Lincoln-Lancaster County Health Department

ENVIRONMENTAL HEALTH DIVISION

3140 N STREET · LINCOLN, NE 68510-1514 (402) 441-8000

Permit
SEWAGE INSTALLATION
SEPTIC SYSTEM-HOLMES GOLF COURSE

Permit # 02380244701

Issued 04/12/02
Expires 10/12/02
Revenue Code 3157

Establishment
LINCOLN PARKS & RECREATION
T9N R7E SEC 4
3701 S 70 ST

FEES: $200.00

TOTAL: $200.00

Permittee
LINCOLN PARKS & RECREATION
2740 A ST
LINCOLN NE 68502-3199

Bruce D. Dart

Bruce D. Dart, Health Director

• POST IN A PROMINENT PLACE • NOT TRANSFERABLE

002021

A APR 12 2002

Lincoln-Lancaster County Health Department
Environmental Health Division
3140 "N" Street • Lincoln, NE 68510-1514
Phone: 402-441-8022

Permit Number: 02302447

Sewage Disposal System

Request for Site Clearance and Permit

Include Form B, Form C and Applicable Fees with this Application.

☒ Septic System ☐ Lagoon ☐ Other (Refer to Form C)

The undersigned hereby requests site clearance and permit to construct a Sewage Disposal System in conformance with appropriate resolution or ordinance, as described herein:

PLEASE PRINT OR TYPE

A. System Location (Indicate correct number and street)

Address 3701 S. 70th ST. HOLMES GOLF COURSE MAINT. (no rural route) BUILDING 6 City LINCOLN NE, Zip 68506

Legal Description 4 9N 7E
1/4 1/4 Section Township Range Subdivision Addition Block Lot

Geographical Location (if known): Longitude _____ Latitude _____

☑ Check if system mail address is not the same as the owner's address

B. Owner CITY OF LINCOLN

Name PARKS & REC. DEPT. Signature J. J. Yost for Parks & Rec.

Address 2740 "A" STREET City/State/Zip LINCOLN, NE 68502

☐ Check if owner designed system Home Phone _____ Work Phone 441-8255

C. Contractor

Name STEVE ROGGE Company Name ROGGE ENGINEERING, INC.

Address 2900 N. 27th St. City/State/Zip LINCOLN, NE 68521

☐ Check if contractor designed system Work Phone 402/466-8251

D. Engineer/Installer ☑ Check and complete if engineer designed system

Designer Name JOHN S. OLSSON Firm OLSSON ASSOC. Work Phone 458-5661

E. This System Will Serve a

☐ Residential Dwelling Number of Bedrooms _____ Is there a Whirlpool Bathtub YES NO

☒ Commercial Establishment/Other Facility Specify MAINTENANCE BUILDING

Design flow in gallons per day 360 Type of Wastewater: ☑ Domestic ☐ Non-Domestic.

DO NOT WRITE BELOW THIS LINE

Approval Process ☒ Municipal Code 24.38 ☐ County Resolution No. 2832

1. **Health Department** Date rec'd 4/12/02 Date frwd 4/15/02 ACTION ☒ Approved ☐ Disapproved Signature Jerrold C. Hood
2. **Supt. Bldg. Insp. or Village Clerk** Date rec'd 4/15/02 Date frwd 4/15/02 ACTION ☒ Approved ☐ Disapproved Signature _____
3. **City or County Engineer** Date rec'd 4-15-02 Date frwd 4-15-02 ACTION ☒ Approved ☐ Disapproved Signature _____

4/26/02 J.C.H.

Installation Final Written Approval

By Jerrold C. Hood R.E.H.S.

Date APRIL 26, 2002

Business Office Use Only

Date Rec'd 04/12/02
Amt Paid 200.00
Rec'd By _____ ~~Cash~~/Check No. 156327

FORM 23-100 10-96 White - Health Dept. Yellow - Engineer Pink - Bldg. Inspector

APR 1 2 2002

B

Lincoln-Lancaster County Health Department
Environmental Health Division
3140 "N" Street • Lincoln, NE 68510-1514
Phone: 402-441-8022

Permit Number: 023802447

Sewage Disposal System

Soil Absorption Test Data Report

Annex to Application

PLEASE PRINT OR TYPE

System Location (Indicate correct number and street)

Address 3701 S. 70th ST City LINCOLN NE, Zip 68506
HOLMES GOLF (no rural route) COURSE MAINT. BLDG.
Owner CITY OF LINCOLN PARKS & REC Addresss 2740 'A' STREET, LINCOLN, NE 68502
Soil Type (SCS): BrD, Burchard Clay Loam Percolation Rate: 40 min./inch
Date of Tests 11/14/01 to 11/15/01 Weather: Precipitation PARTLY CLOY. Temperature 45° F +/-

Percolation Test Data Table

A.	B.	C. D. E. F. Pre-Saturation Period				G. H. I. J. K. Percolation Readings					L. M. N. Results		
		Start		End		Start			End				
Hole No.	Hole Depth (in)	Date (Mo/Da)	Time (Hr/Min)	Date (Mo/Da)	Time (Hr/Min)	Date (Mo/Da)	Time (Hr/Min)	Water Lev (in.)	Date (Mo/Da)	Time (Hr/Min)	Elapsed Time (Min)	Water Level Drop (in)	Percolation Rates (Min/in)
			SEE ATTACHED										
			TEST DATA										

Sum of Percolation Rates: _____
Average of Rates: _____
Rate Used for Calculation: _____

Person Conducting Percolation Tests

Name: RYAN BECKMAN
Phone: 474-6311
Address 1111 LINCOLN MALL
LINCOLN, NE 68508

DO NOT WRITE BELOW THIS LINE

Reviewing Action

Remarks _____

Signature of Reviewing Official _____ Date _____

FORM 23-101 10-96

APR 1 2 2002

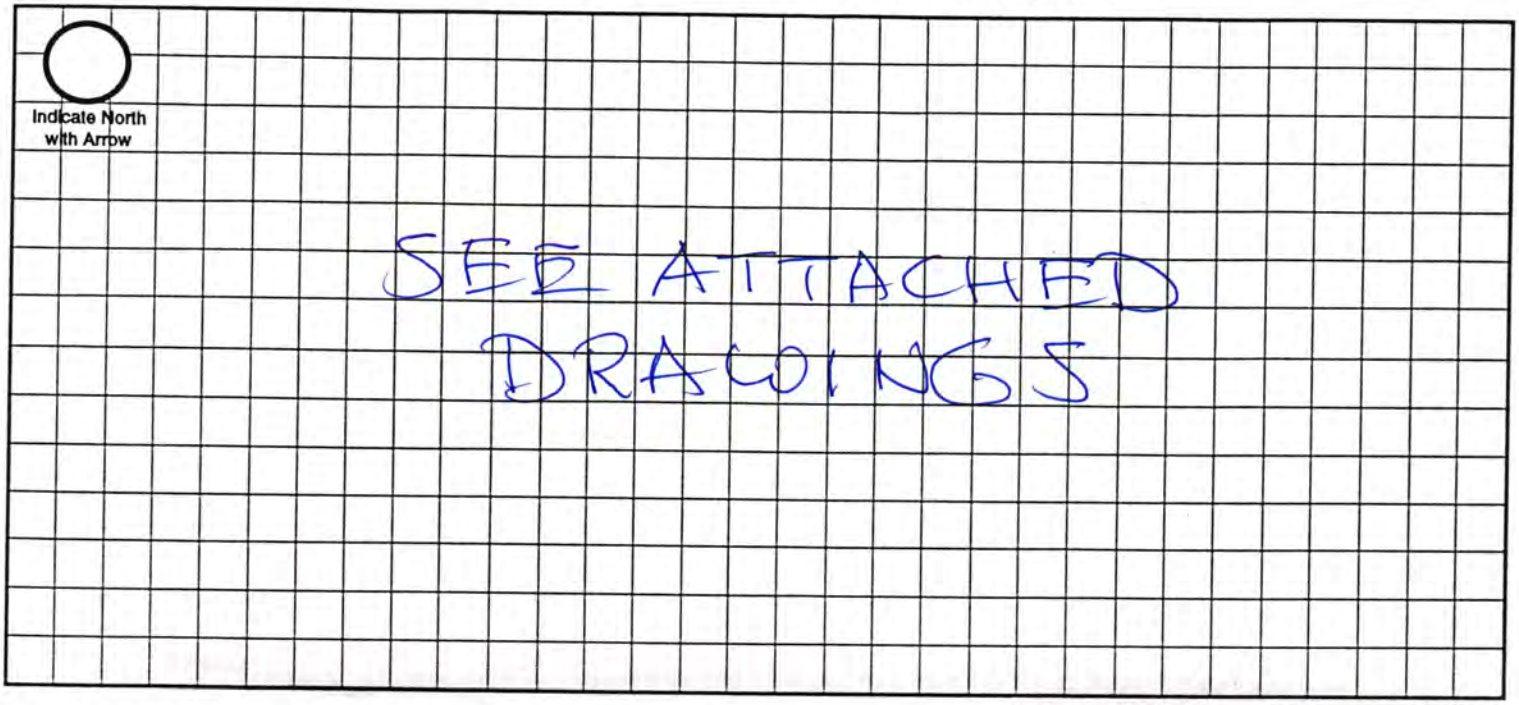
C

Lincoln-Lancaster County Health Department
Environmental Health Division
3140 "N" Street • Lincoln, NE 68510-1514
Phone: 402-441-8022

Permit Number: 023802447

Sewage Disposal System
Preliminary Plan Specifications

Draw a plot plan showing system location, lines, distribution box, tank and laterals, percolation test hole locations, well, residence, compass direction and property lines. Indicate on drawing if residence and well are existing or proposed.



Approximate Scale: _____ ft. = _____ grid line/s

A. System Location (Indicate correct number and street)

Address (no rural route) 3701 S. 70th ST. City LINCOLN NE, Zip 68506
HOLMES GOLF COURSE MAINT. BLDG.

B. Proposed Septic Tank/s

Tank Material: ☑ Concrete ☐ Plastic ☐ Other _____

C. Proposed Absorption System (See Form B for Percolation Information)

Percolation Rate 40 (min. per inch) Soil Type: BrD Land Slope: 3-4 %

Type of Absorption System: ☑ Trench ☐ Bed ☐ Other _____

Total Square Feet of Field Required: 615 sq. ft.

Type of Lateral: ☐ Half-Moon ☐ Perforated Pipe ☑ Other Lateral Material: CHAMBER

Capacity of Septic Tank 1000 gals Number of Absorption Beds: _____ Number of Distribution Laterals per Bed _____

Total Length of Laterals 150 ft. Number of Trenches 2 Trench Width 5'-0"

D. Setbacks Check the Boxes Below if the Required Setback has been Satisfied

Distance From	Private Well	Public Well	Surface Water	Gound Water	Pressure Water Lines	Property Lines	Foundations Yours	Foundations Neighbors	All Other Setbacks
Tank (ft)	50 ☑	500 ☑	50 ☑	NA ☐	25 ☑	20 ☑	15 ☑	25 ☑	☑
Field (ft)	100 ☑	500 ☑	50 ☑	4 ☑	30 ☑	20 ☑	30 ☑	40 ☑	☑
Lagoon (ft)	100 ☐	500 ☐	50 ☐	N/A ☐	30 ☐	50 ☐	100 ☐	200 ☐	☐

E. Required Signatures

Home Building Contractor _____ Date _____

Installer Steve Rogge Date 4-11-02

FORM 23-102 10-96

Soil Absorption Test Data Report

Lincoln Parks & Recreation Golf Course Maintenance Building

Percolation Test Data

		Saturation Period				Percolation Readings						Results		
Hole No.	Hole Depth (in.)	Start Date Mo./Day	Time	End Date Mo./Day	Time	Start Date Mo./Day	Time	Depth to Water (in.)	End Date Mo./Day	Time	Depth to Water (in.)	Elapsed Time (min.)	Water Level Drop in.	Perc. Rates (min./in)
1	36"	2/20/02	11:30 AM	2/21/02	01:13 PM	2/21/02	01:36 PM	9"	2/21/02	02:06 PM	9"	30	0	0
						2/21/02	02:06 PM	9"	2/21/02	02:36 PM	9"	30	0	0
						2/21/02	02:36 PM	9"	2/21/02	03:06 PM	9"	30	0	0
						2/21/02	03:06 PM	9"	2/21/02	03:36 PM	9.5"	30	0.5	60
						2/21/02	03:36 PM	9.5"	2/21/02	04:06 PM	10"	30	0.5	60
						2/21/02	04:06 PM	10"	2/21/02	04:36 PM	10"	30	0	0
						2/21/02	04:36 PM	10"	2/21/02	05:06 PM	10.5"	30	0.5	60
						2/21/02	05:06 PM	10.5"	2/21/02	05:36 PM	10.5"	30	0	0
2	36"	2/20/02	11:35 AM	2/21/02	01:15 PM	2/21/02	01:38 PM	10.5"	2/21/02	02:08 PM	11"	30	0.5	60
						2/21/02	02:08 PM	11"	2/21/02	02:38 PM	11"	30	0	0
						2/21/02	02:38 PM	11"	2/21/02	03:08 PM	11.5"	30	0.5	60
						2/21/02	03:08 PM	10.5"	2/21/02	03:38 PM	10.75"	30	0.25	120
						2/21/02	03:38 PM	10.75"	2/21/02	04:08 PM	11.125"	30	0.375	80
						2/21/02	04:08 PM	11.125"	2/21/02	04:38 PM	12"	30	0.875	34
						2/21/02	04:38 PM	12"	2/21/02	05:08 PM	12"	30	0	0
						2/21/02	05:08 PM	12"	2/21/02	05:38 PM	12.5"	30	0.5	60
3	36"	2/20/02	11:40 AM	2/21/02	01:17 PM	2/21/02	01:40 PM	6"	2/21/02	02:10 PM	6"	30	0	0
						2/21/02	02:10 PM	6"	2/21/02	02:40 PM	6"	30	0	0
						2/21/02	02:40 PM	6"	2/21/02	03:10 PM	6.5"	30	0.5	60
						2/21/02	03:10 PM	6.5"	2/21/02	03:40 PM	6.75"	30	0.25	120
						2/21/02	03:40 PM	6.75"	2/21/02	04:10 PM	6.75"	30	0	0
						2/21/02	04:10 PM	6.75"	2/21/02	04:40 PM	6.75"	30	0	0
						2/21/02	04:40 PM	6.75"	2/21/02	05:10 PM	7"	30	0.25	120
						2/21/02	05:10 PM	7	2/21/02	05:40 PM	7"	30	0	0

Project: Lincoln P&R Golf Course Maint. Bldg.
Location: Holmes Lake Golf Course
Job No.: 2-2001-0959

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Soil Absorption Test Data Report

Lincoln Parks & Recreation Golf Course Maintenance Building

Percolation Test Data

		Saturation Period				Percolation Readings						Results		
Hole No.	Hole Depth (in.)	Start Date Mo./Day	Time	End Date Mo./Day	Time	Start Date Mo./Day	Time	Depth to Water (in.)	End Date Mo./Day	Time	Depth to Water (in.)	Elapsed Time (min.)	Water Level Drop in.	Perc. Rates (min./in)
4	36"	2/20/02	11:45 AM	2/21/02	01:19 PM	2/21/02	01:42 PM	8"	2/21/02	02:12 PM	8"	30	0	0
						2/21/02	02:12 PM	8"	2/21/02	02:42 PM	8.25"	30	0.25	120
						2/21/02	02:42 PM	8.25"	2/21/02	03:12 PM	8.25"	30	0	0
						2/21/02	03:12 PM	8.25"	2/21/02	03:42 PM	8.25"	30	0	0
						2/21/02	03:42 PM	8.25"	2/21/02	04:12 PM	8.25"	30	0	0
						2/21/02	04:12 PM	8.25"	2/21/02	04:42 PM	8.25"	30	0	0
						2/21/02	04:42 PM	8.25"	2/21/02	05:12 PM	8.25"	30	0	0
						2/21/02	05:12 PM	8.25"	2/21/02	05:42 PM	8.25"	30	0	0
5	36"	2/20/02	11:50 AM	2/21/02	01:21 PM	2/21/02	01:44 PM	8"	2/21/02	01:44 PM	9"	30	1	30
						2/21/02	02:14 PM	8"	2/21/02	02:14 PM	10"	30	2	15
						2/21/02	02:44 PM	8"	2/21/02	02:44 PM	9.5"	30	1.5	20
						2/21/02	03:14 PM	8.5"	2/21/02	03:14 PM	9.75"	30	1.25	24
						2/21/02	03:44 PM	9.75"	2/21/02	03:44 PM	10.5"	30	0.75	40
						2/21/02	04:14 PM	10.5"	2/21/02	04:14 PM	11.75"	30	1.25	24
						2/21/02	04:44 PM	11.75"	2/21/02	04:44 PM	12.5"	30	0.75	40
						2/21/02	05:14 PM	12.5"	2/21/02	05:14 PM	13.0"	30	0.5	60
6	36"	2/20/02	11:55 AM	2/21/02	01:23 PM	2/21/02	01:51 PM	8"	2/21/02	02:21 PM	14"	30	6	5
						2/21/02	02:21 PM	12"	2/21/02	02:51 PM	15"	30	3	10
						2/21/02	02:51 PM	12"	2/21/02	03:21 PM	14"	30	2	15
						2/21/02	03:21 PM	12"	2/21/02	03:51 PM	14.75"	30	2.75	11
						2/21/02	03:51 PM	14.75"	2/21/02	04:21 PM	17"	30	2.25	13
						2/21/02	04:21 PM	17"	2/21/02	04:51 PM	19.5"	30	2.5	12
						2/21/02	04:51 PM	19.5"	2/21/02	05:21 PM	20"	30	0.5	60
						2/21/02	05:21 PM	20"	2/21/02	05:51 PM	21.5"	30	1.5	20

Project: Lincoln P&R Golf Course Maint. Bldg.
Location: Holmes Lake Golf Course
Job No.: 2-2001-0959

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Soil Absorption Test Data Report

Lincoln Parks & Recreation Golf Course Maintenance Building

Percolation Test Data

		Saturation Period				Percolation Readings						Results		
Hole No.	Hole Depth (in.)	Start Date Mo./Day	Time	End Date Mo./Day	Time	Start Date Mo./Day	Time	Depth to Water (in.)	End Date Mo./Day	Time	Depth to Water (in.)	Elapsed Time (min.)	Water Level Drop in.	Perc. Rates (min./in)
7	36"	2/20/02	12:00 PM	2/21/02	01:25 PM	2/21/02	01:53 PM	9"	2/21/02	02:23 PM	13.5"	30	4.5	7
						2/21/02	02:23 PM	12"	2/21/02	02:53 PM	14.5"	30	2.5	12
						2/21/02	02:53 PM	12.5"	2/21/02	03:23 PM	15"	30	2.5	12
						2/21/02	03:23 PM	12.25"	2/21/02	03:53 PM	14.25"	30	2	15
						2/21/02	03:53 PM	14.25"	2/21/02	04:23 PM	15.5"	30	1.25	24
						2/21/02	04:23 PM	15.5"	2/21/02	04:53 PM	17.75"	30	2.25	13
						2/21/02	04:53 PM	17.75"	2/21/02	05:23 PM	18.5"	30	0.75	40
						2/21/02	05:23 PM	18.5"	2/21/02	05:53 PM	19"	30	0.5	60
8	36"	2/20/02	12:05 PM	2/21/02	01:27 PM	2/21/02	01:55 PM	16"	2/21/02	02:25 PM	18"	30	2	15
						2/21/02	02:25 PM	15"	2/21/02	02:55 PM	16"	30	1	30
						2/21/02	02:55 PM	14.5"	2/21/02	03:25 PM	14.5"	30	0	0
						2/21/02	03:25 PM	14.5"	2/21/02	03:55 PM	15"	30	0.5	60
						2/21/02	03:55 PM	15.0"	2/21/02	04:25 PM	15.25"	30	0.25	120
						2/21/02	04:25 PM	15.25"	2/21/02	04:55 PM	16"	30	0.75	40
						2/21/02	04:55 PM	16"	2/21/02	05:25 PM	16"	30	0	0
						2/21/02	05:25 PM	16"	2/21/02	05:55 PM	16.25"	30	0.25	120

Project: Lincoln P&R Golf Course Maint. Bldg.
Location: Holmes Lake Golf Course
Job No.: 2-2001-0959

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Figure(s)

02225-1 (Following page 02225-6)

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Product data.

E. Shop drawings.

F. Samples.

G. Design data.

H. Test reports.

I. Certificates.

J. Manufacturer's instructions.

K. Manufacturer's field reports.

1.2 RELATED SECTIONS

A. Section 02228 - Horizontal Directionally Drilled Utilities.

B. Section 02540 - Septic Tank Systems.

C. Section 02620 - Water Distribution System.

D. Section 02623 - Sanitary Sewer Pipe.



1.3 REFERENCES

A. AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.4 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer accepted form.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply Contractor's stamp, signed or initialled certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Engineer at business address of 1111 Lincoln Mall, Lincoln, Nebraska 68508. Coordinate submission of related items. For each section of the specifications, the initial submittal shall be complete for all items and components contained within that section of the specifications.

F. For each submittal for review, allow 21 days excluding delivery time to and from the contractor.

G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Engineer review stamps.

I. When revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

L. Contractor shall reimburse Owner for charges of Engineer for review of substitutes, review of more than one "or-equal" per specification section, and additional review effort due to incompleteness of submittals or failure of Contractor to coordinate and complete submittals.

M. If more than one resubmission is required because of lack of previously requested data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of resubmissions. This would not include submittal data for slump tests, fields tests, and other submittal requirements for placing equipment into service.

1.5 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule in duplicate within 20 days after date Agreement established Notice to Proceed.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each section of Work, identifying first work day of each week.

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of Work at each submission.

G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.6 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.7 PRODUCT DATA

A. Product Data For Review:

1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with SUBMITTA PROCEDURES article above.

B. Product Data For Information:

1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.

C. Product Data For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

F. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.8 SHOP DRAWINGS

A. Shop Drawings For Review:

1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

B. Shop Drawings For Information:

1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

1.9 SAMPLES

A. Samples For Review:

1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

B. Samples For Information:

1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.

C. Samples For Selection:

1. Submitted to Engineer for aesthetic, color, or finish selection.

2. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Engineer selection.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Submit the number of samples specified in individual specification sections; one of which will be retained by Engineer.

G. Reviewed samples which may be used in the Work are indicated in individual specification sections.

H. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.10 DESIGN DATA

A. Submit for the Engineer's knowledge as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 TEST REPORTS

A. Submit for the Engineer's knowledge as contract administrator or for the Owner.

B. Submit test reports for information for the limited purpose of assessing conformance w information given and the design concept expressed in the contract documents.

1.12 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or the Contractor to Engineer, quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Sub supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must acceptable to Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions f delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer f delivery to owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and speci environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Engineer's benefit as contract administrator or for the Owner.

B. Submit report within 30 days of observation to Engineer for information.

C. Submit for information for the limited purpose of assessing conformance with informatio given and the design concept expressed in the contract documents.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02207

AGGREGATE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate materials.

B. Source quality control.

1.2 RELATED SECTIONS

A. Section 02223 - Backfilling.

B. Section 02225 - Trenching.

1.3 REFERENCES

A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

D. ASTM D2487 - Classification of Soils for Engineering Purposes.

E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

G. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS FOR REVIEW

A. Samples: Submit, in air-tight containers, 10 lb. (4.5 kg) sample of each type of fill to testing laboratory.

1.5 SUBMITTALS FOR INFORMATION

A. Materials Source: Submit name of imported materials suppliers.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Type "A" - Granular Embedment: Limestone, crushed natural stone; free of clay, organic matter; graded in accordance with ASTM C136.

Sieve Size	Percent Retained
1 inch	0
3/4 inch	0 to 10
3/8 inch	45 to 80
No. 4	90 to 100
No. 8	95 to 100

B. Type "B" - Alternate Bedding Material: Coarse grained soils with little or no fines, Group Classification, GW, GP or SW containing less than 12 percent fines. Use of material will require moderate degree of compaction, 85 percent Proctor or 50 percent relative density (minimum).

Sieve Size	Percent Retained
1 inch	0
No. 4	>50
No. 200	>5

Soil Group Classification	Coefficients	
	Uniformity (Cu)	Curvature (Cc)
GW	>4	1 to 3
GP	<4	<1 or >3
SW	>6	1 to 3

2.2 FINE AGGREGATE MATERIALS

A. Type "C" Fill Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136 Symbol SW or SP; within the following limits:

Sieve Size	Percent Retained
No. 4	0 to 25
No. 200	93 to 100

Effective size between 0.10 mm and .030mm.

2.3 SOURCE QUALITY CONTROL

A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D2922, ASTM D3017, ASTM D4318, and ASTM C136.

B. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D2167, ASTM D2922, ASTM D3017, ASTM D4318, and ASTM C136.

C. If tests indicate materials do not meet specified requirements, change material or material source and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 02218

LANDSCAPE GRADING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Finish grade subsoil and proof roll.

B. Place, level, and compact topsoil.

1.2 RELATED WORK

A. Section 02223 - Backfilling.

1.3 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect roads and drives

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Reused when possible.

B. Topsoil: Imported, friable loam; free of subsoil, roots, grass, excessive amount of weeds, stone, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify site conditions and note irregularities affecting work of this Section.

B. Beginning work of this Section means acceptance of existing conditions.

3.2 SUBSOIL PREPARATION

A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in e of 1/2 inch in size.

B. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas w equipment used for hauling and spreading topsoil has compacted subsoil.

3.3 PLACING TOPSOIL

A. Place topsoil in areas where seeding is scheduled and agriculture land.

B. Use topsoil in relatively dry state. Place during dry weather.

C. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and con of subgrade.

D. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.

E. Manually spread topsoil around trees, plants, and building to prevent damage.

F. Roll placed topsoil.

G. Remove surplus subsoil and topsoil from site.

H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.4 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.5 SCHEDULE OF LOCATIONS

A. The following paragraph identifies compacted topsoil thicknesses for various locati

B. Seeded Grass and Ground Covered Areas: Restore to original depth, but not less th inches.

C. Field Areas: Restore to original depth, but not less than twelve (12) inches.

END OF SECTION

SECTION 02219

STRUCTURE EXCAVATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Excavation for structures.

B. Excavation for manholes.

1.2 RELATED WORK

A. All Sections.

1.3 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

1.4 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.

B. Protect bench marks and roads.

C. Protect above or below grade utilities which are to remain.

D. Repair damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Material excavated from top 6 inches of the site, graded free of roots, rocks larger than one inch, subsoil, debris, and large weeds.

B. Subsoil: Material excavated from site below topsoil down subgrade elevations, graded free of organic matter, lumps larger than 6 inches, rocks larger than 3 inches, and debris.

PART 3 EXECUTION

3.1 GENERAL

A. Excavation work shall be performed in a safe and proper manner with suitable precau being taken against all hazards.

B. Excavations shall provide adequate working space and clearances for the work to performed therein and for installation and removal of concrete forms.

C. Subgrade surfaces shall be clean and free of loose material of any kind when concre placed thereon.

D. Backfilling and construction of fills and embankments during freezing weather shall be done except by permission of the Engineer. No backfill, fill, or embankment materi shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed any backfill, fill, or embankment.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, above ground, and aerial utilities. Stake and flag location

C. Notify utility companies to remove and relocate utilities in the way of excavation.

D. Maintain, re-route or extend as required existing utility lines to remain which pass throug work area. Pay costs for this work, except those covered by utility companies.

E. Remove abandoned utility service lines from areas of excavation, plug or seal such line with concrete.

F. Protect above and below grade utilities which are to remain.

G. Protect plant life, lawns rock outcropping and other features remaining as a portion of fin landscaping.

H. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs fro excavation equipment and vehicular traffic.

I. Upon discovery of unknown utility or concealed conditions, discontinue affected wor notify Engineer.

3.3 SITE PREPARATION

A. All sites to be occupied by permanent construction or embankments shall be cleared of all logs, trees, roots, brush, tree trimmings, and other objectionable materials and debris.

B. All stumps shall be grubbed.

C. Subgrades for fills and embankments shall be cleaned and stripped of all surface vegetation, sod, and organic topsoil.

3.4 PRESERVATION OF TREES

A. No trees shall be removed outside of excavated or filled areas, unless their removal is authorized by the Engineer.

B. Trees left standing shall be adequately protected from permanent damage by construction operations.

C. Trimming of standing trees where required shall be as directed by the Engineer.

3.5 TOPSOIL EXCAVATION

A. Excavate a minimum of 6 inches of topsoil from areas to be further excavated, relandscaped, or regraded and stockpile on site as directed by Engineer.

B. Following completion of construction, topsoil shall be distributed on areas designated to be seeded and left in suitable condition for finish grading and seeding.

C. Do not excavate wet topsoil.

3.6 SUBSOIL EXCAVATION

A. Excavate subsoil required to accommodate site improvements.

B. Machine slope banks to angle of repose or less, until shored.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Remove lumped subsoil, boulders, and rock.

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

F. Correct unauthorized excavation at no extra cost to Owner.

G. Fill areas over-excavated under structure bearing surfaces with complete crusher run 2" nominal size, or other material acceptable to Engineer.

H. Subgrades for concrete structures shall be firm, dense, and thoroughly compacted consolidated; shall be free from mud and muck; and shall be sufficiently stable to re firm and intact under the feet of the workmen.

I. Subgrades for concrete structures which are otherwise solid, but which become mucky top due to construction operations, shall be reinforced with crushed rock or gravel. finished elevation of stabilized subgrades shall not be above subgrade elevations sho on the drawings.

J. Stockpile excavated material in area designated on site.

K. When complete, verify soil bearing capacities, depths, and dimensions.

L. Accurately locate and record abandoned and active utility lines rerouted or extended, project record documents.

3.7 FINAL GRADING

A. After other outside work has been finished, and backfilling and embankments complete and settled, all areas on the site of the work which are to be graded shall be brought grade at the indicated elevations, slopes, and contours. Use of graders or other pow equipment may be permitted for final grading and dressing of slopes, provided the res is uniform and equivalent to hand work. All surfaces shall be graded to secure effecti drainage.

3.8 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Excess material, broken concrete and other debris resulting from pavement, drive, sidewalk removal, junk, and debris encountered in excavation work and other similar was materials shall be disposed of away from the site of the work at a location approved by th Engineer.

3.9 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankme which may occur within the one year warranty period following final acceptance of th work.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement, within 30 days after notice from the Engineer or Owner.

3.10 FIELD QUALITY CONTROL

A. Provide for visual inspection of bearing surfaces as required.

3.11 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation as required.

B. Protect bottom of excavations and soil adjacent to and beneath foundations from freezing.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Backfilling around and outside of manholes and other structures to elevations shown.

B. Compaction requirements.

1.2 RELATED WORK

A. Section 02207 - Aggregate Materials.

C. Section 02218 - Landscape Grading: Filling of topsoil to finish grade elevation.

D. Section 02219 - Structure Excavation.

E. Section 02225 - Trenching: Excavation and backfilling of trenches.

F. Section 02540 - Septic Tank Systems.

1.3 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D1556 - Density of Soil in Place by the Sand-Cone Method.

C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

G. ASTM D4253 - Test Methods for Maximum Index Density of Soils using a Vibratory Table.

H. ASTM D4254 - Test Methods for Minimum Index Density of Soils and Calcul Relative Density.

1.4 TESTS

A. Tests and analysis of fill materials will be performed in accordance with ANSI/AS D698 or ASTM D4253 and D4254 as appropriate.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. As specified in Section 02207.

2.2 COMMON FILL MATERIALS

A. Subsoil: Reused; free of gravel or rock larger than 3 inch size, and debris.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify stockpiled fill to be reused is approved.

B. Verify dampproofing or waterproofing installation has been inspected.

C. Verify foundations or basement walls are braced to support surcharge forces imposed by backfilling operations.

D. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

3.2 PREPARATION

A. When necessary, compact subgrade surfaces to density requirements for backfill material.

B. Cut out soft areas of subgrade not readily capable of in-situ compaction. Backfill with subsoil and compact to density equal to requirements for subsequent backfill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations. Use unfrozen materials.

B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.

C. Granular Fill Type A, B, and C: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

D. Place and compact common fill material in continuous layers not exceeding 8 inches loose depth.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Slope grade away from building minimum 2 inches in 10 ft., unless noted otherwise.

G. Make gradual grade changes. Blend slope into level areas.

H. Dispose surplus backfill materials off site.

I. Leave stockpile areas completely free of excess fill materials.

3.4 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch.

3.5 COMPACTION TESTING

A. Compaction testing will be performed in accordance with ANSI/ATSM D698 or ASTM D4253 and D4254 as required.

B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.6 SCHEDULE OF LOCATIONS

A. The paragraphs below identify location, fill material to be used (identified from lower to upper fill type), compacted thickness of each fill, and compaction expressed as a percentage of maximum density and optimum moisture in comparison with ANSI/ASTM D698 or ASTM D4253 and D4254 as appropriate.

B. Fill Under Grass Areas: Common fill, 8 inches thick, fill to 6 inches below finish compacted to 88 percent to prevent future settlement. Fill to finish grade with top

C. Fill Under Roadways: Common fill, 8 inches thick, fill to prescribed subgrade elev compact to 95 percent.

D. Overexcavation: Subsoil fill, 6 inches thick, compacted to 95 percent.

3.7 SETTLEMENT

A. Contractor shall be responsible for all settlement of backfill which may occur with one year warranty period following final acceptance of the work.

B. Contractor shall make, or cause to be made, all repairs or replacements made necessa settlement within 30 days after notice from the Engineer or Owner.

END OF SECTION

SECTION 02225

TRENCHING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Excavate trenches for utilities and other excavation related to the work.

B. Compacted bedding and compacted fill over utilities to subgrade elevations.

C. Compaction requirements.

1.2 RELATED WORK

A. Section 02207 - Aggregate Materials.

C. Section 02219 - Structure Excavation.

D. Section 02223 - Backfilling: General backfilling.

E. Section 02620 - Water Distribution System.

F. Section 02623 - Sanitary Sewer Pipe.

G Section 03001 - Concrete.

1.3 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb Rammer and 12 inch Drop.

C. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

G. ASTM D4253 - Test Methods for Maximum Index Density of Soils using a Vi Table.

H. ASTM D4254 - Test Methods for Minimum Index Density of Soils and Calcula Relative Density.

1.4 TESTS

A. Tests and analysis of fill materials will be performed in accordance with ANSI/A D698 or ASTM D4253 and D4254 as required.

1.5 PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other me required to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures which may be damaged by excavation work, inclu service utilities and pipe chases.

C. Notify Engineer of unexpected subsurface conditions and discontinue work in affected until notification to resume work.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from fro

E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

2.1 COMMON FILL MATERIALS

A. Subsoil: Reused; free of gravel or rock larger than 3 inch size, and debris.

2.2 SELECT BEDDING MATERIALS

A. Granular Embedment Material: Type "A" or Type "B" Aggregate as specified in Sect 02207.

B. Select Subsoil: Free of organic material, gravel larger than one inch size, and debris.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify stockpiled fill to be reused is approved.

B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Compact subgrade surfaces to density requirements for backfill material and according to requirements at end of this section.

C. Maintain and protect above and below grade utilities which are to remain.

3.3 EXCAVATION

A. Excavate subsoil required for sanitary sewer, manholes, and piping to existing utilities.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection. Remove water or materials that interfere with work.

C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.

D. Remove lumped subsoil, boulders, and rocks.

E. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

F. Correct unauthorized excavation at no cost to Owner.

G. Fill over-excavated areas under pipe bearing surfaces with approved granular material as directed by the Engineer.

H. Trenches shall be excavated to a width which will provide adequate working sidewall clearances for proper pipe installation, jointing and embedment.

a. Minimum Sidewall Clearance: Minimum permissible sidewall clearance bottom of the trench to an elevation 6 inches above the top of installed pipe, minimum permissible sidewall clearances between the installed pipe and each wall, shall be as follows:

Pipe Size	Minimum Sidewall Clearance
18	12
15	9
12	9
10	6
8	5
6	4
4 and smaller	4

b. Maximum Trench Widths: Maximum trench widths below an elevation 6 in above the top of installed pipe, shall be pipe diameter plus 24 inches.

c. Specified minimum sidewall clearances are not minimum average clearances, bu minimum clear distances which will be required to the trench excavation o trench protective system.

d. For flexible conduits, moveable supports shall not be used below the top of the zone unless it can be demonstrated that the integrity of the embedment material be maintained.

e. For flexible conduits where it is found necessary to use moveable supports below top of the pipe zone, the minimum trench width shall be increased to produc minimum sidewall clearance of 2.5 times the pipe outside diameter.

3.4 DEWATERING

A. Contractor shall provide and maintain adequate dewatering equipment to remove dispose of all surface and ground water entering trenches, or other parts of the work.

B. Excavation shall be kept dry during subgrade preparation and continually thereafter the pipe or manhole to be installed therein is completed to the extent that no damage fr hydrostatic pressure, flotation, or other cause will result.

C. All excavations for trenches which extend down to or below static ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations 6 inches of more below the bottom of the pipe.

D. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

3.5 BACKFILLING

A. Support pipe and conduit during placement and compaction of bedding fill. Hand place and compact fill around pipe to 6 inches above top of pipe.

B. Backfill trenches to contours and elevations. Do not backfill over porous, wet, or spongy subgrade surfaces.

C. Maintain optimum moisture content of backfill materials to attain required compaction density.

D. Remove surplus backfill materials, waste off site.

E. Leave stockpile areas completely free of excess fill materials.

3.6 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch.

3.7 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ANSI/ASTM D698 or ASTM D4253 and D4254 as required.

3.8 SETTLEMENT

A. Contractor shall be responsible for all settlement of backfill which may occur within the one year warranty period following final acceptance of the work.

B. Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner.

3.9 SCHEDULE OF LOCATIONS

A. The paragraphs below identify location, fill material to be used, compacted thick each fill, and compaction expressed as a percentage of maximum density and o moisture in comparison with ANSI/ASTM D698 or D2049 as appropriate.

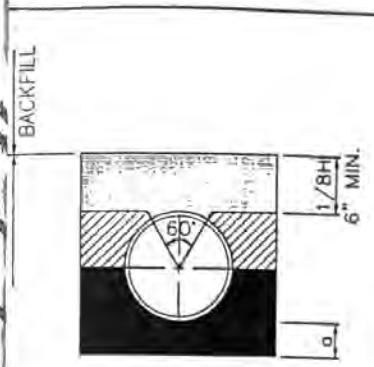
B. Pipe Bedding: Pipe bedding materials shall be placed as indicated on the drawi described herein.

1. Bedding for PVC pipe, force main and sewer pipe installed or exposed by ba shall be Class B Modified Bedding.

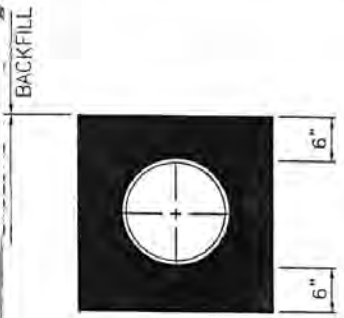
C. Fill Under Turf or Agricultural Areas: Common subsoil fill from top of pipe embe to 4" below finish grade, compacted to 88 percent to prevent future settlement. finish grade with topsoil.

D. Fill under Roadways: Common subsoil fill from top of pipe embedment to prep subgrade elevation, compacted to 95 percent.

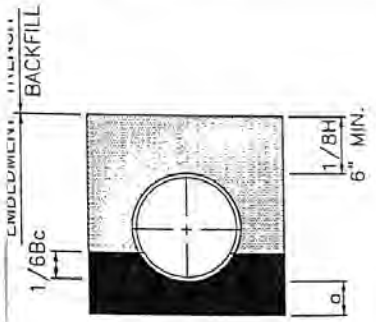
END OF SECTION



CLASS B
FIRST CLASS BEDDING



CLASS B
MODIFIED



CLASS C
ORDINARY BEDDING

TABLE FOR EMBEDMENT DEPTHS BELOW PIPE

D	a MIN. SOIL	a MIN. ROCK
27" & SMALLER	3"	6"
30" TO 60"	4"	9"
66" & LARGER	6"	12"

NOTES:

GRANULAR EMBEDMENT SHALL BE PLACED IN NOT MORE THEN 6" LAYERS AND COMPACTED BY SLICING WITH A SHOVEL OR VIBRATING.

SELECT SUBSOIL SHALL BE PLACED IN UNIFORM LAYERS NOT MORE THAN 8" THICK, AND COMPACTED TO 95% MAXIMUM DENSITY AS DETERMINED BY ASTM D698. GRANULAR EMBEDMENT MAY BE SUBSTITUTED FOR ALL OR PART OF THE SELECT SUBSOIL.

SUBSOIL SHALL BE HAND PLACED FINELY DIVIDED MATERIAL FREE FROM DEBRIS, AS SPECIFIED.

LEGEND

Bc OUTSIDE DIAMETER OF PIPE

H COVER ABOVE TOP OF PIPE

D NOMINAL PIPE SIZE

a EMBEDMENT BELOW PIPE (SEE TABLE)

SUBSOIL

SELECT SUBSOIL

GRANULAR EMBEDMENT

EDMENTS FOR CONDUITS

OLSSON ASSOCIATES
CONSULTING ENGINEERS
1111 Lincoln Mall Lincoln, NE 68501

FIGURE NO.
02225-1
ENGLISH

SECTION 02228

HORIZONTAL DIRECTIONALLY DRILLED UTILITIES

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the installation of utilities in the sizes indicated and at the locations shown on the drawings, using horizontal directional drilling (HDD).

B. HDD is a trenchless excavation method which is accomplished in three phases. The first phase consists of drilling a small diameter pilot hole along a designed directional path. The second phase consists of enlarging the pilot hole to a diameter suitable for installation of the pipe. The third phase consists of pulling the pipe into the enlarged hole. HDD is accomplished using a specialized horizontal drilling rig with ancillary tools and equipment.

C. Services furnished by Contractor shall be performed in accordance with standard HDD industry practice and these Contract Documents shall include all labor, equipment, and consumables necessary to complete the work, including the following tasks:

1. Clearing, grading, and general site and access preparation necessary for construction operations.

2. Transportation of all equipment, labor, consumables, and materials to and from the site of the work.

3. Erection of horizontal drilling equipment.

4. Locate all existing utilities as required.

5. Drilling of a small diameter pilot hole along the path defined on the drawings.

6. Reaming the pilot hole to a diameter suitable for installation of the prefabricated pull section of utility.

7. Prefabrication of the pull section of utility.

8. Installation of the prefabricated pull section of utility in the reamed hole.

9. Flushing, testing, and disinfection of the installed utility.

10. Clean-up and restoration of all work areas.

11. Recording as-built location of utility on the drawings.

12. Other items of work as required.

D. The Contractor shall furnish all labor, materials, tools, equipment, drilling fluids, and items as necessary for a complete and functional installation as required.

1.2 REFERENCES

A. ANSI/AWWA C-600

1.3 RELATED SECTIONS

A. Section 02218 - Landscape Grading.

B. Section 02225 - Trenching.

C. Section 02620 - Water Distribution System.

D. Section 02623 - Sanitary Sewer Pipe.

E. Section 02675 - Disinfection of Water System.

1.4 QUALIFICATIONS AND EXPERIENCE

A. Contractor installing the horizontal directionally drilled utilities shall be commercially engaged and well experienced in installations using this technique. Contractor shall, within the past five (5) years, have successfully completed projects of a similar length, diameter, and conditions using horizontal directional drilling and installing the same type of pipe. Contractor shall submit satisfactory references on previous projects to the Engineer for acceptance with his Bid. Contractor's qualifications and experience will be considered by Engineer in evaluation of bids.

1.5 MEASUREMENT AND PAYMENT

A. Payment shall be made based on a lump sum as part of the entire project. The dimensions on the drawings indicate the minimum limits of the installation and the maximum pay limits for the horizontal directionally drilled utility. No additional payment will be made for additional length of utility beyond that shown in the Bid Form, unless prior written approval is granted by the Engineer.

1.6 SUBMITTAL DATA

A. Submit drawings and data under provisions of Section 01300.

B. Submit the following data on Contractor Qualifications:

1. A listing of similar past projects installed using horizontal directional drilling within the past five (5) years.

2. A list of references including contact person with telephone number for each reference project.

3. Background information on key personnel proposed for use on the project.

C. Submit Project Record Documents as required, including as-built location of all utilities.

PART 2 PRODUCTS

2.1 GENERAL

A. Contractor shall be responsible for providing equipment and materials of sufficient size and capabilities along with adequately experienced labor as required for a complete installation in accordance with the contract requirements.

2.2 MATERIALS

A. Horizontal Directional Drilling Equipment shall have adequate thrust, pullback, and torque capabilities to successfully complete the installation.

B. The equipment shall have a tracking and guidance system which will accurately locate the drilling head and pilot hole during drilling of the pilot hole.

C. Equipment shall be capable of measuring drill string axial and torsional loads, and of measuring drilling fluid discharge rate and pressure.

D. Drilling Fluid System shall be capable of mixing and delivering the drilling fluid to the drill head or the reamer in the volumes and pressures required. Contractor shall maximize recirculation of drilling fluid surface returns. Contractor shall provide solids control and fluid cleaning equipment of a configuration and capacity that can process surface returns and produce drilling fluid suitable for reuse.

E. Drilling Fluid shall be used as required during the installation of the pilot hole, ream of the pilot hole, and installation of the utility. The composition of all drilling proposed for use shall be submitted to Engineer for acceptance. No fluid will be or utilized that does not comply with permit requirements and environmental

F. Contractor shall be responsible for obtaining, transporting, and storing any water for drilling fluids.

G. Drill Pipe (drill stem) shall be of sufficient size and strength to resist all loadings including tensile, compressive, bending, and torsional loads. An safety factor shall be used by the Contractor in sizing the drill pipe.

H. Drill Head configuration shall be as selected by Contractor and compatible requirements for location system.

I. Reamer and Swivels shall be as selected by Contractor. Reamer and swivel assembly be capable of enlarging borehole while preventing damage due to rotation of the during its pullback into its final position. Pulling head, reamer, and swivel assembly be acceptable to the pipe manufacturer.

J. Water or sewer pipe shall be as specified in Sections 02620 - Water Distribution Sys Section 02623 - Sanitary Sewer Pipe and as supplemented herein.

PART 3 EXECUTION

3.1 INSTALLATION

A. Staging and Set-up

1. Contractor shall perform surveying for layout of installation. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations. If Contractor is using a magnetic guidance system, the drill path shall be surveyed for any surface geo-magnetic variations or anomalies.

2. Contractor shall be responsible for locating any and all underground facilities as required. Contractor shall be responsible for all losses and repairs occasioned by damage to underground facilities resulting from drilling operations. Contractor shall, as a minimum, undertake the following steps prior to commencing drilling operations:

a. Contact the utility location/notification service for the construction area.

b. Positively locate and stake all existing lines, cables, or other underground facilities including exposing any facilities which are located within ten (10) feet of the designed drilled path.

c. Modify drilling practices and downhole assemblies to prevent damage to existing facilities.

3. Prior to beginning the work, the Contractor shall prepare a bore plan for each segment drilled. The bore plan shall show finished grade, deflection and radiuses of the pilot bore, all existing utilities with minimum vertical and horizontal clearance. The proposed clearance shall exceed the guidance system accuracy tolerance by a minimum of 100%.

4. Contractor shall position and anchor drill unit as required. Proper setbacks shall be provided to allow for installation of the utility at the locations indicated on the drawings and to avoid excessive steep utility entry and exit angles for the pilot hole and the installed utility.

5. Make necessary provisions for operation of the tracking, locating, and instrumentation systems.

B. Boring of Pilot Hole

1. Install pilot hole using steerable drilling head. Pilot hole shall be drilled along the path shown on the drawings to the tolerances listed herein. However, in all cases, right-of-way restrictions shall take precedence over the listed tolerances. Regardless of the tolerance achieved, no pilot hole will be accepted if it will result in any or all of the pipeline being installed in violation of right-of-way restrictions. Additionally, concern for adjacent utilities and/or structures shall take precedence over the listed tolerances. Listing of tolerances shall not relieve Contractor from responsibility for safe operations or damage to adjacent utilities and structures.

2. Alignment of the utility shall be as shown on the drawings and within the listed tolerances. If curves are allowed by the Engineer, the joint deflections of the utility shall not exceed the recommendations of the pipe manufacturer.

3. Monitor location of drill head as required to install pilot hole to indicated lines and grades, but in no instance shall the interval between locating the drilling head exceed five (5) feet in length along the alignment.

4. Use drilling fluids as required to lubricate and support the pilot hole excavation.

5. Pilot hole shall be free from abrupt changes in line or grade that could result in unacceptably high loadings on the drill pipe or the utility during installation.

C. Prereaming of The Pilot Hole

1. Subsequent to construction of pilot hole, Contractor may, at his option, pre... pilot hole as necessary for installation of the utility.

2. Prereaming operations shall be conducted at the discretion of the Con... Contractor shall insure that a hole sufficient to accommodate the pull sec... utility has been produced. Any damage to the utility resulting from inad... prereaming shall be the responsibility of the Contractor. All provisions o... specification relating to simultaneous reaming and pulling back operations sha... pertain to prereaming operations.

3. Use drilling fluids as required to lubricate and support the reamed pilot hole.

4. Use of pre-reaming shall be at the option of the Contractor, however, lack of p... reaming shall not result in excessive installation loads on the utility.

D. Reaming and Pullback of the Utility

1. Contractor shall utilize a reamer to enlarge the pilot hole to sufficient size f... installation of the utility without imposing excessive installation loadings on th... utility.

2. Grippers used on the utility shall not damage adjacent sections of the pipe. Section... of the pipe utilized by the grippers shall be removed from the pipe after installation... of the pipe. Pulling head, reamer, and swivel assembly shall be acceptable to the... pipe manufacturer.

3. Contractor shall handle and support the pull section of utility so as to prevent damage... to the pipe and minimize pullback forces. Pull section of utility shall be supported... as it proceeds during pull back so that it moves freely and the pipe is not damaged.

4. Contractor shall use drilling fluids as required to lubricate and support the reamed... pilot hole, lubricate installation of the utility, and completely fill all overcut of the... reamed pilot hole.

5. The pull section of utility shall be installed in the reamed hole in such a manner that... external pressures are minimized and an appropriate counter-balancing internal... pressure is maintained. Any damage to the pipe resulting from external pressure... during installation shall be the responsibility of Contractor. If required, the utility... shall be filled with water prior to entering the ground to insure that adequate internal... pressure is maintained at all points to counter balance external collapse pressures... Contractor shall submit pipe filling procedure proposed for use to Engineer for... review and acceptance.

6. Contractor shall continuously monitor the pulling loads imposed upon the utility. The maximum allowable tensile load imposed on the utilities shall not exceed the recommendations of the pipe manufacturer. Contractor shall take all required measures necessary to prevent installation loads on the utility from exceeding those recommended by the pipe manufacturer. If necessary, Contractor shall at his own expense, stop the pullback of the utility, remove the section of pipe installed within the enlarged pilot hole, and pre-ream the pilot hole as required to allow installation of the utility without exceeding the allowable pullback forces.

7. After the utility has been installed Contractor shall determine and note the installed location and depth of the utility on his as-built drawing set. Contractor shall submit a set of drawings indicating the as-built location and depth of all utility to the Engineer.

3.2 FIELD TESTING REQUIREMENTS

A. Water Mains

1. Water mains and services shall be flushed, tested, and disinfected in accordance with Section 02620-Water Distribution System and Section 02675 - Disinfection of Water Distribution System.

B. Sewers

1. Sewer lines shall be tested in accordance with Section 02623 - Sanitary Sewer Pipe.

3.3 REJECTION

A. The installed utility may be rejected by Engineer for the following causes:

1. The utility pipe is unable to successfully pass specified tests.

2. Monitoring records indicate that pullback loads exerted on pipe exceeded the design loadings recommended by pipe manufacturer.

3. Utility pipe is installed outside of the allowable tolerances.

4. If the utility is rejected by Engineer, Contractor shall, at his own expense, remove the rejected utility and install an acceptable utility.

3.4 TOLERANCES

A. Tolerances for the pilot hole and the installed utility shall be as listed below.

B. Vertical tolerance. The utility shall be installed at the locations indicated on the drawings. Deviations from the general grades indicated on the drawings may be allowed, provided that:

1. The soil cover above the top of the utility shall be not less than five feet at all locations.

2. For sanitary sewer, the pipe shall maintain downward slope towards the outlet to provide positive drainage of the pipe with a minimum slope of 0.5%.

3. For water mains, the pipe shall maintain downward slope towards blowoffs or upward slope toward venting points.

C. Horizontal tolerance. The utility shall be installed at the locations indicated on the plans. Minor deviations from the locations indicated on the plans may be allowed, provided that:

1. The horizontal deviation of the utility from the location required on the drawings shall not exceed five feet at any location along the utility without the prior authorization of the Engineer.

2. The horizontal deviation shall not cause the utility to interfere with existing structures, utilities, or result in any part of the finished work being installed in conflict with existing facilities.

D. Contractor shall, at his own expense, compensate for installation tolerances of the utility by adjusting the installation of the utility approaches to accommodate connections to other utilities at each end of the horizontal directionally drilled utilities.

3.5 CLEAN UP AND DISPOSAL OF MATERIALS

A. Contractor shall remove all construction debris and spoil material and dispose of it at an acceptable location.

B. Drilling fluid shall be removed from pits and then the pits backfilled as required.

C. Disposal of excess drilling fluids shall be the responsibility of the Contractor and shall be conducted in compliance with all environmental regulations, right-of-way and workspace agreements, and permit requirements. Disposal of drilling fluids shall not be allowed on the project site. Drilling fluid disposal procedures proposed for use shall be submitted to Engineer for acceptance. No procedure may be used which has not been accepted by Engineer.

D. Contractor shall employ his best efforts to maintain full annular circulation of drilling fluids. Drilling fluid returns at location other than the entry and exit points shall be minimized. In the event that annular circulation is lost, Contractor shall take steps to restore circulation. If inadvertent surface returns of drilling fluids occur, they shall be immediately contained with hand placed barriers (i.e., hay bales, sand bags, silt fences, etc.) as required and collected using pumps as practical. If the amount of the surface return is not great enough to allow practical collection, the affected area shall be diluted with fresh water and the fluid will be allowed to dry and dissipate naturally. If the amount of the surface return exceeds that which can be contained with hand placed barriers, small collection sumps (less than five (5) cubic yards) may be used. If the amount of the surface return exceeds that which can be contained and collected using small sumps, drilling operations shall be suspended until surface return volumes can be brought under control.

3.6 SUBMITTAL DATA

A. Contractor shall prepare and submit information as required.

END OF SECTION

SECTION 02540

SEPTIC TANK SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This Section includes sewage disposal systems consisting of the following:

1. Septic tanks.
2. Splitter boxes.
3. Cleanouts.
4. Leaching piping and chambers.
5. Absorption fill materials.

1.2 RELATED WORK

A. Section 02225 - Trenching.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. Absorption Field: Subsurface or mound wastewater disposal process.

C. Absorption Trench: System of single leaching pipes or leaching chambers and filtering materials installed in trenches for wastewater disposal.

D. Distribution Piping: See Sections 02620 and 02623.

E. HDPE: High-density polyethylene.

F. Leaching Chambers: Perforated plastic structures installed horizontally in absorption field.

G. Seepage Trench: System of multiple, parallel leaching pipes or leaching chambers and filtering materials installed in bed for wastewater disposal.

H. PE: Polyethylene.

I. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Septic tanks.
2. Splitter boxes.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE SEPTIC TANKS

A. Description: Single-chamber, precast, reinforced-concrete tank and covers; designed for structural loading according to ASTM C 890 and made according to ASTM C 1227.

1. Coating: Coal-tar epoxy coating, 15-mil (0.38-mm) minimum thickness covering internal areas above the water line and extending at least 4 inches (100 mm) below that point.
2. Tank Insulation: Rigid, extruded, cellular-polystyrene thermal insulation complying with ASTM C 578, Type VII.

a. Thickness: 4 inches.
b. Recycled Content: Not less than 50 percent blend of postconsumer and recovered polystyrene resins.

B. Manhole: 24 inches (600 mm) in diameter, reinforced-concrete access lid with steel lift rings. Include manhole in center of each septic tank compartment top. Include coal-tar epoxy coating, 15-mil (0.38-mm) minimum thickness over entire surface of access lid.

C. Inlet and Outlet Access: 12 inches (300 mm) in diameter, reinforced-concrete access lids with steel lift rings. Include access centered over inlet and outlet.

2.2 SPLITTER BOXES

A. Description: Precast, reinforced-concrete distribution box and cover; designed for structural loading according to ASTM C 890 and made according to ASTM C 913. Include baffle, manhole, and inlet and outlet pipe connections.

1. Coating: Coal-tar epoxy coating, 15-mil (0.38-mm) minimum thickness covering internal areas above the water line and extending at least 4 inches (100 mm) below that point.
2. Resilient Connectors: ASTM C 923 (ASTM C 923M), of size required for piping, fitted into inlet and outlet openings.
3. Manhole: 24 inches (600 mm) in diameter, reinforced-concrete access lid with steel lift rings. Include manhole in center of distribution box top. Include coal-tar epoxy coating, 15-mil (0.38-mm) minimum thickness over entire surface of access lid.

B. Description: Single-chamber, molded, PE construction; fabricated for distribution box application, with baffle, manhole, and inlet and outlet pipe connections.

1. Manhole: 20 inches (500 mm) in diameter, minimum; PE riser section with PE cover.

2.3 CLEANOUTS

A. Vehicular-Traffic-Area Cleanouts: ASME A112.36.2M; with round, flanged, cast-iron housing and secured, scoriated, medium-duty loading class, cast-iron cover. Include cast-iron ferrule and countersunk brass cleanout plug.

B. Non-Vehicular-Traffic-Area Cleanouts: PVC pipe and fittings, ASTM D 3034, SDR 35, nonperforated, for solvent-cement or elastomeric gasket joints. Include PVC threaded cleanout plug.

2.4 LEACHING CHAMBERS

A. Description: Molded arched structures of PE, easily interlocked, with solid top, perforated sides, and open bottom. For each row, include solid end piece and solid end piece with pipe opening.

2.5 ABSORPTION TRENCH FILL MATERIALS

A. Filtering Material: ASTM D 448, Size No. 24, 3/4 to 2-1/2 inches (19 to 63 mm), washed crushed stone or gravel; or broken, hard-burned clay brick.

B. Filter Mat: Geotextile woven or spun filter fabric, in 1 or more layers, for minimum total unit weight of 8 oz./sq. yd.

C. Backfill: Use soil removed from trench.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey the area for septic tank system installation. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning and avoid disruption of and damage to services.

B. Examine soil structure, materials, and conditions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean exposed surfaces of tanks and other structures and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

3.3 EARTHWORK

A. Excavating, trenching, and backfilling for distribution pipe and fittings are specified in Division 2.

1. Stockpile topsoil for reuse in finish grading without intermixing with other excavated material. Stockpile materials away from edge of excavation and do not store within drip line of remaining trees.

2. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Excavating and Backfilling for Septic and Dosing Tanks: As follows:

1. Excavate sufficient width and length for tanks to a depth determined by tank inlet elevation. Provide level bottom.

2. Backfill with excavated soil, mounding soil above original grade without compacting.

C. Excavating and Backfilling for Trench: As follows:

1. Backfill absorption trenches immediately with excavated soil, mounding soil above original grade without compacting.

3.4 IDENTIFICATION

A. Tracer wire is specified in Section 02620.

B. Use tracer wire over PVC piping, over edges of underground structures, and over edges of absorption fields.

3.5 SEPTIC TANK INSTALLATION

A. Install precast concrete septic tanks level according to ASTM C 891.

B. Fill septic tank with water.

C. Install polystyrene insulation on top of septic tank.

3.6 SPLITTER BOX INSTALLATION

A. Install reinforced-concrete distribution boxes at invert elevations indicated according to ASTM C 891 and manufacturer's written instructions. Set level and plumb.

3.7 PIPING APPLICATIONS

A. Use pipes, fittings, and joining methods, for all piping sizes, according to the following applications:

1. Install solid piping to connect splitter box and leaching chamber.

3.8 PIPE JOINT CONSTRUCTION AND PIPING INSTALLATION

A. Install piping in accordance with Specification Section 02623.

3.9 ABSORPTION FIELD INSTALLATION

A. Filtering Material: Place a supporting layer of filtering material over the compacted trench base to a compacted depth not less than 6 inches (150 mm) below bottom of leaching chamber.

B. Install leaching chambers with no slope.

C. Place filtering material to a compacted depth of not less than 12 inches to the top of the leaching chamber.

D. Install filter mat over filter material before backfilling.

E. Backfill to existing grade in accordance with Section 02223. Mound top for proper drainage.

3.10 CONNECTIONS

A. Connect sanitary sewerage piping to septic tank.

B. Connect piping between septic tank system structures and leach fields.

3.11 FIELD QUALITY CONTROL

A. System Tests: Perform testing of completed septic tank system piping and structures according to authorities having jurisdiction.

B. Additional Tests: Fill underground structures with water and let stand overnight. If water level recedes, locate and repair leaks and retest. Repeat tests and repairs until there is no leakage.

3.12 CLEANING

A. Clear interior of piping and structures of dirt and other superfluous material as work progresses.

B. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of workday or when work stops.

END OF SECTION

SECTION 02620

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

A. Constructing water system line.

B. Pipe and fittings.

C. Thrust restraints.

D. Trenching, installation of system and connection to existing water lines; testing, and backfilling.

E. Boring.

1.2 RELATED WORK

A. Section 02218: Landscape Grading

B. Section 02225: Trenching

C. Section 02228: Horizontal Directionally Drilled Utilities.

1.3 REFERENCES

A. ASTM B88 Standard Specification for Seamless Copper Water Tube.

B. AWWA C104 Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water.

C. AWWA C110 Gray-Iron and Ductile-Iron Fittings, 3 inches through 48 inches for Water and Other Liquids.

D. AWWA C150 Thickness Design of Ductile Iron Pipe.

E. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds for Water or Other Liquids.

F. AWWA C600 Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances.

G. AWWA C800 Thread for Underground Service Line Fittings with Appendix on Co
Standards for Service Line Materials.

H. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches for wa

1.4 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data for all proposed materials.

B. Submit manufacturer's installation instructions.

1.5 REGULATIONS

A. Comply with all applicable Health Department and Plumbing Code requirements.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. PVC Water Main: PVC pipe shall be PVC 1120 Dr 18, Class 150 with O.D. conforming t
that of cast iron pipe. Pipe shall conform with AWWA Specification C-900-89 or latest
edition, rubber compression ring joints conforming to ASTM F477. Pipe shall be J-M "Blue
Brute," or approved equal. Provide tracer wire above water main.

B. Restrained Joint PVC Water Main: Certa-Lok C900/RF restrained joint PVC pipe as
manufactured by CertainTeed shall be used where pipe is installed by Horizontal Directional
Drilling. Pull tracer wire in with water main.

C. Copper Water Service Pipe: Water service pipe shall be type "K" seamless soft-drawn
copper tubing which conforms to the requirements of ASTM B898. Fittings: ASME
B16.26, cast bronze fittings; flared-end joints.

D. Service Saddles: All taps greater than 1 inch size shall be installed with a pipe saddle.
Saddles shall have an "o" ring seal between pipe and saddle and shall be Ford Style S90, or
equal.

E. Curb Stops: As required for service size and material, including any necessary reducers.
Brass, minimum size 1 inch, Ford B22-444, or equal.

F. Curb Boxes: Ford EM2-55-46-48R, Minneapolis Pattern, length 5.5 feet, with plug style lid,
1 ½" tapped base, 1" upper section, and stationary rod, or equal. Provide equivalent product
with 2" base thread for 2" curb stops.

G. Corporation Stop: Ford FB400-4 (1") or FB400-7 (2"), or equal.

H. Gate Valves: Refer to Specification Section 15100 - Valves.

I. Granular Bedding Materials: Refer to Specification Section 02225 - Trenching.

J. Tracer Wire: Tracer wire shall be 12 gauge THHN copper wire. Terminate tracer wire at valves by bringing the wire up the outside of the valve box, drilling a hole in the valve box below the concrete pad, and pulling the wire into the valve box. Terminate with 24 inches of wire coiled inside valve box.

K. Service Pipe Connectors: Fabricated from Red Brass. All copper supply and service pipe shall be joined by flared-end connectors.

2.2 FITTINGS

A. Fittings for Water Main: Ductile or cast iron compact fittings conforming to AWWA C153/A21.53. Liner shall conform to AWWA C104/A21.4.

B. Mechanical Joints: ANSI/AWWA C111/A21.11, except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable.

C. Retainer Glands: Retainer glands using wedge action principle to impart restraint of pipe shall be EBAA Iron Sales "Megalug", suitable for PVC applications or approved equal.

D. Provide polyethylene encasement for fittings. Polyethylene Encasement: Class C, black pigmented, eight (8) mil thick, conforming to the requirements of ANSI A21.5. The encasement may be supplied in flat sheets or tubes at the Contractor's option. The tubes, measured when laid flat, and the flat sheets shall conform to the following dimensions:

Nominal Fitting Diameter inches	Tube and Sheet Sizes Polyethylene Encasement Width inches	
	Tube	Sheet
4	16	32
6	20	40
8	24	48
10	27	54
12	30	60

E. Provide transition gaskets and adapters as needed for connecting plastic pipe to pipe fittings of different material.

2.3 THRUST BLOCKS

A. Construct poured in place concrete thrust blocks for all fittings where change of alignm occurs per applicable portions of Section 03001 Concrete, and in accordance with the of Lincoln Standard Plans.

2.4 MECHANICAL JOINTS WITH TIE RODS

A. Ties Rods: ASTM A307.

B. Steel Pipe: ASTM A53, standard weight.

C. Washers: ANSI B18.22.1, plain steel.

2.5 MECHANICAL COUPLINGS

A. Couplings: Dresser Style 38, Smith Blair 441 or 411 Flexible Coupling, or equal; with pipe stop.

B. Gaskets: Oil resistant synthetic rubber.

PART 3 EXECUTION

3.1 PREPARATION

A. Review layout requirements with other affected work. Coordinate locations of fittings to accommodate system.

B. Protect landscaping and other features remaining as final work.

C. Coordinate and schedule work with Owner and notify property owners at least 48 hours before commencing work.

3.2 TRENCHING

A. Trench for water system piping per Section 02225 - Trenching.

B. Keep trenches free of debris, material, or obstructions that may damage pipe.

C. Backfill per Section 02225 - Trenching.

3.3 BORING

A. Where shown on the plans, the excavation shall be made by means of bore holes. The bore holes shall generally be made using mechanical augers of either the wet or dry type. Any annular space between the carrier pipe and the bore hole in excess of ½ inch shall be filled with pressure grout or other suitable material as directed by the Engineer.

3.4 INSTALLATION

A. Install pipe and fittings in accordance with manufacturer's instructions and AWWA C600.

B. Install corporation stops into upper half of main.

C. Install new curb stop and box at the location shown on the drawings or as directed by the Engineer.

3.5 HANDLING

A. Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition. Equipment, tools, and methods used in handling pipe and fittings in which cement lining has been damaged shall be replaced. Small and readily accessible damaged areas may be repaired.

3.6 INSPECTION

A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site of the work.

3.7 LAYING WATER MAIN

A. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated in Table 5 of AWWA C600, unless specially designed bells and spigots are provided.

B. All water mains shall be placed at a depth sufficient to provide 5 feet of cover over the top of the pipe, unless specifically stated otherwise in the drawings.

C. If water mains are installed by horizontal directional drilling, Contractor shall attempt to install water mains between a 5 and 8 foot depth. However, greater depths will be allowed as shown on the drawings or required to prevent high spots in the water main.

D. Pipe shall be protected from lateral displacement by placing the specified pipe embedment material. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

E. Pipe shall be laid with the bell ends facing the direction of laying except when reverse laying is specifically authorized by the Engineer.

F. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer, either above or below the sewer. At crossings, one full length of water pipe shall be located such that both joints will be as far from the sewer as possible.

G. Either shorter pipe sections or fittings shall be installed where the alignment or grade requires them.

3.8 CUTTING PIPE

A. Cuttings shall be done in a neat manner, without damage to the pipe. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting the end of the pipe, it shall be dressed with a file to remove all roughness and sharp corners.

3.9 CLEANING

A. The interior of all pipe and fittings shall be thoroughly cleaned of foreign material before being installed and shall be kept clean until the work has been accepted. Before jointing, all joint contact surfaces shall be wiped clean and kept clean until jointing is completed.

B. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other materials shall not be placed in or allowed to enter the pipe.

C. Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug which will prevent trench water from entering the pipe.

3.10 FIELD JOINTS

A. Joints in buried locations shall be push-on type unless otherwise indicated on the drawings.

3.11 PUSH-ON-JOINTS

A. All instructions and recommendations of the pipe manufacturer, relative to gasket installation and other jointing operations, shall be followed by the Contractor. All joints surfaces shall be lubricated with heavy vegetable soap suitable for use in potable water, shall be stored in closed containers, and shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

3.12 THRUST ANCHORAGE AND BLOCKING

A. All bends deflecting 11 1/4 degrees or more which are installed in buried piping shall be provided suitable thrust blocking, anchors, joint harness, or other acceptable means for preventing movement of the pipe caused by internal pressure.

B. Concrete blocking shall extend from the fitting to solid undisturbed earth and shall be installed so that all joints are accessible for repair. The bearing area of concrete reaction blocking shall be as shown on the drawings or as directed by the Engineer. If adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of steel rods across the joint and securely anchored to pipe and fitting or other adequate anchorage facilities shall be installed to provide the necessary support. Should the lack of solid vertical excavation face be due to improper trench excavation, the entire cost of furnishing and installing metal harness anchorages in excess of the contract value of the concrete blocking replaced by such anchorages shall be borne by the Contractor.

3.13 LEAKAGE

A. All joints shall be watertight and free from leaks. Each leak which is discovered within one (1) year after final acceptance of the work by the Owner shall be repaired by and at the expense of the Contractor.

3.14 PRESSURE TESTING

A. Fill line and flush as needed to remove all trapped air.

B. Hydrostatically test all portions of the new water line for leakage in accordance with AWWA C600, Section 4.

C. Pressure test all portions of the line at 120 psi measured at the lowest point for 2 hours minimum.

D. Repair any leaks and retest.

E. Contractor shall be responsible for performing all required tests.

3.15 ADJUSTMENT

A. Check and adjust curb stops and accessories for smooth operation.

3.16 WATER FOR TESTING AND DISINFECTION

A. The Owner will furnish water for purposes of testing and disinfection.

B. The Contractor shall disinfect the water distribution system in accordance with Section 02675.

END OF SECTION

SECTION 02623

SANITARY SEWER PIPE

PART 1 GENERAL

1.1 WORK INCLUDED

A. Sewer Pipe.

B. Fittings and jointing materials.

1.2 RELATED WORK

A. Section 02219 - Structure Excavation.

B. Section 02223 - Backfilling.

C. Section 02225 - Trenching.

D. Section 02228 - Horizontal Directionally Drilled Utilities.

1.3 REFERENCES

A. ASTM C301 - Standard Test Methods for Vitrified Clay Pipe.

B. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.

C. ASTM C700 - Standard Specifications for Vitrified Clay Pipe, extra strength.

D. ASTM C828 - Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe.

E. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

F. ASTM D1784 - Specification for Rigid Poly (Vinyl Chloride) PVC Compounds.

G. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel - Plate Loading.

H. ASTM D3034 - Standard Specification for Type PSM PVC Sewer Pipe and Fittings.

I. ASTM D3212 - Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

J. ASTM F477 - Standard Specification for Elastomeric Seals for Joining Plastic Pipe.

K. Uni-Bell B-6 - Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Submit product data as required.

B. Include data on pipe materials, pipe fittings, gasket material, and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site as required.

B. Store and protect products as required.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE (PVC) - OPEN CUT APPLICATIONS

A. Pipe.

1. ASTM D3034, SDR 35.

2. Pipe shall be made of PVC plastic having a minimum cell classification of 12454B or 12454C as defined in ASTM D1784.

3. The pipe shall be uniform in color, opacity, density and other physical properties. Pipe and fittings shall be marked in accordance with the relevant ASTM standard, i.e, D3034 or F679, including a date or date code.

B. Joints.

1. ASTM D3212, stab type with elastomeric gaskets. Gaskets shall be in compliance with ASTM F477 and shall be suitable for sewage service. Solvent weld joints and couplings will not be permitted. Natural rubber gaskets will not be acceptable.

C. Fittings.

1. PVC plastic fittings, cell classification 12454B or 12454C as defined in ASTM D1784.

2. Fittings and wyes/tees for service connections shall be integrally molded PVC or factory fabricated from pipe meeting the respective ASTM specifications. The wall thickness of the waterway and bell of molded fittings shall be no less than the respective minimum thicknesses for the adjoining pipe. Saddles shall not be permitted on new installations.

3. All fittings shall be compatible with the pipe to which they are attached and shall be provided by the pipe supplier who will be responsible for their suitability.

D. Plain End Couplings and Adaptors for Connection to Other Pipe Materials.

1. Can-Tex "C-5 Adaptors;" Fernco "PVC Donuts" or "Flexible Couplings;" Nashua Pre-Cast Corporation "Flex-O-Joint;" or equal.

2.2 POLYVINYL CHLORIDE PIPE (PVC) - TRENCHLESS APPLICATIONS

A. Restrained Joint PC Pressure Piping System

1. Certa-Lok Yellomine restrained joint PVC pipe as manufactured by CertainTeed shall be used where pipe is installed by Horizontal Directional Driller or installed in steel casing. Provide "Permanent-Use" Certa-Lok Joint.

2.3 CLEANOUTS

A. Cleanouts are specified in Section 02540 - Septic Tank Sections.

2.4 CONNECTIONS TO MANHOLES

A. Precast manhole bottoms with resilient manhole/pipe connectors	A-Lock "Manhole Pipe Seal," Dura-Tech "Dura-Seal," or Press-Seal Gasket Corp "PSX: Positive Seal" with double stainless steel compression bands
B. Precast manholes with boxouts for grouted/concrete, manhole/pipe connections	Rubber ring water stop with stainless steel compression bands

2.5 QUALITY CONTROL TESTS AND CERTIFICATION

A. PVC Pipe.

1. PVC pipe shall be tested in accordance with ASTM D3034 (latest revision) for pipe 4 inch through 15 inch and ASTM F679 (latest revision) for pipe 18 inch through 27 inch. Written certification by the manufacturer indicating compliance with the requirements of the relevant ASTM specification shall be submitted to the Engineer for approval prior to delivery of the pipe. The certification shall include the test result data.

2. When the pipe is delivered, the Engineer may select pipe specimens at random at the point of delivery, or at the job site, to ensure conformance with the requirements of pipe flattening, impact resistance, pipe stiffness and extrusion quality. Tests on these specimens shall be performed at a certified testing facility approved by the Engineer.

3. When testing is required by the Engineer, one test pipe shall be selected at random by the Engineer from each 1,200 feet, or fraction thereof, for each size of pipe delivered to the work site. The length of specimen for each selected pipe shall be a minimum of 8 feet.

4. Pipe shall meet the following requirements for straightness. The maximum allowable ordinate as measured from the concave side of the pipe shall not exceed one-sixteenth (1/16) inch per foot of length, but in no event shall the deviation from straight be more than one-half (½) inch for any joint of pipe.

5. All quality and certification tests shall be at the Contractor's expense and shall be included in the price bid per foot of pipe installed.

PART 3 EXECUTION

3.1 HANDLING AND STORAGE

A. Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings.

B. Hooks inserted in ends of pipe shall have broad, well padded contact surfaces.

C. Pipe stored on the job site shall be covered with canvas or other opaque material to protect it from the sun's rays. Air circulation shall be provided under the covering.

D. Ultraviolet radiation degradation evidenced by a light yellow (or brown) discoloration of the pipe shall be cause for rejection and removal of the pipe. Pipe which is not installed within 120 days of the latest factory compliance test shall not be used without the written approval of the Engineer. Pipe older than two years from date of manufacture shall not be used.

3.2 CUTTING PIPE

A. Cutting shall be done in a neat manner, without damage to the pipe.

B. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.

3.3 CLEANING

A. The interior of all pipe and fittings shall be thoroughly cleaned of foreign matter before being installed and shall be kept clean until the work has been accepted.

B. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean, and kept clean until jointing is completed.

C. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other materials shall not be placed in or allowed to enter the pipe.

D. Whenever pipe laying is stopped, the open end of the pipe shall be sealed with a watertight plug which will prevent trench water from entering the pipe.

3.4 INSPECTION

A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; spigot ends shall be examined with particular care.

B. All defective pipe and fittings shall be removed from site of the work.

3.5 ALIGNMENT

A. Pipelines or runs intended to be straight shall be laid straight and at uniform grade between changes in grade.

B. Straight section of piping between manholes shall be lamped by the Engineer with assistance from the Contractor.

3.6 LAYING PIPE

A. Pipe shall be protected from lateral displacement by placing the specified pipe embedment material.

B. Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

C. Pipe shall be laid with the bell ends facing the direction of laying except when reverse laying is specifically authorized by the Engineer.

D. The Contractor shall erect substantial batter boards at intervals of not more than 50 feet. Batter boards shall be used to determine and check pipe subgrades. Not less than three (3) batter boards shall be maintained in proper position at all times when trench grading is in progress.

E. Other methods of maintaining alignment and grade, such as use of laser beam equipment or surveying instruments, will be considered, provided complete information describing the proposed method is submitted to the Engineer for review before pipe laying is started. Laser beam equipment, if allowed for use, shall project the laser beam through the previously installed portions of the sewer and onto a removable alignment target placed inside of the joint of pipe being installed. Laser beam equipment relying upon a laser broadcast station and pole-mounted prisms or targets shall not be allowed.

F. All instructions and recommendations of the joint manufacturer shall be followed. Immediately before joints are pushed together, all joint surfaces shall be lubricated with the lubricant furnished by the joint manufacturer.

G. When material is encountered which will not, in the Engineer's opinion, provide a suitable bed for construction of the sewer; granular foundations and bedding shall be installed at the Engineer's direction.

H. Granular bedding and foundation, which is necessary due to improper trench preparation and maintenance or neglect in handling ground water, shall be installed at the Contractor's expense.

I. Piping cast into a concrete manhole base shall be provided with manufacturer's recommended water stop collar or other suitable means of providing a watertight, structurally sound connection as recommended by the pipe manufacturer and approved by the Engineer.

3.7 CONNECTING WITH EXISTING PIPING

A. Connections between new and existing piping shall be made with fittings suitable for the conditions encountered.

3.8 WATER MAIN CONFLICT

A. Sewer lines crossing water mains shall be laid to the grades indicated on the drawings. At crossings, one full length of sewer pipe shall be located so both joints will be as far from the water main as possible. Special structural support for the water and sewer pipes may be required.

B. Further, the sanitary sewer shall be encased in a concrete envelope a minimum of 10'-0" either side of the centerline of the water main. The concrete envelope shall provide a minimum of 8" of concrete cover around the sewer. In lieu of the concrete envelope, the sewer line may be reconstructed of ductile iron pipe such that a 20 foot length of ductile iron sewer is centered over the water main.

C. Where a 10 foot separation between a sewer manhole and the water main cannot be maintained, the water main shall be cut as required so that a 20 foot length of pipe may be centered at the nearest point to the manhole.

3.9 SEWER ACCEPTANCE TESTS

A. Each reach of sewer shall meet the applicable requirements of the following acceptance tests. The acceptance testing requirements described herein represent the minimum testing required. In instances where local codes or standards exceed the specified requirements, those codes or standards shall govern over these requirements. All defects shall be repaired to the satisfaction of the Engineer.

B. The Contractor shall provide, at his own expense, all labor, equipment, and materials required for the tests including all pipe, fittings, and valves needed for testing as well as between the reach to be tested and the source of water supply, water, temporary plugs or bulkheads, all necessary test equipment, temporary restraining or bracing as required, and other required work. The schedule of testing shall be submitted to the Engineer prior to starting the tests. The methods used and the time of conducting tests shall be acceptable to the Engineer.

C. Lamping. Unless otherwise indicated on the drawings, each section of sewer line between manholes shall be straight and uniformly graded. Each section will be lamped by the Engineer. The Contractor shall furnish suitable assistants to assist the Engineer.

D. Leakage Integrity. The leakage integrity for each reach of sewer between manholes shall be tested using either exfiltration or low pressure air testing prior to making any service connections into the new sewer. Leaks shall be located by testing short sections of pipe. Leaks shall be repaired and the reach of sewer retested at the Contractor's expense.

E. Exfiltration Testing. Exfiltration tests shall be conducted by blocking off all manhole openings except those connecting with the reach being tested, filling the line with water, and measuring the water required to maintain a constant level in the manholes. During the exfiltration test, the water depth above the pipe invert at the lower end shall be at least to the elevation of the ground surface, unless otherwise specified. The maximum depth of the water at the lower end shall not exceed 25 feet, and the minimum depth of the water at the upper end shall be at least 5 feet above the crown of the pipe or 5 feet above groundwater elevation, whichever is higher. The total exfiltration shall not exceed 200 gallons per inch of nominal diameter per mile of pipe per day for each reach tested. For purposes of determining maximum allowable leakage, nominal diameter and depth of manholes shall be included. The exfiltration tests shall be maintained on each reach for at least 2 hours and as much longer as necessary, in the opinion of the Engineer, to locate all leaks.

F. Low Pressure Air Testing. Low pressure air testing may be used in lieu of exfiltration testing for sewer pipe. The test shall be conducted for all piping installed, except manhole drop pipes. Air testing shall not be used for manholes or pipe larger than 24 inches in diameter. Low pressure air testing shall comply with ASTM C828 for vitrified clay, Uni-Bell B6 for PVC pipe, and ASTM C924 for concrete pipe. If the length of sewer to be tested is fully or partially submerged in groundwater, the test pressure shall be increased as required to overcome the actual static pressure exerted by the groundwater. If a test pressure greater than 8 psi results, air testing shall not be used, and exfiltration testing will be required. The time elapsed for a 1 psi drop in air pressure shall be not less than, nor shall the air loss exceed, the limits set forth in the governing standard. Unless otherwise required by the governing standard, air leakage shall not exceed 0.003 cfm per square foot of internal pipe wall at an average pressure of 3 psi. The time elapsed for a one psi drop in air pressure shall not be less than:

t = 0.472d; where: t = time in minutes
d = pipe diameter in inches

G. Infiltration. If, at any time prior to expiration of the correction period stipulated in the General Conditions, infiltration exceeds 200 gallons per inch of nominal diameter per mile of sewer per day, the Contractor shall locate the leaks and make repairs as necessary to control the infiltration. The sewer shall be free of visible leaks regardless of their infiltration rate. All visible leaks shall be repaired. Repaired pipe shall be retested.

H. Deflection. Prior to acceptance of the work but no earlier than 30 days after completing the backfilling of the sewer, each reach of PVC and other flexible types of sewer pipe shall be checked for excessive deflection by pulling a mandrel through the pipe, or by other methods acceptable to the Engineer. Pipe with diametrical deflection exceeding 5 percent of the inside diameter shall be uncovered, and the bedding and backfill replaced to prevent excessive deflection. Damaged pipe shall be repaired or replaced to the satisfaction of the Engineer and so to allow the pipe to pass the deflection test. Repaired or replaced sections of the pipe shall be retested.

3.10 CLEANING.

A. The interior of all pipes and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. After completion of the pipe testing program, the line shall be cleaned to the satisfaction of the Engineer by use of sewer cleaning equipment, flushing, or other acceptable methods.

END OF SECTION

SECTION 02631

SANITARY SEWER MANHOLES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Construction of new manholes.

1.2 RELATED WORK

A. Section 02219 - Structure Excavation.

B. Section 02540 - Septic Tank Systems.

C. Section 02623 - Sanitary Sewer Pipe.

D. Section 07160 - Bituminous Dampproofing.

1.3 SUBMITTALS

A. Submit as required.

B. Shop Drawings: Indicate manhole locations, elevations, and pipe sizes and elevations of penetrations.

C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete: Materials, handling, forms, finishing, curing, and other work as specified in concrete section.

B. Precast Sections: Circular precast concrete base and riser sections with eccentric cone top sections; ASTM C478

1. Minimum Thickness: As indicated on the drawings.

2. Reinforcement: ASTM C478.

3. Openings: Circular or horseshoe shaped boxout for each connecting pipe, with surfaces grooved or roughened to improve mortar bond.

C. Portland Cement: ASTM C150.

D. Hydrated Lime: ASTM C207, Type S.

E. Mortar: One part Portland Cement, 1/2 part hydrated lime, 3 parts sand.

F. Gaskets:

1. Mastic: Federal Specifications SS-S-210; K.T. Snyder "Ram-Nek".

2. Rubber: Neoprene or other synthetic, 40 plus or minus 5 hardness when measured by ASTM D2240, Type A durometer.

G. Coal Tar Paint: Koppers "Bitumastic Super-Service Black," Tnemec "450 Heavy Tenemicol," Porter "Tarmastic 103," or Sonneborn, "Hydrocide 700."

H. Castings: Manhole covers and frames shall be iron castings which shall meet all the requirements of "Specifications for Gray Iron Castings," ASTM A-48, Class 35B and the City of Lincoln Standards as shown on plan no. LSP-162 for Standard Heavy Traffic Type Manhole Cover and Frame for Sanitary Sewer Manholes. All frames and covers shall be machined and fitted so as to prevent any rocking in the frame when installed. No casting will be accepting that is warped, cracked, that has swells, or that has been plugged or filled.

I. Manhole Steps: Manhole steps covers and frames shall be drill-in type, copolymer polypropylene plastic with 1/2" grade 60 steel reinforcement and shall meet all the requirements of the City of Lincoln Standards as shown on plan no. LSP-162 for Reinforced Plastic Steps.

J. Sand: Concrete sand (fine aggregate) sieved through 8 mesh screen.

K. Shrinkage-Correcting Aggregate: Master Builders "Embeco," Sike "Kemox," or Sonneborn "Ferrolith G-DS."

L. Nonshrinking Mortar: Premixed or job mixed; job mixed shall be one part shrinkage-correcting aggregate, one part Portland Cement, one part sand.

M. Resilient Manhole/Pipe Connectors: A-Lock "Manhole Pipe Seal," Dura-Tech "Dura-Seal," or Press-Seal Gasket Corp "PSX: Positive Seal."

N. Bituminous Dampproof: As specified in Section 07160.

2.2 MANUFACTURE

A. The first riser section for use with cast-in-place bases shall be provided with openings for connecting piping to be grouted in, with circular openings with continuous, circular, resilient connectors cast into the riser wall, or with smooth circular openings for installation of the resilient sealing boots. Boxouts for grouting shall have surfaces grooved or roughened to improve grout bond.

B. Where boxouts are used for the manhole/pipe connection, a rubber ring water stop shall be installed on the sewer pipe in the center of the concrete/grout to prevent water passage along the outside of the sewer pipe through the concrete/grout connection. Rubber ring water stops shall have stainless steel compression bands.

2.3 DELIVERY AND HANDLING

A. Precast concrete sections shall not be delivered to the job until representative concrete control cylinders have attained a strength of at least 80 percent of the specified minimum.

B. Precast concrete sections shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come into contact with joint surfaces.

2.4 INSPECTION

A. Precast concrete sections and concrete blocks shall be inspected when delivered and all cracks or otherwise visibly defective units rejected.

PART 3 EXECUTION

3.1 CONSTRUCTION

A. Manholes shall be furnished and constructed as shown on the drawings.

B. All mortar shall be used within 40 minutes after mixing. Mortar which has begun to take on initial set shall be discarded and shall not be mixed with additional cement or new mortar.

C. In no case shall an invert section through a manhole be greater than that of the outgoing pipe. The shape of the invert shall conform exactly to the lower half of the pipe it connects. Side branches shall be connected with as large a radius of curvature as practicable. All inverts shall be troweled to a smooth clean surface.

D. Circular precast sections shall be provided with a rubber or mastic gasket to seal joints between sections. The space between joints of precast connecting wall sections shall be neatly "pointed up" with nonshrinking mortar after manhole installation. All mortar between manhole section joints shall be troweled to a smooth clean surface.

E. Precast sections may be provided with lifting notches on the inside faces of walls to facilitate handling. Lifting notches shall be not more than three (3) inches in depth. Lifting notches extending through the manhole wall shall not be acceptable. Lifting notches shall be filled and neatly "point up" with nonshrinking mortar after manhole installation. The interior wall surfaces of the manhole shall be smooth when completed.

F. Manholes shall be water tight. All visible leakage shall be eliminated.

G. All manholes shall be adjusted to final grade as directed by the Engineer.

H. All outside surfaces below grade that will not be in contact with the cast-in-place concrete manhole base, shall be coated with bituminous dampproofing as specified in Section 07160. Manholes shall not be backfilled until dampproofing is dry and hard.

I. Prior to installation, one coat of coal tar epoxy shall be applied to all castings. Before painting, castings shall be throughly cleaned and properly supported. All loose rust shall be removed by wire brushing. Castings shall not be handled until the coating is dry and hard.

J. Stub-outs for future connections shall be provided in manholes at the locations indicated on the drawings. Stub-outs shall be not less than 3'-0" nor more than 4'-0" long and shall terminate in a bell with a removable plug.

3.2 MANHOLE ACCEPTANCE TESTS

A. Each manhole shall meet the requirements of the following acceptance tests. The acceptance testing requirements described herein represent the minimum testing required. In instances where local codes or standards exceed the specified requirements, those codes or standards shall govern over these requirements. All defects shall be repaired to the satisfaction of the Engineer.

B. The Contractor shall provide, at his own expense, all labor, equipment, and materials required for the tests including all pipe, fittings, and valves needed for testing as well as between the reach to be tested and the source of water supply, water, temporary plugs or bulkheads, all necessary test equipment, temporary restraining or bracing as required, and other required work. The schedule of testing shall be submitted to the Engineer prior to starting the tests. The methods used and the time of conducting tests shall be acceptable to the Engineer.

C. The Contractor shall test each manhole for leakage by either an exfiltration or vacuum test. Each manhole shall be subjected to at least one exfiltration or vacuum test as specified herein. Manholes that fail the initial testing shall be repaired or replaced and then retested until they successfully pass the testing requirements and to the satisfaction of the Engineer.

D. Exfiltration. Exfiltration tests shall be conducted by blocking off all manhole openings, filling the manhole with water, and measuring the water level drop during the test. During the exfiltration test, the water depth shall be to the top of the manhole frame. The depth of the water shall be at least 5 feet above the groundwater elevation. If these conditions cannot be met then exfiltration testing shall not be allowed and the manhole shall be vacuum tested. After the manhole concrete has been saturated, the water level in the manhole shall be observed for a period of four (4) hours and as much longer as necessary, in the opinion of the Engineer. If after this period of time the difference in water elevation is not greater than ½-inch, the manhole shall be considered as passing the exfiltration test. Manhole exfiltration testing shall not be conducted as part of the exfiltration testing for adjacent sections of sewer. Each manhole exfiltration test shall test only the manhole structure and any associated drop pipe assembly. Each manhole shall be tested for individually for exfiltration.

E. Vacuum Testing of Manholes. Vacuum testing of manholes for acceptance shall be performed after manhole and connecting sewer lines have been backfilled. Vacuum testing of manholes shall be conducted in accordance with ASTM C1244.

F. Infiltration. Each manhole shall be free of visible leaks. All visible leaks shall be repaired. Repaired manholes shall be retested for leakage.

3.3 CLEANING

A. The interior of all manholes and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

END OF SECTION

SECTION 02675

DISINFECTION OF WATER SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Disinfection of potable water system.

B. Pressure testing and reporting results.

1.2 RELATED SECTIONS

A. Section 02228 - Horizontal Directionally Drilled Utilities.

B. Section 02620 - Water Distribution System.

1.3 REFERENCES

A. AWWA B300 - Standard for Hypochlorites.

B. AWWA B301 - Standard for Liquid Chlorine.

C. AWWA B302 - Standard for Ammonium Sulfate.

D. AWWA B303 - Standard for Sodium Chlorite.

E. AWWA C651 - Standards for Disinfecting Water Mains.

1.4 SUBMITTALS FOR INFORMATION

A. Section 01300 - Submittals: Procedures for submittals.

B. Test Reports: Indicate results comparative to specified requirements.

C. Submit detailed disinfection plan for well and transmission main.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Disinfection report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Initial and 24 hour disinfectant residuals quantity in treated water in ppm for each outlet tested.
5. Date and time of flushing start and completion.
6. Disinfectant residual after flushing in ppm for each outlet tested.

B. Bacteriological report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for outlet tested.
7. Certification that water conforms, or fails to conform, to bacterial standards of NDOH.
8. Minimum 2 samples collected 24 hours apart demonstrating zero coliform present.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

4. Testing Firm: Company specializing in testing potable water systems, certified by the State of Health.

REGULATORY REQUIREMENTS

A. Conform to Nebraska Department of Health code or regulation for performing the work of this Section.

B. Provide certificate of compliance from NDOH indicating approval of water system.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.1 PREPARATION

A. At least 15 days prior to starting any disinfection work, the Contractor shall submit to the Engineer a detailed flushing and disinfection plan. The plan shall be coordinated with the Owner and shall cover the method and procedure proposed, to include coordination, sequence of operations, equipment to be used, the manner of filling and flushing of lines, and the neutralization and disposal of wasted water. All chlorinated water discharged to drainage courses shall be neutralized by dilution or chemical treatment.

B. The Contractor shall coordinate flushing and disinfection work with adjacent work as necessary to preclude work interference or duplication of effort and to expedite the overall progress of the work.

C. The Contractor shall provide all necessary piping connections, temporary valves, sampling taps, pumps, disinfectant, neutralization agents, testing laboratory services, and all other items of equipment or facilities required to complete the disinfection work.

D. Water required for flushing and disinfection work will be provided as stipulated in the temporary facilities section.

E. Verify that piping system has been cleaned, inspected, and pressure tested.

3.2 EXECUTION

A. Provide and attach equipment required to execute work of this Section.

B. At connections and cut-ins, swab all new pipe fittings, valves, and the open ends of the existing pipe with a 200 ppm chlorine solution immediately before assembly.

C. Disinfect all portions of the new water line with an approved chlorine compound to provide 50 ppm chlorine throughout the system and let stand for 24 hours, then flush.

D. Circulate and flush repeatedly until required cleanliness is achieved.

E. Flush and clean with domestic water.

F. Replace permanent system devices removed for disinfection.

3.3 TESTS

A. The Contractor shall collect two water samples 24 hours apart for each continuous section of new water main at two separate sampling locations that are at least 1,000 feet apart. Where continuous sections of new water main are less than 1,000 feet long, one sampling location per continuous section will be adequate. The samples will be analyzed for bacteriological quality. Two consecutive tests at each sampling location must show the absence of coliform bacteria prior to placing water mains into service.

B. If portions of main are placed in service before the entire system, those portions shall be tested according to Part A given above.

C. All costs for testing or re-testing due to failed tests will be at the Contractor's expense.

D. Test samples in accordance with ANSI/AWWA C651.

END OF SECTION

SECTION 03001

CONCRETE

PART 1 GENERAL

1.1 WORK INCLUDED

A. Formwork, shoring, bracing, and anchorage.

B. Concrete reinforcement and accessories.

C. Cast-in-place concrete.

1.2 REFERENCES

A. ACI 301 - Specifications of Structural Concrete for Buildings.

B. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

C. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

E. ASTM C33 - Concrete Aggregates.

F. ASTM C94 - Ready-Mixed Concrete.

G. ASTM C150 - Portland Cement.

H. ASTM C260 - Air Entraining Admixtures for Concrete.

I. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

J. ASTM D2103 - Polyethylene Film and Sheeting.

K. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

1.4 TESTS

A. Submit proposed mix design to Engineer for review prior to commencement of work.

B. Contractor will take cylinders and perform slump tests in accordance with ACI 301.

C. Three concrete test cylinders will be taken for every 75 or less cu yds of each class of concrete placed each day.

D. One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.

E. One slump test will be taken for each set of test cylinders taken.

1.5 SUBMITTALS

A. Submit shop drawings of reinforcing steel as required.

B. Indicate reinforcement sizes, spacings, locations of reinforcing steel, bending and cutting schedules, splicing, and supporting and spacing devices.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Conform to ACI 301.

2.2 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet steel deformed bars; uncoated finish.

B. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; Deformed type, ANSI/ASTM A497; in flat sheets or coiled rolls; uncoated finish.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, normal - Type 1 Portland, grey color.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and free from deleterious materials.

2.4 ADMIXTURES

A. Air Entrainment Admixture: ASTM C260.

B. Fly Ash: Fly ash shall conform to the requirements of pozzolan Class C or Class F of ASTM C618 except that the maximum loss on ignition for Class F pozzolan shall be 6.0 percent. Additionally, both Class C and Class F pozzolans shall have a maximum allowable free carbon content not to exceed 3.0 percent as determined in accordance with ASTM E30. Either class of fly ash shall not contain more than 1.50 percent of available alkalies as Na_2O.

2.5 ACCESSORIES

A. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 7500 psi.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Water Stops: Six inch, 12 gage ungalvanized steel plate, clean and free from coating that would weaken concrete bond. Water stop shall be continuous throughout the length of the construction joint with junctions lapped 4 inches and securely bolted or welded together.

2.6 CURING MATERIALS

A. Water: Clean and free from deleterious materials.

B. Membrane Curing Compound: ASTM C309.

C. Polyethylene Film: ASTM D2103, 4 mil thick, clear color.

D. Sealer - Dustproofer: L & M Construction chemicals "Super Seal #35", A.C. Horn "Duraflex", epoxy deck sealer hardener, SS-1996 Type 2.

2.7 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Concrete:

1.	Compressive Strength (7 days):	2,650 psi
2.	Compressive Strength (28 days):	3,500 psi
3.	Slump:	3 inch ± 1 inch
4.	Aggregate:	47B Sand and Gravel as specified by State of Nebraska DOR

C. Add air entraining agent to mix for concrete exposed to freeze-thaw cycling to provide air content of 6 percent ±2 percent.

D. Fly Ash Modified Concrete: Concrete may be modified by replacing 15% of the cement per cubic yard of concrete with 100 lb. of fly ash and using a water-reducing admixture in accordance with the manufacturer's recommendations of dosage rates.

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Verify lines, levels, and measurement before proceeding with formwork.

B. Hand trim sides and bottom of earth forms; remove loose dirt.

C. Align form joints.

D. Do not apply form release agent where concrete surfaces which may be affected by agent.

E. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

F. When concrete is placed against gravel or crushed rock which does not contain at least 25 percent material passing a No. 4 sieve, such surfaces shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least 4 inches.

3.2 REINFORCEMENT

A. Place, support, and secure reinforcement against displacement.

3.3 PLACING CONCRETE

A. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.4 SLABS

A. Float finish surfaces.

3.5 CURING

A. Concrete shall be protected from loss of moisture by water saturation or curing for at least 7 days after placement.

B. Concrete shall be protected against freezing for at least 7 days after placement.

END OF SECTION

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SECTION 03475

PRE-ENGINEERED PUBLIC RESTROOM BUILDING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work of this Section includes all materials and labor required in the placement and erection of one (1) Aspen Single Extended Pre-Engineered Public Restroom Building. Generally, work will include: site preparation and grading, excavations for structure, structural backfill, foundation and pad construction, building and building construction, and vault system.

1.2 APPROVED MANUFACTURERS

A. This specification is based on the Aspen Single Extended building as manufactured by Romtec, Inc., 18240 N. Bank Road, Roseburg, Oregon 97470, ph. (541)496-3541 or approved alternate.

1.3 CODE COMPLIANCE AND STANDARDS

A. All work and materials shall comply with the latest industry building codes and regulations, including but not limited to the following:

1. Uniform Building Code (UBC)-Latest Edition
2. National Electrical Code (NEC)-Latest Edition
3. Uniform Plumbing Code (UPC)-Latest Edition
4. Uniform Federal Accessibility Standards (UFAS)-Latest Edition

1.4 PERMITS, LICENSES, FEES AND INSPECTIONS

A. Obtain, pay for, and maintain all required permits, licenses and certificates of inspection. State plumbing and electrical permit and inspection will be required for this construction.

1.5 QUALITY ASSURANCE

A. Structure and mechanical systems are to be pre-engineered and certified by a registered Professional Engineer. The Aspen Single Extended building shall be installed by a representative of the manufacturer or by individuals who can exhibit experience installing this building type.

1.6 DESIGN CRITERIA

A. Members to withstand dead load and design loads due to pressure and suction of wind gravity calculated in accordance with latest version of the Uniform Building Code.

1. Snow Load = 200 psf
2. Roof Dead Load = 15 psf
3. Wall Dead Load = 100 psf
4. Seismic Zone 4
5. Wind Speed = 120 mph
6. Wind Exposure = D
7. Soil Bearing = 1000 psf

B. Design shall meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.7 BUILDING DESCRIPTION

A. Summary: The pre-engineered men and women's single-user restroom is erected on a concrete slab. The building is constructed of interlocking 8"Wx16"Lx8"H split concrete block, which is then grouted solid. The building has 1 entry door, 2 Lexan windows, and 2 roof panels installed. Foundations should meet or exceed all state and local codes. These are all defined in Section 2. Building is designed to be in accordance with the latest version of the Uniform Building Code.

B. The size of the Aspen Single Extended restroom is 8'8"Wx12'8"L with a privacy wall.

C. The 5'4"Wx7'4"L unisex restroom is as follows upon entering the 3'Wx80"H steel entry door:

1. Handicap accessible riser with safety bars.
2. Tami-Seal 3' up on the interior side of the exterior walls then cover with FRP. Attached with Glue and mechanical fasteners.
3. One (1) kick proof 16" x 24" vents.
4. One (1) floor-mounted handicap accessible toilet with two (2) 42" stainless steel grab bars.
5. One (1) wall-mounted urinal.

1.8 SUBMITTALS

A. Submit the following for approval:

1. Shop Drawings: Provide complete plans and elevations for structure type, including: size and dimension of building components; material types and finishes; hardware; details and methods of assembling construction; joints and connections; details and layout of mechanical and vault systems.

2. Product Data: Manufacturer's standard literature for facility and system components specified. Standard literature and technical data for system components manufactured by companies other than building manufacturer such as: light fixtures, heating system, hardware and roofing system.

1.9 WARRANTY

A. The Aspen Single Extended building and all their associated components shall be warrantied against defects in materials for a period of not less than one year from date of Final Acceptance.

PART 2 PRODUCTS

2.1 GENERAL

A. Furnish restroom building, in the model described below. Buildings shall be manufactured by Romtec, Inc. or approved alternate. Complete installations shall be coordinated with the manufacturer. Provide non-factory supplied components, as specified by the manufacturer, to allow for a complete installation. All building models and components shall be in compliance with the Uniform Federal Accessibility Standards (UFAS).

B. Restroom Building: Romtec, Aspen Single Extended, split face block construction. The restroom facility shall come complete and shall include the following features:

1. FACTORY SUPPLIED ITEMS PER RESTROOM:

a. Building Dimensions
   1) Building plan: 8'8"Wx12'8"L exterior with a privacy wall.

b. Wall Material
   1) 8"W x 16"L x 8"H dry stack interlocking split face concrete blocks, Compressive Strength = f'm = 1500 psi. Hydratite® Plus (mixed with mortar for first course).

c. Block Sealer
   1) Tama-seal, with for the negative side (interior side) of the exterior walls, apply 3 feet up from the slab.

d. FRP
   1) Fiberglass Reinforced Panel for all interior walls in restrooms, glue and 1/4" nylon anchor mechanically fastener.

e. Wall Vent
   1) 1/8" black steel frame and expanded mesh welded to galvanized louvers with fine mesh screen with kick-proof winterizing cover.

f. Door (1)
   1) 18 gauge galvanized hollow metal doors with honeycomb core and baked enamel finish.

g. Door Hinges
   1) U.S. 26D spring hinges and U.S. 26D hinges.

h. Door Handles
   1) Stainless steel 4"x16" plates with 2 stainless steel pull-pull handles with Schlage single cylinder dead bolt, 12-237 latch.

i. Door Frame
   1) 16 gauge welded, galvanized hollow metal frames, 2" frame width at jam, 4" at head, 8" deep, baked enamel finish.

j. Roof
   1) Preassembled steel roof panels. The Aspen Single Extended building has 2 panels that are 8'Wx8'9"L. The joists are 14 gauge, 4" deep, 2" flanges, heavy gauge steel framing spaced at 22" o.c. maximum. The roof panels have 3 ½" batt R-11 insulation with vapor barrier. The roofing is prefinished metal.

k. Windows (2)
   1) Lexan fixed windows with powder coated steel frame that are 2'Hx6'L.

l. Grab Bars (2 Sets)
   1) 36" and 42" stainless steel.

m. Vaults (1)
   1) 750 gallon cross-link polyethylene vault with 12" vents stack adapter, 24" sewer clean out adapter, and riser adapter.

2. INSTALLER SUPPLIED ITEMS:

a. Labor
   1) All labor and trades to do the concrete work and unload the building and install it and to supply the concrete.

b. Concrete
   1) Ready mixed 3000 lbs. for footing and slab, 2500 lbs. for wall and side walk construction; use tinted concrete in slab to match surrounding sitework.

c. Vault Footing
   1) Ready mixed 3000 lbs. for 3' x 3' footing and slab.

d. Concrete Forms
   1) The forms for the vault footing are inside the vault, but the forms for the slab will be supplied by installer and shall meet or exceed all state and local codes.

e. Concrete Footing
   1) 24W" x 8D" under all exterior walls including privacy wall of building and under all interior walls, 3 #5 rebar running continues, 30" lap.

f. Concrete Stem Walls
   1) Around all exterior and interior walls including privacy wall 8"W x 42"H with 3 #5 horizontal rebar, 30" Min lap, and #5 24" on center verticals with 8" bends alternating in footing and extending out of slab 30", 3000 lbs. concrete.

g. Concrete Reinforcement
   1) 60 ksi minimum (grade 60) as specified by the building supplier.

h. Concrete Slab
   1) 5"D with 2 layers of welded wire mess 6x6 10/10 flat sheets over 6 mil vapor barrier, 3000 lbs. concrete.

i. Structural Fill
   1) 3/4" minus crushed rock under slab and back filled around all footing and stem walls, and vaults.

j. Mortar
   1) Grout: 2500-psi strength at 28 days.

k. Rebar walls
   1) One # 5 continues horizontal every 4' with 30 lap, verticals #5 every 24".

l. Toilet Paper Disp. (1)
   1) Bobrick B-2746 two roll dispenser, tumbler lock on spindles, controlled delivery.

m. Restroom Sign (1)

1) Best Manufacturing Co., #WP287RB or #WP288RB, 6"x7 ¼" fiberglass sign, work and picture accessible signage with Braille message.

PART 3 EXECUTION

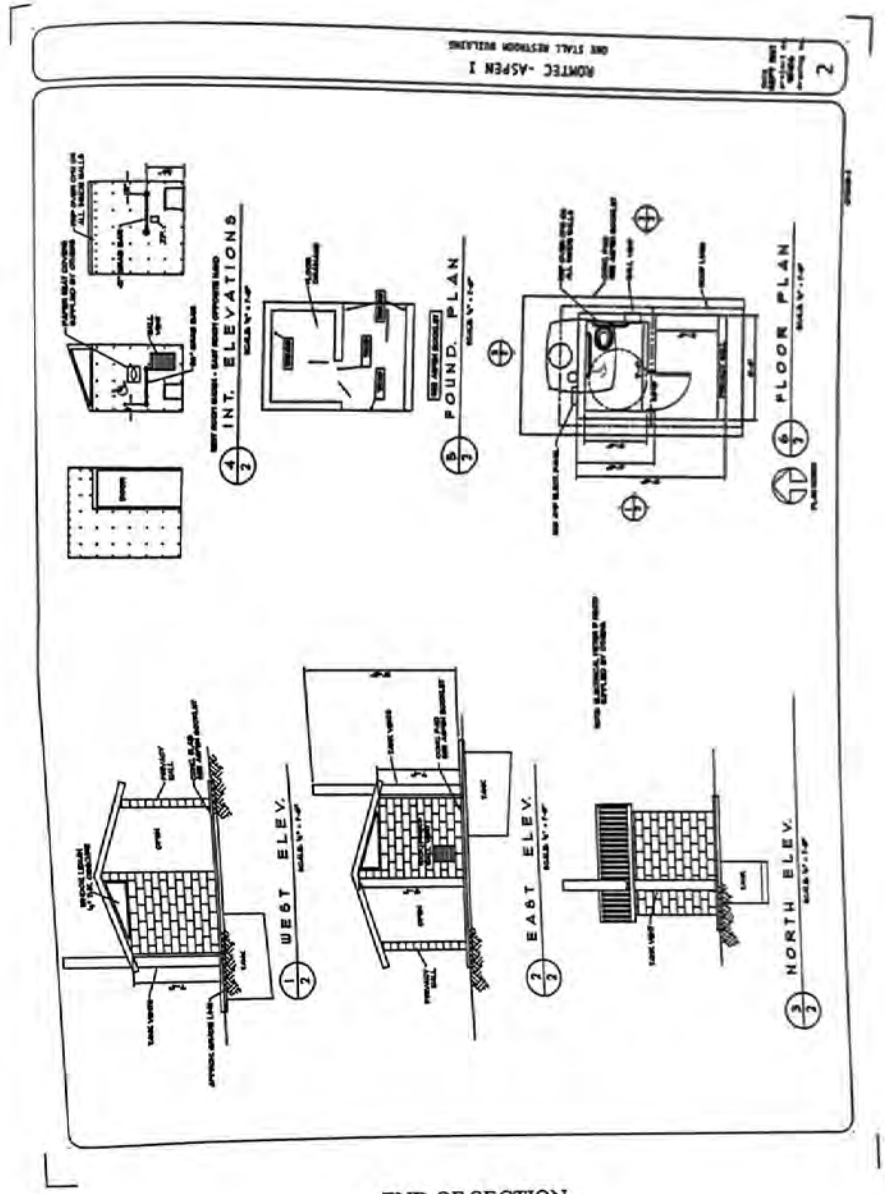
3.1 GENERAL

A. Prefabricated Aspen Single Extended building shall be installed in strict accordance with the manufacturer's instructions. The Contractor shall coordinate with the manufacturer to determine responsibilities for total project requirements. Installer shall be thoroughly acquainted with installation requirements prior to beginning construction. Work shall be coordinated with sitework and utility construction as a part of, or adjacent to, building installation.

B. In preparation for installing the facility, verify final layout and building elevations. Clear only the essential area of construction of trees and vegetation.

C. Excavate for building foundation in accordance with the manufacturer's requirements. Install vault. Construct building pad and foundation. Erect prefabricated structure. Install fixtures and accessories. Complete adjacent sitework. Grade site to obtain positive drainage away from structure. Topsoil, fine grade and seed all areas of construction disturbance in accordance with other sections of these specifications.

D. Thoroughly clean all surfaces, interior and exterior, making facility ready for public use.



END OF SECTION

SECTION 07160

BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Cold applied asphalt bitumen dampproofing.

B. Locations scheduled at end of this Section.

1.2 RELATED WORK

A. Section 02223 - Backfilling.

B. Section 02631 - Sanitary Sewer Manholes.

C. Section 03001 - Concrete: Concrete substrate.

1.3 SUBMITTALS

A. Submit product data as required.

B. Indicate properties of primer, bitumen, and mastic.

C. Submit manufacturer's installation instructions as required.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperatures above 40 degrees F for 24 hours before application, and continuously until dampproofing has cured.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Sonneborn "Hydrocide 700B Semi-Mastic".

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PART 3 EXECUTION

3.1 INSPECTION

A. Verify surfaces are solid, free of frozen matter, loose particles, cracks, pits, rough projections, and foreign matter detrimental to adhesion and application of dampproofing.

B. Do not apply dampproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to applicator.

C. Verify items which penetrate surfaces to receive dampproofing are securely installed.

D. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

B. Apply mastic to seal penetrations, small cracks, and honeycomb in substrate.

3.3 APPLICATION

A. Apply cold bitumen with roller or spray.

B. Apply two coats, continuous and uniform at a rate of one gal/30 sq ft per coat.

C. Apply from 2 inches below finish grade elevation to top of footings.

D. Seal watertight items projecting through dampproofing surface with mastic.

3.4 SCHEDULE

A. Exterior surfaces of manholes, boxes, and septic tanks, except surfaces that will be in contact with cast-in-place concrete manhole bases.

END OF SECTION

SECTION 15100

VALVES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Gate Valves.

B. Valve Operators.

1.2 RELATED WORK

A. Section 02228 - Horizontal Directionally Drilled Utilities.

B. Section 02620: Water Distribution System.

1.3 REFERENCES

A. AWWA C500-86.

B. AWWA C600-87.

1.4 SUBMITTALS

A. Submit copies of valve ordering schedule for approval before ordering valves.

B. Submit detailed shop drawings. Clearly indicate make, model, location, type, size and pressure rating.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings

PART 2 PRODUCTS

2.1 GATE VALVES

A. Gate valves shall be cast iron body; resilient seated, parallel sheath type with mechanical joint ends; conforming to AWWA C509-87. Gate valves shall be Mueller or equal.

B. Gate valves which are buried or submerged shall be non-rising stem with O-ring stem seals.

C. End connections shall be mechanical joints.

2.2 VALVE OPERATORS

A. Two (2) inch square wrench nuts shall be provided on all buried valves and where shown on the drawings. Unless otherwise directed by the Owner, all wrench nuts shall comply with Section 19 of AWWA C500. Not less then two operating keys shall be furnished for operation of the wrench nut operated valves.

B. Unless otherwise required by the Owner, the direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word "OPEN" and an arrow indicating the direction to open.

C. All buried valves shall be provided with valve boxes. Valve boxes shall be of cast iron, extension sleeve type, suitable for the cover shown on the drawings. The valve box shall not be less then 5 inches in diameter and shall have suitable cast iron bases and covers. The cover shall have cast thereon an appropriate name designating the service for which the valve is used.

D. Valve boxes shall be Tyler Cat. No. 6855, two piece shaft, slip type, extension length as required, or equal.

2.3 SHOP PAINTING

A. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop painted for corrosion protection. The valve manufacturer's standard paint will be acceptable provided it is functionally equivalent to the specified paint and is compatible with the specified field painting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Valves shall be set plumb: not to exceed 1/4" per foot per meter.

B. Fire hydrants and valve boxes shall be set plumb: not to exceed 1/4" per foot per meter.

C. Install valves and accessories in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Utility company electricity-metering components.
6. Concrete equipment bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Devices for Utility Company Electricity Metering: Comply with utility company published standards.

C. Comply with NFPA 70.

1.3 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.

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C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.

D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 – PRODUCTS

2.1 RACEWAYS

A. EMT: Electrical metallic tubing; ANSI C80.3, zinc-coated steel, with compression fittings.

B. FMC: Flexible metal conduit; zinc-coated steel.

C. IMC: Intermediate metal conduit; ANSI C80.6, zinc-coated steel, with threaded fittings.

D. LFMC: Liquidtight flexible metal conduit; zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

E. RMC: Rigid metal conduit; galvanized rigid steel; ANSI C80.1.

F. RNC: Rigid nonmetallic conduit; NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.

G. Raceway Fittings: Specifically designed for raceway type with which used.

2.2 WIRES, CABLES, AND CONNECTIONS

A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.

B. Conductors, Larger Than No. 10 AWG: Stranded copper.

C. Insulation: Thermoplastic, rated 600 V, 75 deg C minimum, Type THW, THHN-THWN, or USE depending on application..

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs. Strength rating to suit structural loading.

D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.

1. Materials: Same as channels and angles, except metal items may be stainless steel.

E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Carbon-steel wedge or sleeve type.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 ELECTRICAL IDENTIFICATION

A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).

C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:

1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
2. Embedded continuous metallic strip or core.
3. Printed legend that indicates type of underground line.

F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.

1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch (1-mm), galvanized-steel backing. 1/4-inch (6-mm) grommets in corners for mounting.

H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.5 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Concrete."

PART 3 – EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

3.2 RACEWAY APPLICATION

A. Outdoor Installations:

1. Exposed: RMC.
2. Concealed: RMC, RNC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

A. Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.

B. Use RMC elbows where RNC turns out of slab.

C. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or woven polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wires.

D. Install telephone and signal system raceways, 2-inch trade size (DN 53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-deg ree bends or equivalent. Add pull boxes where necessary to accomplish this.

3.4 WIRING METHODS FOR POWER CIRCUITS

A. Application: Use wiring methods specified below to the extent permitted by applicable codes as interpreted by authorities having jurisdiction.

B. Underground Feeder Circuits: Insulated single conductors in raceway.

3.5 WIRING INSTALLATION

A. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.

B. Dry Locations: Steel materials.

C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb (90-kg) minimum design load for each support element.

3.7 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

3.8 ELECTRICITY-METERING EQUIPMENT

A. Install utility company metering equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.9 FIRESTOPPING

A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Division 7 Section "Through-Penetration Firestop Systems."

3.10 CONCRETE BASES

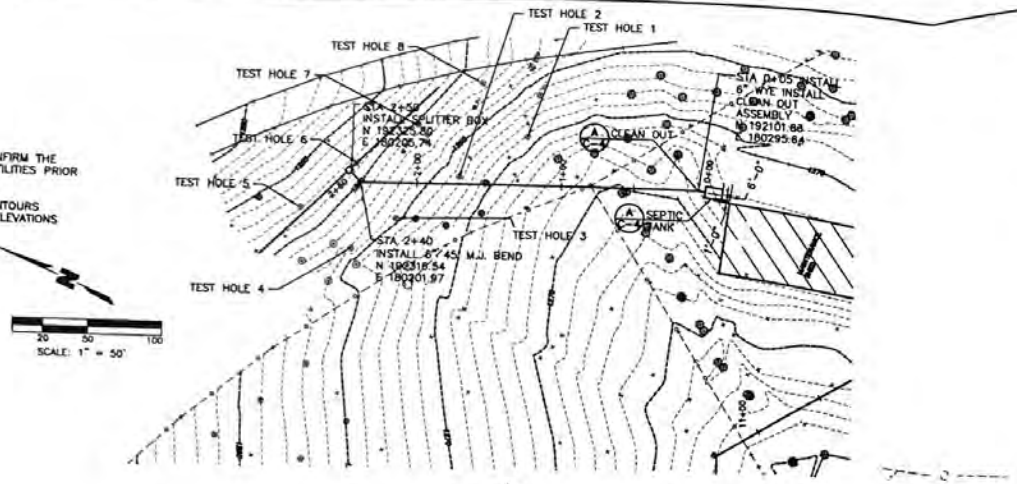
A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

END OF SECTION 16050

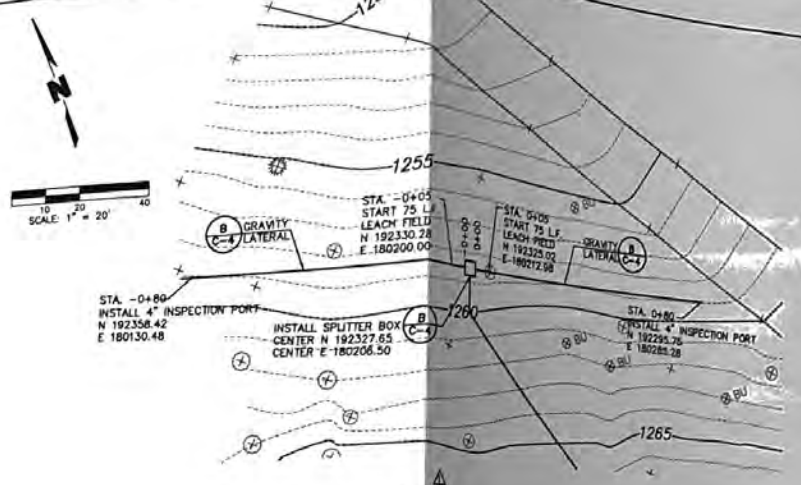
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7 Jan 2002
STATE OF NEBRASKA

NOTE:
CONTRACTOR SHALL CONFIRM THE LOCATION OF BURIED UTILITIES PRIOR TO COMMENCING WORK.

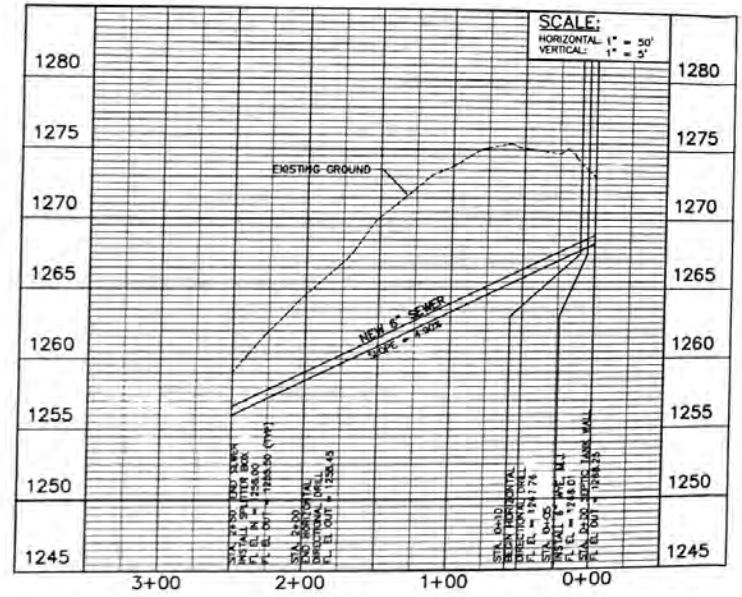
ALL ELEVATION AND CONTOURS SHOWN IN N.G.V.D 88 ELEVATIONS



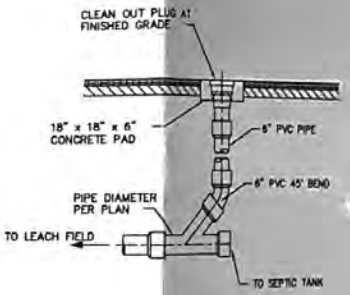
BUILDING TO LEACH FIELD



LEACH FIELD



SEWER PROFILE: BUILDING TO LEACH FIELD



CLEANOUT DETAIL E C-3
NOT TO SCALE

CONTROL POINTS

CONTROL POINT#1
N 192104.09
E 180498.14
EL. = 1257.87
5/8" REBAR

CONTROL POINT#2
N 192230.06
E 180260.88
EL. = 1270.01
5/8" REBAR

CONTROL POINT#4
N 191897.33
E 180169.86
EL. = 1284.47
5/8" REBAR

CONTROL POINT#5
N 191859.09
E 180512.10
EL. = 1258.19
5/8" REBAR

CONTROL POINT#10
N 191711.07
E 179482.74
EL. = 1297.79
5/8" REBAR

CONTROL POINT#11
N 192045.58
E 180156.67
EL. = 1261.38
HUB & TACK

BENCH MARK(S):

BM #1 BRASS CAP NE WINGWALL OF BRIDGE OVER SALT CR. ON 70TH. EL. = 1253.57 (NAVD 88)

BM #2 EAST C.O.E. - 3" BRASS DISK FLUSH WITH GROUND 3' N OF GOLF COURSE FENCE 300' E OF PROPOSED MAINTENANCE SHED STAMPED C.O.E. WITH WITNESS POST. EL. = 1251.47 (NAVD 88)

BM #3 W C.O.E. - 3" BRASS DISK FLUSH WITH GROUND 1.5' N OF GOLF COURSE FENCE N OF PROPOSED MAINTENANCE SHED STAMPED C.O.E. WITH WHITE WITNESS POST. EL. = 1263.34 (NAVD 88)

LEGEND :

SIGN POLE
TELEPHONE PEDESTAL
ELECTRIC METER
LIGHT POLE
WATER VALVE
FIRE HYDRANT
GUY WIRE
PAD MOUNTED TRANSFORMER
BUSH
CONIFEROUS TREE
DECIDUOUS TREE
SPOT ELEVATION
TREE MASS
CONTOUR LINE
STORM SEWER LINE
CHAIN LINK FENCE
CHAIN FENCE
EXISTING SANITARY SEWER
NEW SANITARY SEWER
EXISTING WATER
NEW WATER
EXISTING GAS
NEW GAS
UNDERGROUND ELECTRIC
BUILDING LINE
FL FLOWLINE

REVISIONS

REV. NO.	DESCRIPTION	DATE	DRAWN BY
1	CHANGE ORDER 1	3/01/02	RCS

THIS DRAWING WAS ORIGINALLY APPROVED AND SEALED ON 01/08/01 BY JOHN S. OLSSON A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF NEBRASKA NO.-7480.

OLSSON ASSOCIATES
CONSULTING ENGINEERS
1111 Lincoln Mall
Lincoln, NE 68508

LINCOLN, NEBRASKA 2001

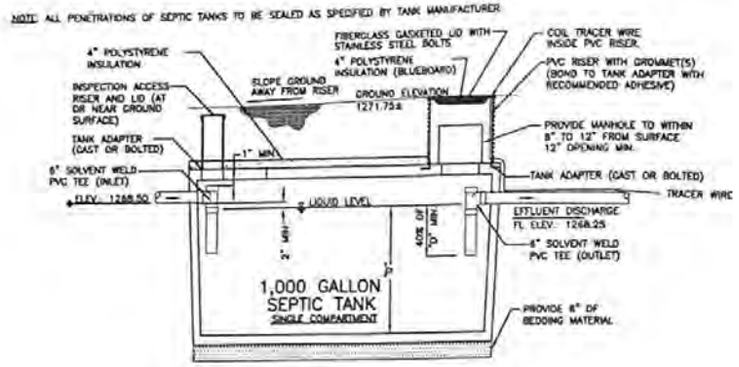
LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

SEWER PLANS & PROFILES

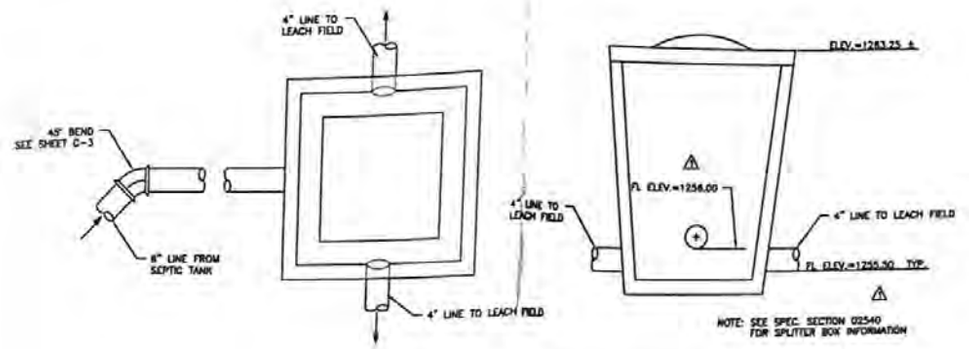
drawn by:	CTR	project no.:	2001-0959
checked by:	RCS	drawing no.:	100223-4
approved by:	JSO	date:	1/07/02

SHEET C-3

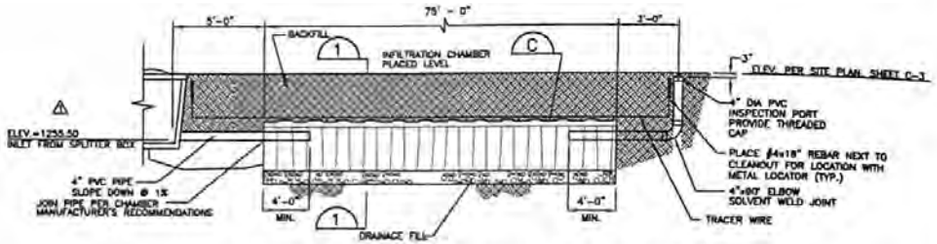
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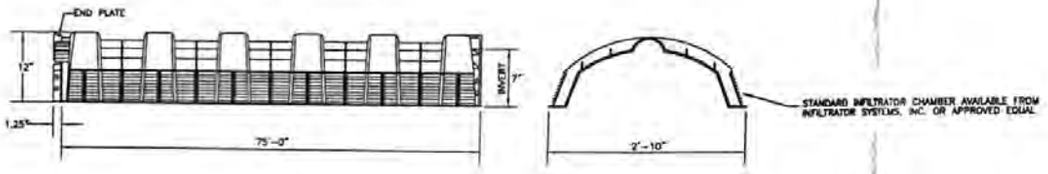
SEPTIC TANK DETAIL (A, C-3)
NOT TO SCALE



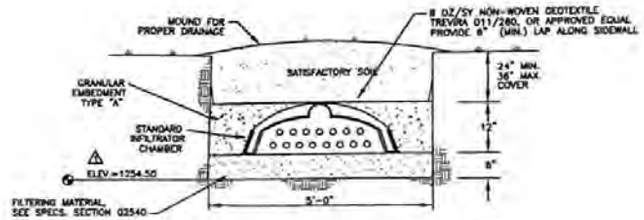
SPLITTER BOX DETAIL (D, C-3)
NOT TO SCALE



GRAVITY LATERAL – TYPICAL LONGITUDINAL SECTION (B, C-3)
NOT TO SCALE



STANDARD INFILTRATOR CHAMBER DETAIL (C)
NOT TO SCALE



CHAMBER TRENCH SECTION (1)
NOT TO SCALE

F:\PROJECTS\2001959\CIVIL\DWG\LSANDT(MAIN).DWG - SEWER LAYOUT 5"=1

BENCH MARK(S):

LEGEND :

REVISIONS

REV NO.	DESCRIPTION	DATE	DRAWN BY
1	CHANGE ORDER 1	03/01/02	RCS

This drawing was originally approved and sealed on 01/08/02 by John S. Olsson a licensed professional engineer in the state of Nebraska No.-7480.

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Lincoln, NE 68508

LINCOLN, NEBRASKA 2001

LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

SEWER DETAILS

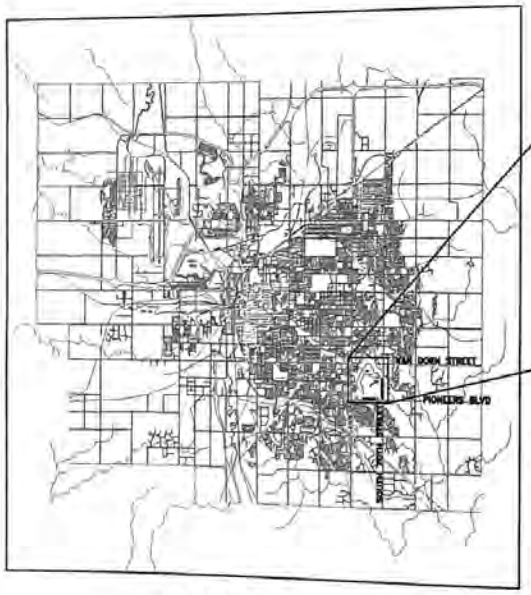
drawn by:	BKN	project no.:	2001-0959
checked by:	RCS	drawing no.:	100223-5
approved by:	JSO	date:	1/07/02

SHEET C-4

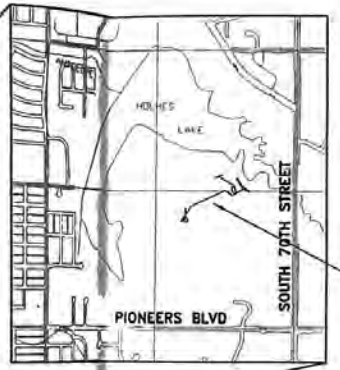
LINCOLN PARKS AND RECREATION
HOLMES LAKE MAINTENANCE BUILDING UTILITIES
LINCOLN, NEBRASKA
2002

PARKS & RECREATION
LINCOLN

PARKS & RECREATION
LINCOLN



LINCOLN, NEBRASKA
SCALE: 1" = 2 MILES



PROJECT LOCATION

LOCATION MAP
SCALE: 1" = 1/4 MILE

N

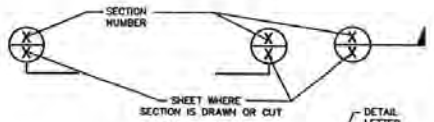
OLSSON ASSOCIATES
ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS

OA PROJECT NO. 2001-0959
DRAWING NO. 100223-1

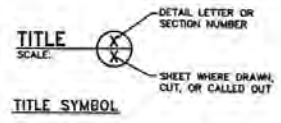
INDEX OF DRAWINGS

G-1	COVER SHEET
C-1	SITE PLAN
C-2	WATER PLAN
C-3	SEWER PLANS & PROFILES
C-4	SEWER DETAILS
ME-1	MECHANICAL\ELECTRICAL SITE PLAN

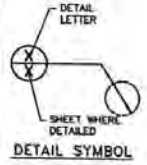
SYMBOLS LEGEND



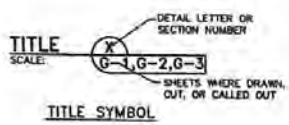
SECTION SYMBOLS



TITLE SYMBOL



DETAIL SYMBOL



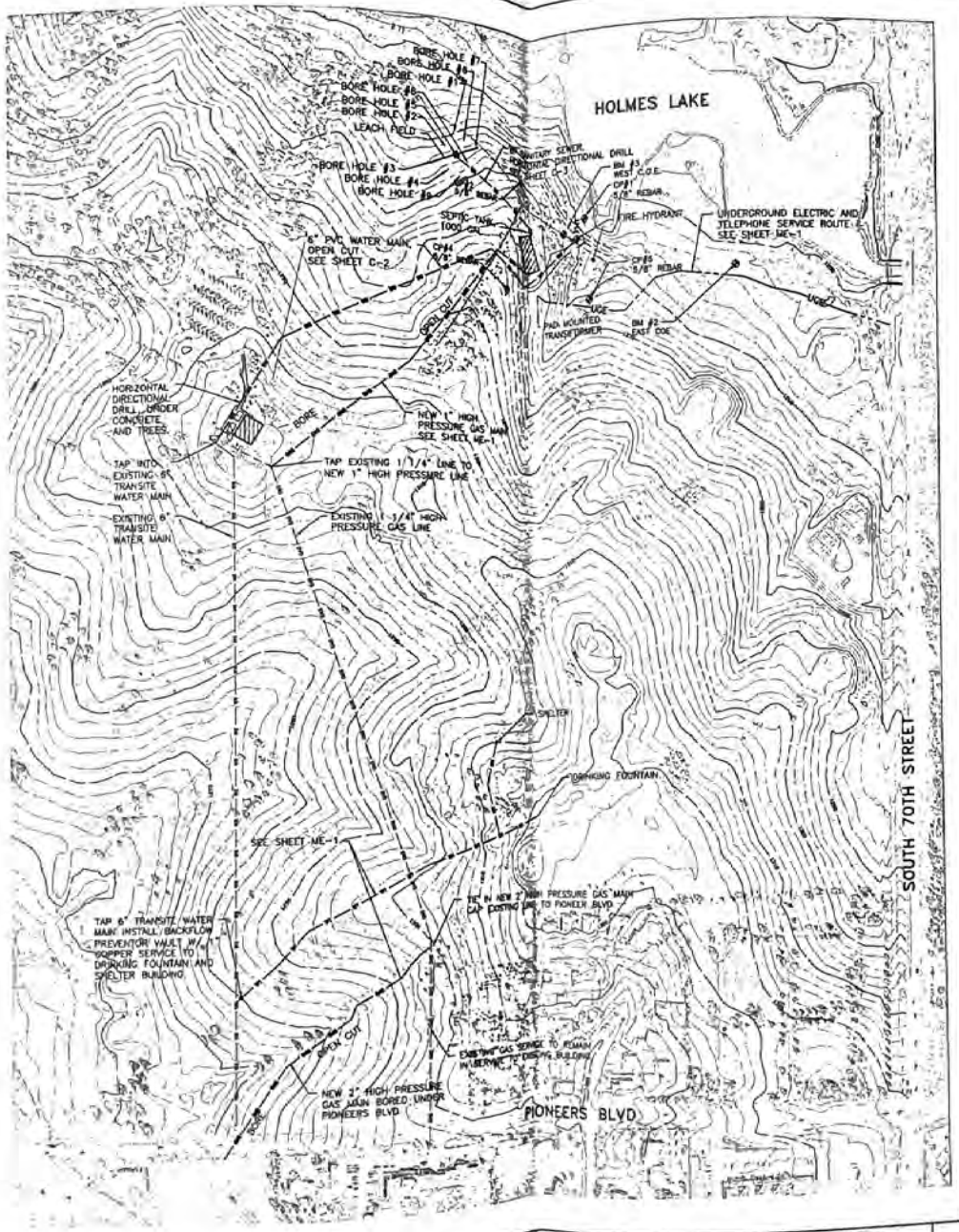
TITLE SYMBOL

JOHN S. OLSSON E-7480 STATE OF NEBRASKA
COORDINATING PROFESSIONAL ENGINEER & CIVIL ENGINEER

CHARLES L. BOWLE III E-8916 STATE OF NEBRASKA
MECHANICAL ENGINEER

KENNETH FAIRCHILD E-11047 STATE OF NEBRASKA
ELECTRICAL ENGINEER

SHEET
G-1



N

SCALE 1"=200'

0 100 200 400

SCALE IN FEET

GENERAL NOTES:

1. CONTRACTOR TO PRESERVE ALL SURVEY CONTROL AND SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION STAKING REQUIRED FOR THE PROJECT.
2. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UTILITY LOCATIONS AND ELEVATION PRIOR TO START OF CONSTRUCTION.

CONTROL POINTS

CONTROL POINT#1
1921104.29
1804618.74
= 1257.97
/8" REBAR

CONTROL POINT#2
1922330.06
1802760.86
= 1270.09
/8" REBAR

CONTROL POINT#3
1921887.33
1801859.80
= 1284.47
/8" REBAR

CONTROL POINT#5
1918559.09
1802912.10
= 1258.19
/8" REBAR

CONTROL POINT#10
N 191711.07
E 179462.74
EL = 1297.79
5/8" REBAR

CONTROL POINT#11
N 192045.88
E 180156.87
EL = 1281.38
NAIL & TACK

BENCH MARK(S):

BRASS CAP IN TOP WALL OF BRIDGE OVER SALT CR
EL = 1253.57 (NAVD 88)

EAST C.O.E. - 3" BRASS DISK FLUSH WITH GROUND
OF GOLF COURSE FENCE 80E 5' OF PROPOSED
CHANGE ENCD STAMPED C.O.E. WITH WITNESS POST
1251.47 (NAVD 88)

W C.O.E. - 3" BRASS DISK FLUSH WITH GROUND 1.5'
GOLF COURSE FENCE N OF PROPOSED MAINTENANCE
STAMPED C.O.E. WITH WHITE WITNESS POST EL =
(NAVD 88)

LEGEND :

- SIGN POST
- TELEPHONE PEDESTAL
- ELECTRIC METER
- LIGHT POLE
- WATER VALVE
- FIRE HYDRANT
- GUY WIRE
- PAD MOUNTED TRANSFORMER
- BUSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SPOT ELEVATION
- TREE MASS
- CONTOUR LINE
- STORM SEWER LINE
- CHAIN LINK FENCE
- CHAIN LINK FENCE
- EXISTING SANITARY SEWER
- NEW SANITARY SEWER
- EXISTING WATER
- NEW WATER
- EXISTING GAS
- NEW GAS
- UNDERGROUND ELECTRIC
- BUILDING LINE

REVISIONS

REV NO	DESCRIPTION	DATE	DRAWN BY

REGISTERED PROFESSIONAL ENGINEER JOHN S. OLSSON E-7480 STATE OF NEBRASKA

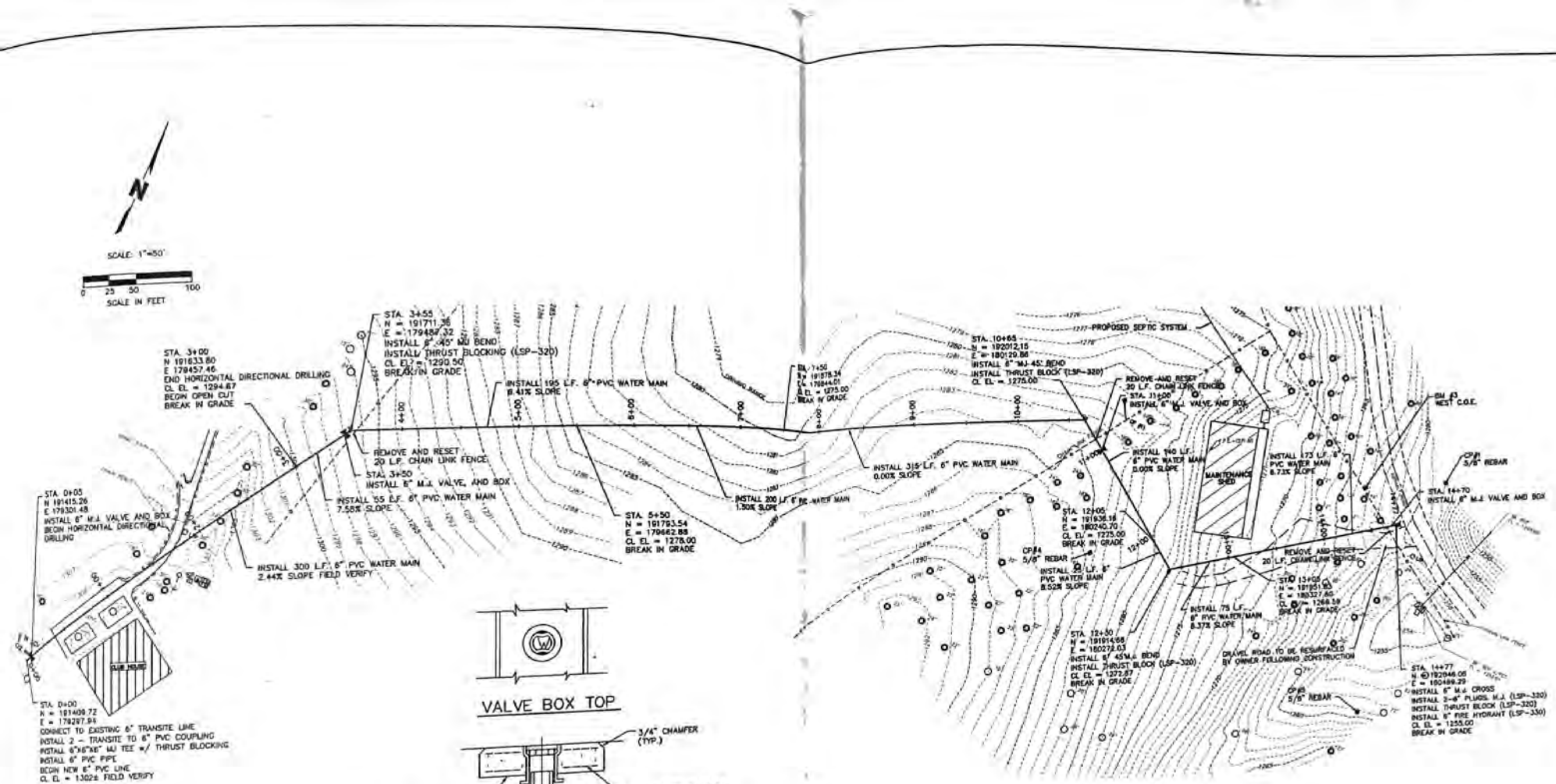
OLSSON ASSOCIATES
CONSULTING ENGINEERS
1111 Lincoln Mall
Lincoln, NE 68508

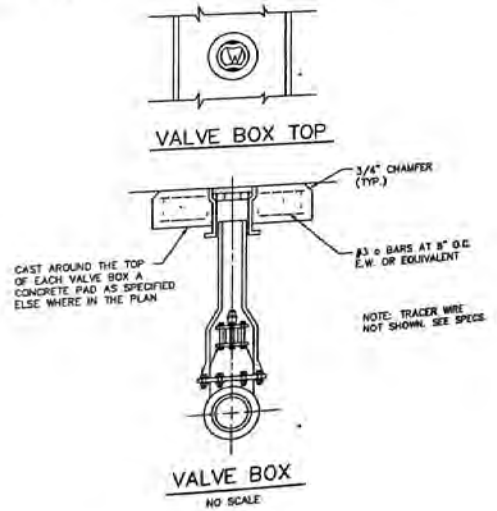
LINCOLN, NEBRASKA 2001

LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

SITE PLAN

drawn by:	CTR	project no.:	2001-0458	SHEET C-1
checked by:	RCS	drawing no.:	100223-2	
approved by:	JSO	date:	1/07/02	





CONTROL POINTS

CONTROL POINT#1
N 192104.06
E 180498.14
EL = 1257.87
5/8" REBAR

CONTROL POINT#2
N 192230.06
E 180260.86
EL = 1279.01
5/8" REBAR

CONTROL POINT#4
N 191827.33
E 180185.86
EL = 1284.47
5/8" REBAR

CONTROL POINT#5
N 191856.06
E 180512.10
EL = 1258.19
5/8" REBAR

CONTROL POINT#10
N 191711.07
E 179462.74
EL = 1297.79
5/8" REBAR

CONTROL POINT#11
N 192045.88
E 180156.67
EL = 1281.38
HUB & TACK

GENERAL NOTES:

1. INSTALL CITY OF LINCOLN STANDARD FIRE HYDRANT PLAN NO. LSP-330.
2. INSTALL CITY OF LINCOLN STANDARD THRUST BLOCK PLAN NO. LSP-320.
3. REFER TO THIS SHEET FOR VALVE AND BOX INSTALLATION.
4. WATER MAIN SHALL BE BURIED A MINIMUM OF 8 FEET FOR FREEZE PROTECTION UNLESS OTHERWISE NOTED ON THE DRAWINGS.

BENCH MARK(S):

BM #1 SET ON TOP NW CORNER OF BRIDGE OVER SALT CR. IN 70'N. EL = 1253.87 (NAVD 88)

BM #2 EAST C.O.E. - 3" BRASS DISK FLUSH WITH GROUND 7' N OF GOLF COURSE FENCE 500' E OF PROPOSED MAINTENANCE PAVED STAMPED C.O.E. WITH WITNESS POST. EL = 1251.17 (NAVD 88)

BM #3 WEST C.O.E. - 3" BRASS DISK FLUSH WITH GROUND 1.5' N OF GOLF COURSE FENCE N OF PROPOSED MAINTENANCE PAVED STAMPED C.O.E. WITH WHITE WITNESS POST. EL = 1283.14 (NAVD 88)

LEGEND :

- SIREN POLE
- TELEPHONE PEDESTAL
- ELECTRIC METER
- LIGHT POLE
- WATER VALVE
- FIRE HYDRANT
- GUY WIRE
- PAD MOUNTED TRANSFORMER
- BUSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SPOT ELEVATION
- TREE MASS
- CONTOUR LINE
- STORM SEWER LINE
- CHAIN LINK FENCE
- CHAIN FENCE
- EXISTING SANITARY SEWER
- NEW SANITARY SEWER
- EXISTING WATER
- NEW WATER
- EXISTING GAS
- NEW GAS
- UNDERGROUND ELECTRIC
- BUILDING LINE

REVISIONS

REV NO	DESCRIPTION	DATE	DRAWN BY

REGISTERED PROFESSIONAL ENGINEER JOHN C. OLSSON E-7460 STATE OF NEBRASKA

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1111 Lincoln Mall
Lincoln, NE 68508

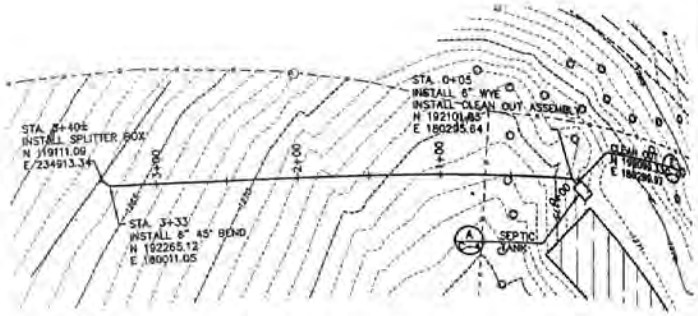
LINCOLN, NEBRASKA 2001

LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

WATER PLAN

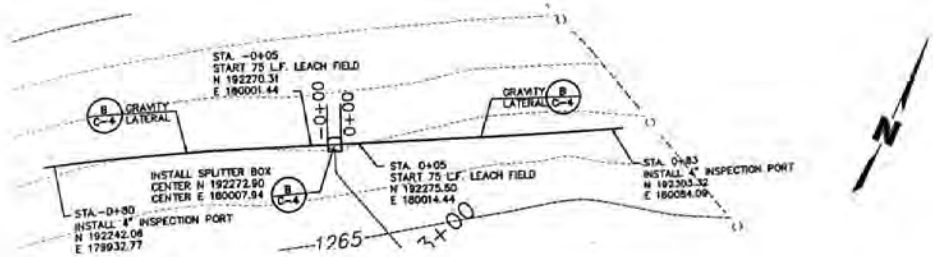
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checked by: RCS
approved by: JSO
project no.: 2001-0859
drawing no.: 10022.3-3
date: 1/07/02

SHEET C-2



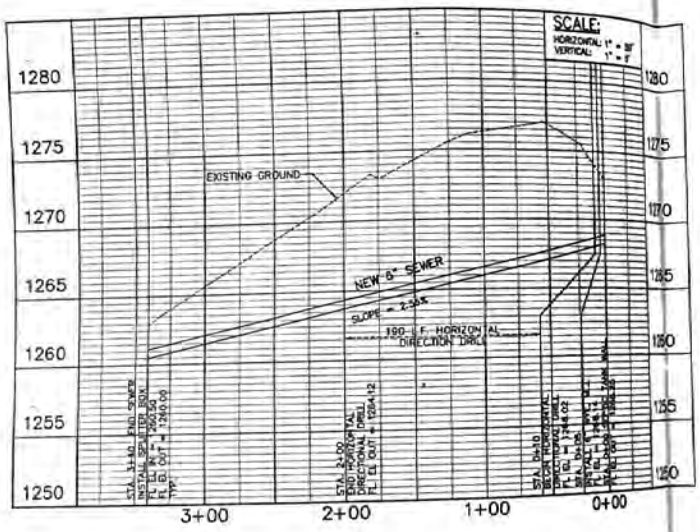
BUILDING TO LEACH FIELD

SCALE: 1" = 50'



LEACH FIELD

SCALE: 1" = 20'



SEWER PROFILE: BUILDING TO LEACH FIELD

CONTROL POINTS

CONTROL POINT#0
N 191911.09
E 234913.34
EL = 1259.57 (NAVD 88)
5/8" REBAR

CONTROL POINT#1
N 192045.88
E 180156.67
EL = 1281.38
NAIL & TACK

CONTROL POINT#10
N 191711.07
E 179462.74
EL = 1247.79
5/8" REBAR

CONTROL POINT#11
N 192230.08
E 180200.88
EL = 1270.01
5/8" REBAR

CONTROL POINT#2
N 192230.08
E 180200.88
EL = 1270.01
5/8" REBAR

CONTROL POINT#4
N 192057.33
E 180188.86
EL = 1284.47
5/8" REBAR

CONTROL POINT#5
N 191958.08
E 180212.16
EL = 1258.19
5/8" REBAR

CONTROL POINT#7
N 192104.09
E 180408.14
EL = 1257.87
5/8" REBAR

MARK(S):

TEXAS CAP NL WINGWALL OF BRIDGE OVER SALT CR.
EL. 0 = 1253.57 (NAVD 88)

1500 S.D. - 3" BRASS DISK FLUSH WITH GROUND
AT SW COURSE FENCE 500' E OF PROPOSED
CONC. MKD STAMPED C.O.E. WITH WITNESS POST.
EL= (NAVD 88)

1 USE - 3" BRASS DISK FLUSH WITH GROUND 1.5'
SW COURSE FENCE, N OF PROPOSED MAINTENANCE
STAMPED C.O.E. WITH WHITE WITNESS POST. EL =
(NAVD 88)

LEGEND :

- SIRN POLE
- TELEPHONE PEDESTAL
- ELECTRIC METER
- LIGHT POLE
- WATER VALVE
- FIRE HYDRANT
- GUY WIRE
- PAD MOUNTED TRANSFORMER
- BUSH
- CONIFEROUS TREE
- DECIDUOUS TREE
- SPOT ELEVATION
- TREE MASS
- CONTOUR LINE
- STORM SEWER LINE
- CHAIN LINK FENCE
- CHAIN FENCE
- EXISTING SANITARY SEWER
- NEW SANITARY SEWER
- EXISTING WATER
- NEW WATER
- EXISTING GAS
- NEW GAS
- UNDERGROUND ELECTRIC
- BUILDING LINE

REVISIONS

REV NO	DESCRIPTION	DATE	DRAWN BY

REGISTERED PROFESSIONAL ENGINEER
JOHN S. OLSSON
E-7480
STATE OF NEBRASKA
11/9/02

OLSSON ASSOCIATES
CONSULTING ENGINEERS
1111 Lincoln Mall
Lincoln, NE 68508

LINCOLN, NEBRASKA 2001

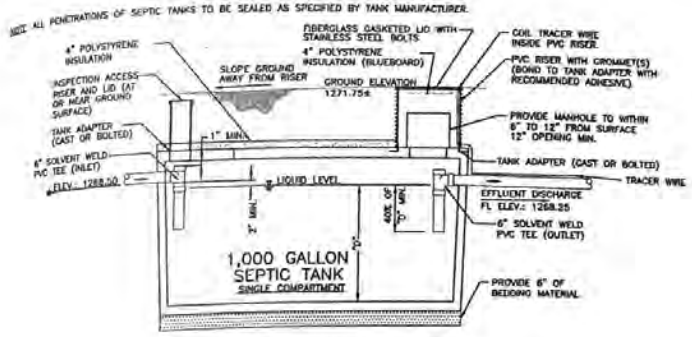
LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

SEWER PLANS & PROFILES

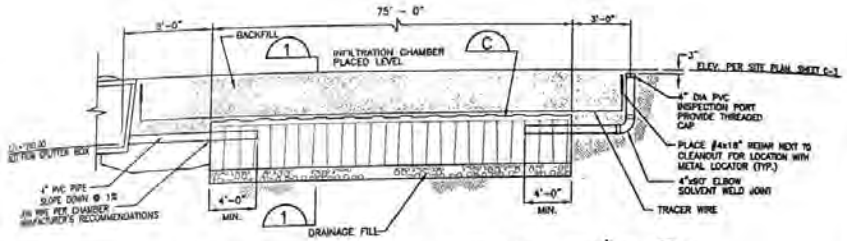
drawn by: CTR
checked by: RCS
approved by: JSO

project no.: 2001-0959
drawing no.: 100223-4
date: 1/07/02

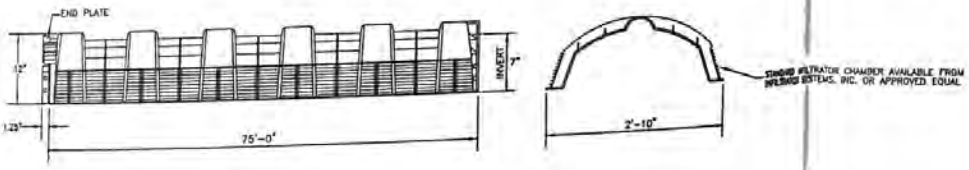
SHEET C-3



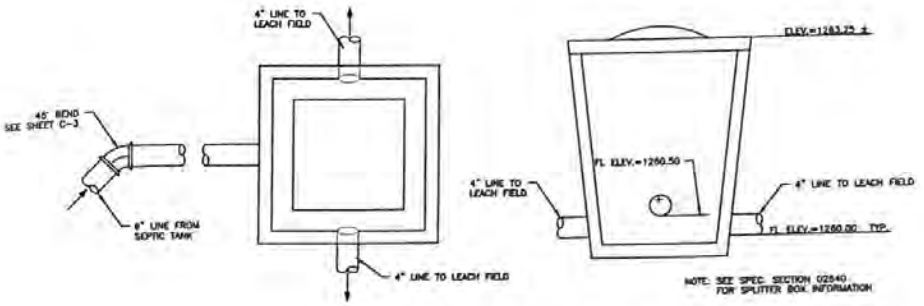
SEPTIC TANK DETAIL (A, C-3)
NOT TO SCALE



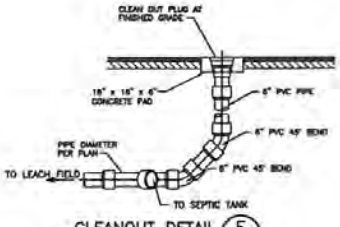
GRAVITY LATERAL – TYPICAL LONGITUDINAL SECTION (B, C-3)
NOT TO SCALE



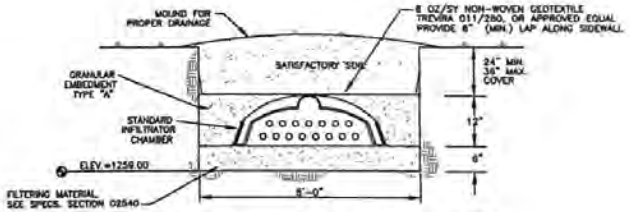
STANDARD INFILTRATOR CHAMBER DETAIL (C)
NOT TO SCALE



SPLITTER BOX DETAIL (D, C-3)
NOT TO SCALE



CLEANOUT DETAIL (E, C-3)
NOT TO SCALE



CHAMBER TRENCH SECTION (1)
NOT TO SCALE

LEGEND :

REVISIONS			
REV. NO	DESCRIPTION	DATE	DRAWN BY

REGISTERED PROFESSIONAL ENGINEER JOHN S. OLSSON 7480 STATE OF NEBRASKA

OLSSON ASSOCIATES
CONSULTING ENGINEERS
1111 Lincoln Mall
Lincoln, NE 68508

LINCOLN, NEBRASKA 2001

LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

SEWER DETAILS

drawn by:	BKN	project no.:	2001-0959
checked by:	RCS	drawing no.:	100223-S
approved by:	JSO	date:	1/07/02

SHEET C-4

...IS NECESSARY THROUGH TREES AS TO ...LEAST AMOUNT OF ROOT DAMAGE.
...ANY LAWN IRRIGATION PIPING OR ...DURING INSTALLATION.
...TO BUILDING AS SHOWN ON DRAWINGS. ...SYSTEMS ARE PROVIDED BY OWNER.

...NOTES: (SYMBOLS ①, ②, ETC.)

...PRESSURE GAS SERVICE TO NEW MAINTENANCE ...OF EXISTING 1-1/4" LINE WITH 1" BORE ...ED CLEARING PAST THE ICE BOX AREA. ...OUT TO THE NEW MAINTENANCE BUILDING. ...EXACT LOCATIONS WITH OWNER.

...3/4" DOMESTIC WATER LINE TO FUTURE ...STATION LOCATION AND CAP. COORDINATE ...WITH OWNER.

...WATER MAIN. INSTALL BACKFLOW ...AND METER VAULT W/ 1" COPPER SERVICE. ...DETAIL SEE THIS SHEET.

...6" HIGH PRESSURE GAS SERVICE. TO ...1-1/4" LINE CAP AND LEAVE 1 1/4" LINE IN ...EXISTING) BUILDING.

...PRESSURE GAS SERVICE BORED UNDER ...BLD. TO THIS CLEARING. OPEN CUT TO ...1/2" SERVICE LINE. COORDINATE EXACT ...WITH OWNER.

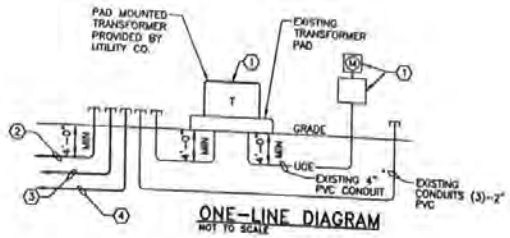
...DRAIN AND CAP EXISTING WATER SUPPLY ...FOUNTAIN AT THE OLD MAINTENANCE ...AND CAP

...NEW PRE-ENGINEERED PUBLIC RESTROOM ...EXIT TO EXISTING SHELTER. COORDINATE ...LOCATION AND REQUIREMENTS. SEE ...NOTE.

...NOTES: (SYMBOLS ① ② ETC.)

...ROUTE FOR UNDERGROUND ELECTRICAL, ...AND CABLE TV SERVICE. FINAL ROUTE ...COORDINATED WITH OWNER IN ORDER TO ...MINIMIZE DAMAGE TO TREE ROOTS. PROVIDE ...BOX LOCATED EVERY 150 FEET FOR ...OF TELEPHONE AND CABLE TV.

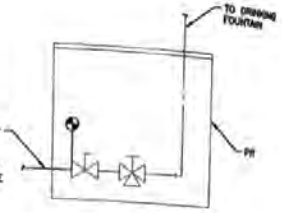
...EXACT LOCATION OF TRANSFORMER, ...SPARE PAD, CONDUIT, ETC. PROVIDED BY ...REFER TO ONE LINE DIAGRAM THIS SHEET. ...FOR UPS FOR TELEPHONE AND CABLE TV ...LOCATED ADJACENT TO TRANSFORMER PAD AND ...BUILDING.



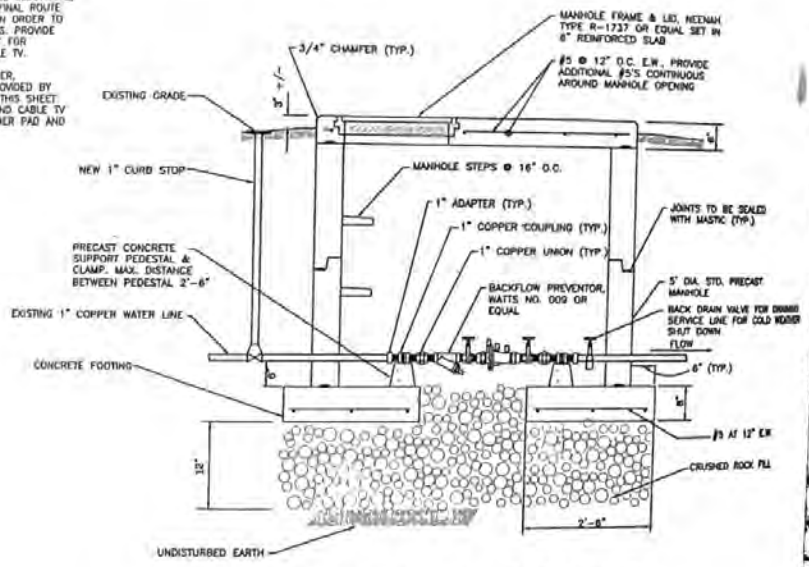
ONE-LINE DIAGRAM
NOT TO SCALE

ONE-LINE DIAGRAM NOTES: (SYMBOLS ①, ②, ETC.)

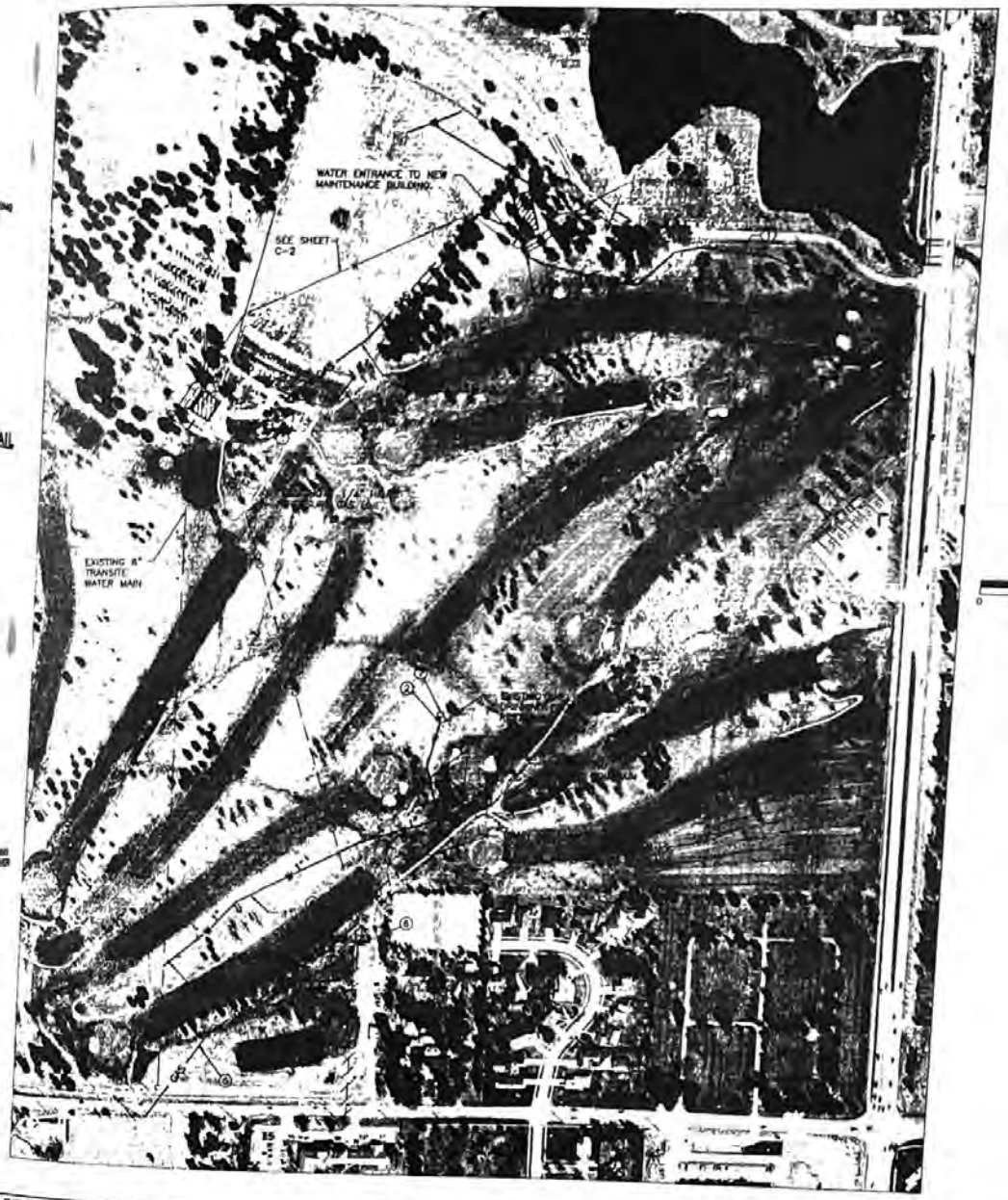
1. COORDINATE ALL SERVICE ENTRANCE REQUIREMENTS WITH UTILITY COMPANY.
2. PROVIDE 2" TELEPHONE SERVICE CONDUIT TO LOCATION SHOWN. OWNER HAS PROVIDED 2" PVC FOR SERVICE ENTRANCE FROM BUILDING TO STUB-OUT LOCATION ADJACENT EXISTING TRANSFORMER PAD. COORDINATE REQUIREMENTS WITH OWNER. REFER TO ROUTE SHOWN ON THIS SHEET. COORDINATE INSTALLATION OF CONDUIT IN COMMON TRENCH WITH ELECTRICAL SERVICE.
3. PROVIDE 2" CABLE TV SERVICE CONDUIT TO LOCATION SHOWN. OWNER HAS PROVIDED 2" PVC FOR SERVICE ENTRANCE FROM BUILDING TO STUB-OUT LOCATION ADJACENT EXISTING TRANSFORMER PAD. COORDINATE REQUIREMENTS WITH OWNER. REFER TO ROUTE SHOWN ON THIS SHEET. COORDINATE INSTALLATION OF CONDUIT IN COMMON TRENCH WITH ELECTRICAL SERVICE.
4. ELECTRICAL SERVICE PRIMARY PROVIDED BY LOCAL UTILITY COMPANY REFER TO ROUTE SHOWN ON THIS SHEET.



EXISTING DRINKING FOUNTAIN DETAIL
NOT TO SCALE



BACKFLOW PREVENTION DEVICE & VAULT
NOT TO SCALE.



LEGEND :

SP	SIGN POLE		DECIDUOUS TREE
TP	TELEPHONE PEDESTAL		SPOT ELEVATION
EM	ELECTRIC METER		TREE MASS
LP	LIGHT POLE	1280	CONTOUR LINE
WV	WATER VALVE	55	STORM SEWER LINE
FH	FIRE HYDRANT		CHAIN LINK FENCE
GW	GUY WIRE		CHAIN FENCE
TR	PAD MOUNTED TRANSFORMER	S	EXISTING SANITARY SEWER
BU	BUSH	SS	NEW SANITARY SEWER
	CONIFEROUS TREE	W	EXISTING WATER
		W	NEW WATER
		GAS	EXISTING GAS
		GAS	NEW GAS
		UGE	UNDERGROUND ELECTRIC
			BUILDING LINE

REVISIONS

REV NO.	DESCRIPTION	DATE	DRAWN BY

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LINCOLN PARKS & REC HOLMES LAKE MAINTENANCE BUILDING UTILITIES

MECHANICAL/ELECTRICAL SITE PLAN

drawn by:	HAD	project no.:	2001-0959
checked by:	DAR	drawing no.:	100223-7
approved by:	JLF	date:	12/17/01

SHEET ME-1