG	WALL AND DOOR PROTECTION
	CG-1	INPRO, TAPE-ON CORNER GUARDS, 1.5" WING, 4' HIGH, TBD
	HR-1	INPRO, 800 HANDRAIL, WOODGRAIN, TBD
12 3530	WD	RESIDENTIAL CASEWORK
	WD-1	SMART CABINETRY, STANDARD OVERLAY, BRIGHTON, MAPLE
12 2116	WT	VERTICAL LOUVER BLINDS
	WT-1	HUNTER DOUGLAS, SOMNER VERTICAL BLINDS, TRENT, TBD
12 3623.13	PLAM	PLASTIC-LAMINATE-CLAD COUNTERTOPS
	PLAM-1	WILSONART, BEACHWALK 5044-60
12 3661.16	SSF	SOLID SURFACE FABRICATION
	SSF-1	FORMICA, LIMED CONCRETE 608
	SSF-2	FORMICA, VANITY BOWL 1612, TBD

GENERAL FINISH NOTES

1. REFER TO FINISH PLANS AND ROOM ELEVATIONS FOR ADDITIONAL FINISH LOCATIONS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALLOWING FOR DELIVERY LEAD TIMES FOR ALL FINISHES SPECIFIED WITHIN THE CONSTRUCTION SCHEDULE. ALL DELIVERY TIMES MUST BE CONFIRMED, AND ANY EXCESSIVE LEAD TIME MUST BE BROUGHT TO THE ARCHITECT'S ATTENTION IMMEDIATELY TO ALLOW FOR RE-SPECIFICATION IF NECESSARY.
3. WHERE TRANSITION OF DISSIMILAR FLOORING MATERIALS OCCUR, THEY SHALL BE LOCATED DIRECTLY UNDER THE CENTER LINE OF DOOR OPENINGS UNO.
4. ALL CRACKS, HOLES, IMPERFECTIONS IN EXISTING WALLS, PARTITIONS OR GYP BOARD SHALL BE FILLED WITH PATCHING PLASTER AND SMOOTHED OFF TO MATCH ADJOINING SURFACES.
5. ALL SEALANTS TO MATCH SURFACE IN WHICH THEY OCCUR.
6. PAINT ALL MISCELLANEOUS ITEMS SCHEDULED TO BE PAINTED, PAINT TO MATCH THE SURFACE IN WHICH THEY OCCUR.
7. ALL EXPOSED MECHANICAL AND ELECTRICAL ITEMS SCHEDULED TO BE PAINTED SHALL BE PAINTED TO MATCH ADJACENT FINISHES.
8. PROVIDE SCHLUTER TRS-X CERAMIC TILE COVED BASE TRIM, SCHLUTER: EBHK U7/07 BRUSHED STAINLESS (WITH IN SIDE AND OUTSIDE CORNER TRIMS) AT ALL CTF TO CTW APPLICATIONS, UNO.
9. UPON COMPLETION, REMOVE ALL PAINT FROM WHERE IT HAS SPILLED, SPLASHED OR SPLATTERED ON EXPOSED SURFACES.
10. EXAMINE ALL FINISH SURFACES AFTER COMPLETION OF WORK AND PROCEED WITH "TOUCH-UP" AS REQUIRED.
11. UNDERSIDE OF SOFFITS (WHERE OCCURS) TO RECEIVE A FINISH TO MATCH THE ADJACENT SOFFIT VERTICAL FINISH, UNO.
12. PAINT CEILING ACCESS PANELS WHERE THEY OCCUR TO MATCH ADJACENT CEILING FINISH.
13. STAINED AND PAINTED SURFACES SHALL BE FINISHED SUCH THAT JOINTS AR NOT VISIBLE WHEN VIEWED FROM ANY ANGLE AS DETERMINED BY THE ARCHITECT.
14. REFER TO INTERIOR ELEVATIONS FOR LOCATIONS/TYPES OF PLASTIC LAMINATE AND SOLID SURFACE MATERIALS.
15. ALL WALLS TO RECEIVE WOOD BASE, UNO.
16. ALL GYP BOARD CEILINGS AND SOFFITS TO BE PNT-1, UNO.
17. PROVIDE CORNER GUARDS AT ALL OUTSIDE CORNERS (CG-1), UNO.
18. ALL COVER PLATES, SWITCHES, OUTLETS, RECEPTACLES AND DEVICES TO BE WHITE, UNO.
19. HOLLOW METAL DOORS AND HOLLOW METAL FRAMES SHALL BE PAINTED (XX-X) WHERE NEW WORK IS INDICATED.
20. PROVIDE INTEGRAL COVED BASE (6" HEIGHT) AS INDICATED IN THE ROOMS THAT RECEIVE RSF.
21. PROVIDE FIBERGLASS REINFORCED PANELS (FRP-1) 48" HEIGHT WHERE OTHER ROOMS AS INDICATED IN THE ELEVATIONS AND THE WALL FINISH PLANS.
22. PROVIDE WINDOW TREATMENTS AT ALL EXTERIOR WINDOWS WITH WT-1.

FINISH LEGEND

- PT-X — WALL FINISH SYMBOL
- CT-X — FLOOR FINISH SYMBOL
- EXG — EXISTING FLOOR FINISH TO REMAIN
- CORNER GUARD

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CONSULTANTS

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BUFFALO MANOR APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20245211
DRAWN BY: BRJ
CHECKED BY: SS

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Signature:
Date: 05-26-2026 REG. NO. : 1565

DRAWING TITLE
FIRST FLOOR FINISH PLAN

A901

Revit Version:
Plot Date: 5/26/2026 1:20:01 PM

KEYNOTE LEGEND:

< < < INDICATES KEYNOTE ON PLAN

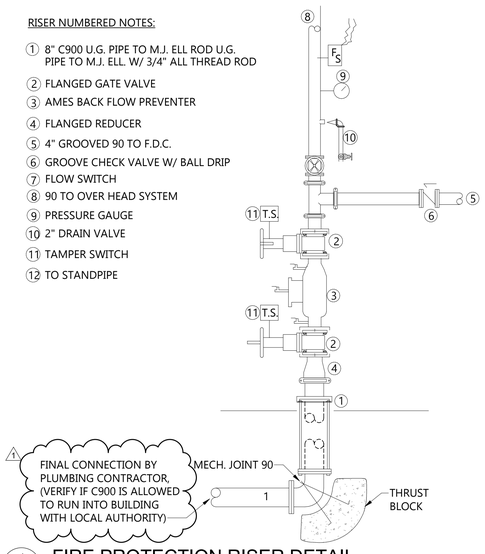
OH 01 ORDINARY HAZARD GROUP 1.

GENERAL NOTES

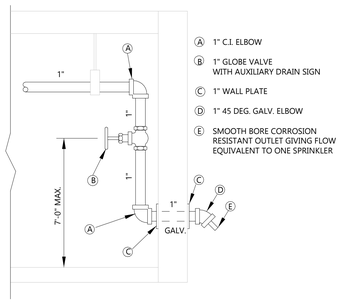
1. SPRINKLER SYSTEM SHALL BE NFPA 13R.
2. SPRINKLERS PENETRATING FIRE WALLS SHALL BE SEALED WITH FIRE CAULKING.
3. ONLY NEW SPRINKLERS SHALL BE EMPLOYED IN THE INSTALLATION OF THE SPRINKLER SYSTEM. SPRINKLER HEADS TO BE CENTERED IN CEILING TILE.
4. THE SYSTEM SHALL ONLY EMPLOY THE USE OF APPROVED MATERIALS AND DEVICES.
5. SPRINKLER PLANS SHALL BE APPROVED PRIOR TO THE INSTALLATION OF ANY PIPE. A SET OF APPROVED PLANS SHALL BE MAINTAINED AT ALL TIMES ON THE JOBSITE.
6. AN APPOINTMENT SHALL BE MADE A MINIMUM OF TWO WORKING DAYS IN ADVANCE WITH THE APPROPRIATE FIRE PREVENTION OFFICE FOR ALL INSPECTIONS AND TESTS.
7. ALL SYSTEM PIPING SHALL BE HYDROSTATICALLY TESTED AT 200 PSI FOR TWO HOURS OR AT 50 PSI ABOVE STATIC PRESSURE IN EXCESS OF 150 PSI.
8. FIRE DEPARTMENT CONNECTIONS SHALL BE VISIBLE, ACCESSIBLE, HAVE NST FEMALE OUTLETS, HAVE PROTECTIVE CAPS, AND AN APPROVED CHECK VALVE LOCATED IN THE MAIN LINE. (AS CLOSE TO THE FIRE DEPARTMENT CONNECTION AS POSSIBLE) FOR COMMERCIAL SYSTEMS ONLY.
9. ALL VALVES SHALL HAVE A PERMANENTLY AFFIXED SIGN INDICATING ITS FUNCTION.
10. A STOCK OF SPARE SPRINKLERS OF EACH STYLE, TYPE, AND TEMPERATURE RATING ALONG WITH A SPRINKLER WRENCH SHALL BE LOCATED AT THE SPRINKLER RISER.
11. ANY PORTION OF THIS SPRINKLER SYSTEM WHICH IS EXPOSED TO FREEZING SHALL BE ADEQUATELY PROTECTED AGAINST THIS EXPOSURE.
12. FITTINGS TO BE CAST IRON OR DUCTILE.
13. THREADS TO MEET ANSI/ASME STANDARDS.
14. ALL MATERIALS AND INSTALLATION TO CONFORM WITH NFPA #13 STANDARDS.
15. COORDINATE BETWEEN MECHANICAL AND ELECTRICAL LAYOUTS.
16. ADD SPRINKLERS UNDER ALL DUCTWORK OVER 48" WHEN STRUCTURE IS EXPOSED.
17. THE SPRINKLER CONTRACTOR WILL SUPPLY THE OWNER WITH THE NECESSARY INSTRUCTION MANUALS FOR THE UPKEEP OF THE SYSTEM.
18. SPRINKLER PLAN TO MEET ALL STATE AND LOCAL BUILDING CODES. A SET OF FIRE PROTECTION PLANS ARE TO BE SUBMITTED TO THE STATE FIRE MARSHALS OFFICE OR ANY OTHER GOVERNING BODIES FOR REVIEW. SPRINKLER PLANS NEED APPROVAL PRIOR TO INSTALLATION OF ANY PIPING.
19. SPRINKLER SYSTEM LAYOUT IS GENERAL & DIAGRAMMATIC. ADDITIONAL HEADS AND/OR PIPING NEEDED TO CONFORM WITH NFPA SHALL BE PROVIDED BY THE FIRE SPRINKLER CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
20. SPRINKLER PIPING
    A. SCHEDULE 40: ASTM A53, UL LISTED, FM APPROVED FOR 1" PIPING.
    B. SCHEDULE 10: ASTM A135, UL LISTED, FM APPROVED FOR PIPING 1 1/2" & LARGER.
21. ADD SIDEWALL SPRINKLER HEADS TO PROVIDE COVERAGE UNDER OPEN GARAGE DOORS AS REQUIRED.
22. ALL AREAS SHOWN SHALL BE PROTECTED AS LIGHT HAZARDS UNLESS OTHERWISE NOTED.
23. CONCEALED HEADS SHALL BE WHITE UNLESS ARCHITECTURAL CEILING IS WOOD OR DIFFERENT COLOR. PROVIDE CUSTOM COLOR HEADS IN THE AREAS WITH CUSTOM COLORS, REFER TO ARCHITECTURAL ROOM FINISH SCHEDULES. PHYSICAL COLOR SAMPLES REQUIRED WITH SUBMITTAL.
24. CPVC PIPE & FITTINGS MAY ONLY BE USED IN CONJUNCTION WITH STEEL SPRINKLER PIPING & FITTINGS THAT ARE LISTED COATED STEEL PIPING, ONLY IF STEEL PIPE MANUFACTURER HAS BEEN CONTACTED TO ENSURE THAT THEIR PRODUCTS ARE COMPATIBLE FOR USE WITH CPVC. ADDITIONALLY CUTTING OIL, GASKET LUBRICANT, THREAD SEALANT FOR INSTALLATION OF STEEL PIPING MUST BE TESTED COMPATIBLE WITH CPVC. CPVC PIPING & FITTINGS TO BE UL LISTED & COMPLY WITH NFPA.

RISER NUMBERED NOTES:

1. 8" C900 U.G. PIPE TO M.J. ELL ROD U.G. PIPE TO M.J. ELL. W/ 3/4" ALL THREAD ROD
2. FLANGED GATE VALVE
3. AMES BACK FLOW PREVENTER
4. FLANGED REDUCER
5. 4" GROOVED 90 TO F.D.C.
6. GROOVE CHECK VALVE W/ BALL DRIP
7. FLOW SWITCH
8. 90 TO OVER HEAD SYSTEM
9. PRESSURE GAUGE
10. 2" DRAIN VALVE
11. TAMPER SWITCH
12. TO STANDPIPE

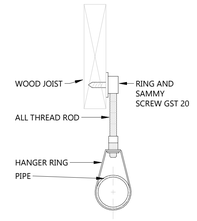


4 F201 FIRE PROTECTION RISER DETAIL
NOT TO SCALE



A 1" C.I. ELBOW
B 1" GLOBE VALVE WITH AUXILIARY DRAIN SIGN
C 1" WALL PLATE
D 1" 45 DEG. GALV. ELBOW
E SMOOTH BORE CORROSION RESISTANT OUTLET GIVING FLOW EQUIVALENT TO ONE SPRINKLER

3 F201 INSPECTORS TEST FOR WET PIPE
NOT TO SCALE



2 F201 HANGER DETAIL
NOT TO SCALE

1 F201 FIRST FLOOR FIRE PROTECTION PLAN
1/8" = 1'-0"

EAPC
Architecture | Engineering
Interior Design | Industrial
TELEPHONE 701.461.7222
112 No.Roberts Street, Suite 300, Fargo ND 58102
www.eapc.net

CLIENT
BEYOND SHELTER, INC.

PROJECT DESCRIPTION
BUFFALO MANOR APARTMENT COMPLEX

CITY JAMESTOWN
STATE NORTH DAKOTA

ISSUE DATES

MARK	DESCRIPTION	DATE
1	ADDENDUM #1	05/26/2026
CD	CONSTRUCTION DOCUMENTS	05/11/2026

PROJECT NO: 20245211
DRAWN BY: CBL
CHECKED BY: JL

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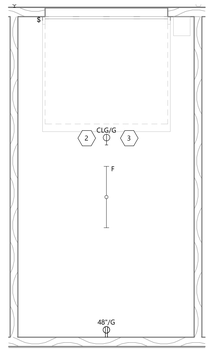
REGISTERED PROFESSIONAL ENGINEER
TYLER COULOMBE
PE-7432
DATE 05/11/2026
NORTH DAKOTA

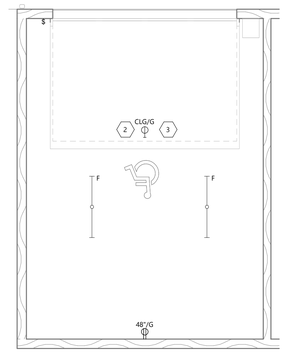
DRAWING TITLE
FIRST FLOOR FIRE PROTECTION PLAN & DETAILS

F201

Revit Version: 2026
Plot Date: 5/22/2026 11:57:15 AM



5 E100 TYPICAL SINGLE GARAGE PLAN
1/4" = 1'-0"



4 E100 TYPICAL ACCESSIBLE GARAGE PLAN
1/4" = 1'-0"

GENERAL NOTES

A. ALL PRODUCTS AND MANUFACTURES SHALL MEET BABA CERTIFICATIONS.

B. ALL GARAGES SHALL BE PLACED UPON THEIR OWN CIRCUIT AND ATTACHED TO PANEL AS NOTED. UTILITY COORDINATION NOTES. SEE SCHEDULE.

COORDINATE WITH OTTERTAIL ELECTRIC UTILITY AND ARVIG TELECOMMUNICATIONS UTILITY ON SERVICE REQUIREMENTS. EC SHALL COVER ALL INSTALLATION COSTS FROM UTILITY IN BASE BID.

- OTTERTAIL POWER COOPERATIVE:
  1. TYLER JACOBSON - (218) 739-8484
- ARVIG COMMUNICATIONS:
  1. TREVOR DAHL - (218) 346-8433

KEYNOTE LEGEND:

< < < INDICATES KEYNOTE ON PLAN

1. PROVIDE (2) 4" PVC CONDUIT TO UTILITY EASEMENT AT EDGE OF PROPERTY FOR DATA/CABLE/TELEPHONE ENTRY (VERIFY WITH UTILITY).
2. PROVIDE SINGLE RECEPTACLE OUTLET AT CEILING FOR OVERHEAD DOOR OPERATOR.
3. ROUTE TO GARAGE PANEL AS INDICATED. SEE GARAGE PANEL SCHEDULE.
4. UTILITY TRANSFORMER USE DETAIL SIMILAR TO 4/E100 EXCEPT USE WALL MOUNTED C/T CABINET.
5. COORDINATE FIXTURE LOCATION WITH ARCHITECT.
6. 3/4" CONDUIT TO BUILDING EXTERIOR SIGN FROM PANEL.

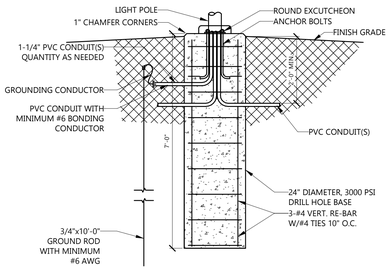
ELECTRICAL SITE COORDINATION:

THE LOCATION, CAPACITY, AND VOLTAGE OF THE LINES ARE ALL IN ACCORDANCE WITH DATA GIVEN THIS OFFICE BY THE UTILITY COMPANY. COORDINATE WITH THE LOCAL UTILITY COMPANY THE INSTALLATION OF THE ELECTRICAL SERVICE. COMPLY WITH UTILITY REGULATIONS. REPORT DISCREPANCIES TO THE ENGINEER.

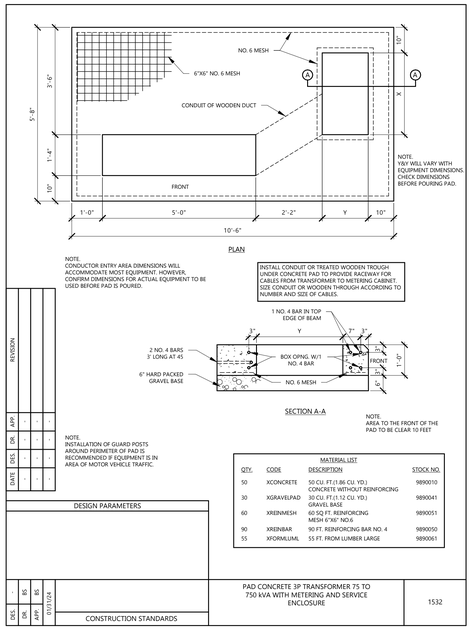
ELECTRIC UTILITY

OTTERTAIL POWER COMPANY:
LACIE BLAKE
BEMIDJI, MN 56619
(218)-739-8272

COMMUNICATIONS UTILITY:
EC TO VERIFY



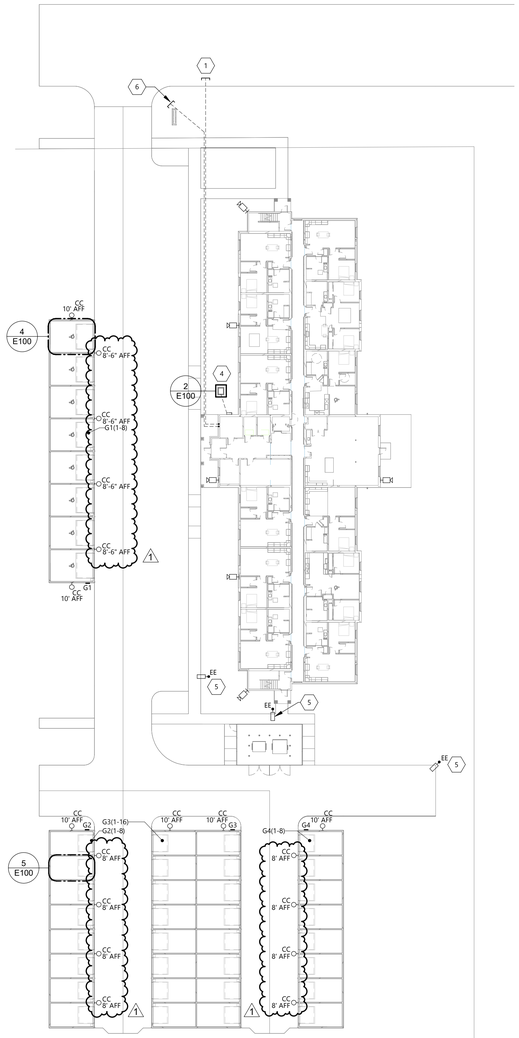
3 E100 LIGHT POLE BASE DETAIL
NOT TO SCALE



MATERIAL LIST

QTY.	CODE	DESCRIPTION	STOCK NO.
50	XCONCRETE	50 CU. FT.(1.86 CU. YD.) CONCRETE WITHOUT REINFORCING	9890010
30	XGRAVELPAD	30 CU. FT.(1.12 CU. YD.) GRAVEL BASE	9890041
60	XREINMESH	60 SQ FT. REINFORCING MESH 6"X6" NO.6	9890051
90	XREINBAR	90 FT. REINFORCING BAR NO. 4	9890050
55	XFORMLUML	55 FT. FROM LUMBER LARGE	9890061

2 E100 TRANSFORMER PAD DETAIL
NOT TO SCALE



1 E100 ELECTRICAL SITE PLAN
1" = 30'-0"

N

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PROJECT NO: 20245211
DRAWN BY: ML
CHECKED BY: LS

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REGISTERED PROFESSIONAL ENGINEER
LEONARD S. SCHAFF
PE-2044
DATE: 05/11/2026
NORTH DAKOTA

DRAWING TITLE
ELECTRICAL SITE PLAN

E100

Revit Version: 2026
Plot Date: 5/26/2026 1:12:47 PM