

**CONTRACT DOCUMENTS AND
TECHNICAL SPECIFICATIONS FOR
CITY OF RAMSEY, MINNESOTA
IP 17-09 BUNKER LAKE BOULEVARD
UTILITIES EXTENSION**

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



Leonard Linton, P.E.

Date: May 30, 2017

License No. 21112

Prepared By:

City of Ramsey
Engineering Department
7550 Sunwood Drive N.W.
Ramsey, Minnesota 55303
(763) 427-1410

May 2017

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ADVERTISEMENT FOR BIDS

The City of Ramsey will receive sealed bids until Wednesday, June 21, 2017, at 10:30 a.m. for furnishing all labor, material, machinery and tools necessary for City Improvement Project 17-09, Bunker Lake Boulevard Utilities Extension, at which time bids will be publicly opened at the Ramsey Municipal Center, 7550 Sunwood Drive NW, Ramsey, MN.

The work generally consists of extending sanitary sewer and watermain along 0.27 miles of Bunker Lake Boulevard from Armstrong Boulevard to Puma Street in the City of Ramsey. Primary estimated quantities include 1,453 lineal feet of sanitary sewer, 91 lineal feet of sanitary sewer structures, 1,571 lineal feet of watermain, 2,250 cubic yards of granular borrow, and miscellaneous other improvements.

It is anticipated that a contract will be awarded on June 27, 2017, and that work may begin on or after July 10, 2017. This project shall be completed on or before August 25, 2017.

The contract documents may be examined at the Ramsey Municipal Center, 7550 Sunwood Drive NW, Ramsey, MN 55303. Copies of the contract documents may be obtained at the above address upon receipt of a non-refundable deposit of \$40. The contract documents shall also be available on QuestCDN. These documents may be downloaded by selecting this project and by entering eBidDoc Number 5159764 on the Search Projects page. For assistance and free membership registration, contact QuestCDN at (952) 233-1632 or info@questcdn.com.

All bids shall be submitted in sealed envelopes plainly marked as “IP 17-09, Bunker Lake Boulevard Utilities Extension.” If mailed, the bid should be placed in a separate envelope and mailed to the City address noted above to the attention of the City Engineer.

Each bidder shall submit, with the proposal, a bidder’s bond made payable to the City of Ramsey in the amount of 5% of the total bid. No bidder may withdraw their bid for at least 45 days after the scheduled closing time for the receipt of bids. The City of Ramsey reserves the right to reject any or all bids, and to waive informalities.

By order of the City of Ramsey, Minnesota: May 23, 2017

Published:

Anoka County Union May 26 and June 2, 2017
Finance and Commerce May 26 and June 2, 2017

INFORMATION FOR BIDDERS

BIDS will be received by the CITY OF RAMSEY (hereinafter called the "OWNER") at the Ramsey Municipal Center, 7550 Sunwood Drive NW, Ramsey, MN 55303 until June 21, 2017 at 10:00 a.m., and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to Bruce Westby, City Engineer, at the City of Ramsey. Each sealed envelope containing a BID must be plainly marked on the outside as "IP 17-09; Bunker Lake Boulevard Utilities Extension" and the envelope shall bear on the outside the name of the BIDDER, and their address and license number if applicable. If mailed, bids should be placed in a separate envelope and mailed to the City address noted above to the attention of City Engineer Bruce Westby.

All BIDS must be made on the required BID FORM. All blank spaces for BID prices must be filled out in ink or typewritten and the BID FORM must be fully completed and executed when submitted. Only one (1) copy of the BID FORM is required.

The OWNER may waive any informality or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within thirty (30) days after the actual date of the opening thereof. Should there be reasons why the contract cannot be awarded within the specified period; the time may be extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID schedule by examination of the site and a review of the drawings and specifications, including any ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve the CONTRACTOR from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID BOND in the amount of five percent (5%) of the total amount of the BID, made payable to the Treasurer of the City of Ramsey. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except the three (3) lowest responsible BIDDERS. When the AGREEMENT is executed, the BONDS of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the Payment BOND and Performance BOND have been executed and approved, after which, it will be returned. A certified check may be used in lieu of a BID BOND.

A Performance BOND and a Payment BOND, each in the amount of one hundred percent (100%) of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign BID BONDS or Payment BONDS and Performance BONDS must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the contract is awarded will be required to execute the AGREEMENT and obtain the Performance BOND and Payment BOND within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary AGREEMENT and BOND forms. In case of failure of the BIDDER to execute the AGREEMENT, the OWNER may at its option consider the BIDDER in default; in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER, within ten (10) days of receipt of acceptable Performance BOND, Payment BOND and AGREEMENT signed by the party to whom the AGREEMENT was awarded, shall sign the AGREEMENT and return to such party an executed duplicate of the AGREEMENT. Should the OWNER not execute the AGREEMENT within such period, the BIDDER may give WRITTEN NOTICE to withdraw his signed AGREEMENT. Such notice of withdrawal shall be effective upon receipt of that WRITTEN NOTICE by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the AGREEMENT by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period; the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the AGREEMENT without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the WORK and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the AGREEMENT and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted. Award will be made to the lowest responsible BIDDER.

All applicable laws, ordinances and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to their BID.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER.

The ENGINEER is Bruce Westby, City Engineer, 7550 Sunwood Drive NW, Ramsey, MN 55303; telephone (763) 433-9825.

BID PROPOSAL

This Bid is submitted to the City of Ramsey for City Improvement Project #17-09 – Bunker Lake Boulevard Utilities Extension.

That _____, the undersigned bidder, proposes and agrees, if this bid is accepted, to enter into an agreement with the Owner in the form included in the contract documents to perform and furnish all work as specified or indicated in the contract documents for the Contract Price and within the contract time indicated in this Bid and in accordance with the other terms and conditions of the contract documents.

In submitting this bid, bidder represents, as more fully set forth in the Agreement, that:

- (a) Bidder has examined copies of all bidding documents and of the following addenda (receipt of all which is hereby acknowledged:

- (b) Bidder has familiarized himself with the nature and extent of the contract documents, work, site, locality and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the work.
- (c) Bidder has given Engineer written notice of all conflicts, errors or discrepancies that it has discovered in the contract documents and the written resolution thereof by Engineer is acceptable to bidder.
- (d) This bid is genuine, is not made in the interest of or on behalf of any undisclosed person, firm or corporation, and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; bidder has not directly or indirectly induced or solicited any other bidder to submit a false or sham bid; bidder has not solicited or induced any person, firm or corporation to refrain from bidding and bidder has not sought by collusion to obtain for itself any advantages over any other bidder or over owner.
- (e) Bidder agrees that final completion will occur by August 25, 2017, and agrees to pay liquidated damages as provided for therein.
- (f) A bid bond in the amount of five percent (5%) of the basic bid contained herein is attached. This bid bond shall be forfeited if the bidder fails to execute and file the required contract and bond within ten (10) days after notification of the bid award by the owner.
- (g) The contractor agrees to perform all work described in the contract documents for the following unit prices or lump sum:

BID PROPOSAL

ITEM NO.	MNDOT NO.	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	EXTENSION
1	2021.501	MOBILIZATION	LS	1	_____	_____
2	2101.501	CLEARING AND GRUBBING	ACRE	0.04	_____	_____
3	2104.501	REMOVE WATERMAIN	LF	10	_____	_____
4	2104.505	REMOVE BITUMINOUS PAVEMENT	SY	336	_____	_____
5	2104.513	SAWING BITUMINOUS PAVEMENT – FULL DEPTH	LF	330	_____	_____
6	2104.521	SALVAGE CONCRETE PIPE STORM SEWER	LF	16	_____	_____
7	2104.523	SALVAGE GATE VALVE & BOX	EA	1	_____	_____
8	2104.523	SALVAGE HYDRANT	EA	1	_____	_____
9	2104.523	SALVAGE PIPE APRON	EA	1	_____	_____
10	2105.501	COMMON EXCAVATION (CV)	CY	350	_____	_____
11	2105.521	GRANULAR BORROW (CV)	CY	2,250	_____	_____
12	2105.601	DEWATERING	LS	1	_____	_____
13	2211.503	AGGREGATE BASE CLASS 5 (CV)	CY	70	_____	_____
14	2503.511	8” PVC PIPE SEWER (SDR 26)	LF	120	_____	_____
15	2503.511	18” PVC PIPE SEWER (SDR 26)	LF	1,333	_____	_____
16	2503.602	8” PIPE PLUG (SANITARY)	EA	2	_____	_____
17	2503.602	18” PIPE PLUG (SANITARY)	EA	1	_____	_____

ITEM NO.	MNDOT NO.	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	EXTENSION
18	2503.602	CONNECT TO EXISTING MANHOLE (SANITARY)	EA	1	_____	_____
19	2503.603	CLEAN AND VIDEO TAPE PIPE SEWER (SANITARY)	LF	1,453	_____	_____
20	2504.602	6" GATE VALVE & BOX	EA	2	_____	_____
21	2504.602	8" GATE VALVE & BOX	EA	2	_____	_____
22	2504.602	16" GATE VALVE & BOX	EA	4	_____	_____
23	2504.602	FURNISH HYDRANT	EA	2	_____	_____
24	2504.602	INSTALL HYDRANT	EA	3	_____	_____
25	2504.602	CONNECT TO EXISTING WATERMAIN	EA	1	_____	_____
26	2504.603	6" WATERMAIN DUCTILE IRON CL 53	LF	25	_____	_____
27	2504.603	8" WATERMAIN DUCTILE IRON CL 52	LF	121	_____	_____
28	2504.603	16" WATERMAIN DUCTILE IRON CL 52	LF	1,412	_____	_____
29	2504.608	DUCTILE IRON FITTINGS	LBS	867	_____	_____
30	2506.516	CASTING ASSEMBLY (SANITARY)	EA	5	_____	_____
31	2506.521	INSTALL CASTING	EA	5	_____	_____
32	2506.601	CONSTRUCT SANITARY SEWER STRUCTURE DESIGN 48-4007	LF	91.0	_____	_____
33	2563.601	TRAFFIC CONTROL	LS	1	_____	_____

ITEM NO.	MNDOT NO.	ITEM DESCRIPTION	UNIT	QUANTITY	PRICE	EXTENSION
34	2573.503	SILT FENCE	LF	450	_____	_____
35	2573.530	STORM DRAIN INLET PROTECTION	EA	2	_____	_____
36	2573.533	SEDIMENT CONTROL LOG TYPE STRAW	LF	150	_____	_____
37	2574.508	FERTILZER TYPE 3	LBS	276	_____	_____
38	2575.501	HYDROSEEDING MNDOT MIXTURE 21-111	ACRE	1.41	_____	_____
39	2575.502	MNDOT SEED MIXTURE 21-111	LBS	141	_____	_____
40	2575.560	HYDRAULIC MATRIX TYPE MULCH	LBS	2820	_____	_____
TOTAL BID LINES 1-40					_____	_____

This Bid Submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individuals Signature)

Doing Business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type: _____

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Date of Qualification to do business in Minnesota is: _____

A Joint Venture

Name of Joint Venture: _____ (SEAL)

First Joint Venturer Name: _____

By: _____
(Signature of first joint venture partner – attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____

By: _____
(Signature of second joint venture partner – attach evidence of authority to sign)

(Each joint venture must sign. The manner of signing for each individual, partnership, and corporation that is party to the joint venture should be in the manner indicated above.)

Bidders Business Address: _____

Phone: _____ Facsimile: _____

Submitted on _____, 2017

State Contractor License No. _____. (If Applicable)

S-1 RESPONSIBLE CONTRACTOR

In accordance with Laws of Minnesota, 2014, chapter 253 (Minnesota Statutes §16C.285), Bidders are hereby advised that the Department cannot award a construction contract in excess of \$50,000 unless the contractor is a “responsible contractor” as defined in Minnesota Statutes §16C.285, subdivision 3. A bidder submitting a Proposal for this Project must verify that it meets the minimum criteria specified in Minnesota Statutes §16C.285, subdivision 3, by completing the Responsible Contractor Certificate within this Proposal. Statements in the certificate must be certified by a company officer. Bidders are responsible for obtaining verifications of compliance from all subcontractors, using a form provided by the Department. A bidder must submit signed verifications from subcontractors upon the Department’s request.

A Bidder or subcontractor who does not meet the minimum criteria established in Minnesota Statutes §16C.285, subdivision 3, or who fails to verify compliance with the minimum requirements, will not be a “responsible contractor” and will be ineligible to be awarded the Contract for this Project or to work on this Project. Bidders and subcontractors are also advised that making a false statement verifying compliance with any of the minimum criteria will render the Bidder or subcontractor ineligible to be awarded a construction contract for this Project and may result in the termination of a contract awarded to a Bidder or subcontractor that makes a false statement.

S-2 (1801) SUBLETTING OF CONTRACT **REVISED 11/24/14**

The provisions of MnDOT 1801 are modified as follows:

S-2.1 For Projects in excess of \$50,000, the Contractor may sublet work only to subcontractors that meet the definition of “responsible contractor” in Minnesota Statutes §16C.285, subdivision 3. The Contractor is responsible for obtaining verifications of compliance with §16C.285 from subcontractors using a form provided by the Department. The Contractor must provide such verifications to the Department upon the Department’s request.

S-2.2 The third paragraph of MnDOT 1801 is modified to read:

On Contracts with Disadvantaged Business Enterprise (DBE), the Contractor's organization shall perform Work amounting to not less than 30 percent of the total original Contract Amount. The Department will deduct specialty items from the total original Contract Amount before calculating the amount of Work that the Contractor shall perform.

STATE OF MINNESOTA - RESPONSIBLE CONTRACTOR CERTIFICATE

Applies to all prime contracts in excess of \$50,000

A responsible contractor is defined in Minnesota Statutes §16C.285, subdivision 3.

Any prime contractor or subcontractor who does not meet the minimum criteria under Minnesota Statutes §16C.285, subdivision 3, or who fails to verify that it meets those criteria, is not a responsible contractor and is not eligible to be awarded a construction contract for the project or to perform work on the project.

A false statement under oath verifying compliance with any of the minimum criteria shall render the prime contractor or subcontractor that makes the false statement ineligible to be awarded a construction contract for the project and may result in termination of a contract awarded to a prime contractor or subcontractor that makes a false statement.

A prime contractor shall submit to the contracting authority upon request copies of the signed verifications of compliance from all subcontractors of any tier pursuant to subdivision 3, clause 7.

By signing this statement, I, _____(typed or printed name),
_____(title) certify that I am an owner or officer of the company and do verify under oath that my company is in compliance with each of the minimum criteria listed in the law.

(name of the person, partnership or corporation submitting this proposal)

(business address)

Signed: _____
(bidder or authorized representative)

Date

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ARTICLE 1. Definitions

The following words, phrases or terms hereinafter used in the agreement of any contract documents shall be interpreted according to each designated meaning as follows:

1.1 Addenda: Written or graphic instruments issued prior to the execution of the agreement which modify or interpret the contract documents, drawings and specifications, by additions, deletions, clarifications or corrections.

1.2 Agreement: The written agreement between the Owner and the Contractor covering the work to be performed, including all contract documents.

1.3 Bid Guaranty: The term means the security designated in the contract documents to be furnished by the bidder as a guaranty of good faith to enter into a contract with the Owner if the work is awarded to him.

1.4 Bid Proposal: The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.

1.5 Bidder: Any individual, partnership, or corporation submitting a proposal for the work to be completed.

1.6 Calendar Day: Every day shown on the calendar.

1.7 Change Order: A written order to the Contractor signed by the Owner authorizing an addition, deletion or revision in the work, or an adjustment in the contract price or the contract time issued after execution of this agreement.

1.8 Contract Bonds: Performance, labor and material payment bonds, maintenance or guarantee-instruments of security, furnished by the Contractor and his surety in accordance with the contract documents.

1.9 Contract Documents: The contract documents shall consist of the following:

- (1) Legal and Procedural Documents
 - a. Advertisements for Bids
 - b. Information for Bidders
 - c. Executed Bid Form
 - d. Executed Bid Guaranty
 - e. Executed Agreement
 - f. Executed Bond
 - g. Notice of Award
 - h. Notice to Proceed
- (2) Special Provisions
- (3) Technical Provisions
- (4) General Conditions
- (5) Executed Payment Forms

- (6) Drawing(s)
 - (7) All addenda issued by the Engineer prior to the time of the opening of the bids.
 - (8) Supplemental Agreements & Change Orders
- 1.10 Contract Price: The total monies payable to the Contractor under the contract documents.
- 1.11 Contract Time: The number of calendar days stated in the contract documents for the completion of the work.
- 1.12 Contractor: The individual, partnership, or corporation undertaking the execution of the work under the terms of the contract and acting directly or through a duly authorized representative.
- 1.13 Engineer: By the term "Engineer" is meant City Engineer for the City of Ramsey, who has been appointed by the Owner to take charge of the work contemplated by these specifications and accompanying drawings and is designated and referred to in these specifications as the "Engineer". (The Engineer or Owner may appoint an authorized representative or inspector, limited in authority, assigned to make inspection of the work performed and materials furnished by the Contractor. Such a representative has no authority to order or permit deviation from plans and specifications.)
- 1.14 Field Order: A written order affecting a change in the work not involving an adjustment in the contract price or an extension of the contract time, issued by the Engineer to the Contractor during construction.
- 1.15 Final Completion: That date as certified by the Engineer when construction of the project is complete in accordance with the contract documents, such that all work has been paid, minus retainage.
- 1.16 Notice of Award: The written notice of the acceptance of the bid issued by the Owner to the Successful bidder.
- 1.17 Notice to Proceed: The written notice issued by the Owner to the Contractor authorizing him to proceed with the work and establishing the date of commencement of the work.
- 1.18 Owner: A private, public or quasi-public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.
- 1.19 Plans: The term means the official drawings, plans, profiles, elevation, cross sections and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of work to be performed. All such drawings, as listed elsewhere in the contract documents, are a part of the plans whether attached to the contract documents or separate therefrom.
- 1.20 Project: The undertaking to be performed as provided in the contract documents.
- 1.21 Project Representative: The term means an authorized representative of the Engineer, assigned to make any or all necessary inspections of the work performed and the materials furnished by the Contractor.

1.22 Shop Drawings: All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor and which illustrate the equipment, material or some portion of the work.

1.23 Special Provisions: The term means contract requirements peculiar to the project which are not otherwise thoroughly or satisfactorily detailed and set forth in the standard detail specifications or plans.

1.24 Specifications: The term means the directions, provisions, and requirements contained herein, together with all written agreements made or to be made pertaining to the method and manner of performing the work, or to the quantities and qualities of materials to be furnished under the contract.

1.25 Subcontractor: The term means those having a direct contract with the Contractor and it includes one who furnished materials worked to a special design according to the plans and specifications of this work, but does not include one who merely furnishes material so worked.

1.26 Substantial Completion: That date as certified in writing by the Engineer when the construction of the project or a specified part thereof is sufficiently complete in accordance with the contract documents for use by the Owner.

1.27 Supplemental General Conditions: Modification to the general conditions that supplement, add to, delete from or change the articles therein.

1.28 Surety: The Guarantor for the Contractor who, with the Contractor, signs an instrument or instruments known as the bond or bonds guaranteeing that the Contractor will fully comply with the plans, specifications and agreements.

1.29 Work: The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

Abbreviations

A.A.S.H.O.: The American Association of State Highway Officials. All references to A.A.S.H.O. specifications or methods of tests shall be understood to refer to their latest published edition of the "Standard Specifications for Highway Materials and Methods of Sampling and Testing".

A.N.S.I.: American National Standards Institute, Inc. All references to A.N.S.I. specifications shall be understood to refer to their latest published edition.

A.S.A.: The American Standards Association. All references to A.S.A. specifications shall be understood to refer to their latest published edition.

A.S.T.M.: The American Society for Testing Materials. All references to A.S.T.M. specifications or methods shall be understood to refer to their latest published edition of the A.S.T.M. Standards.

A.W.W.A.: The American Water Works Association. All references to A.W.W.A. specifications shall be understood to refer to their latest published edition.

MnDOT: The Minnesota Department of Transportation. All references to MnDOT specifications shall be understood to refer to their latest published edition.

M.S.S.: Minnesota State Statutes. All references to M.S.S. shall be understood to refer to the latest published edition.

ARTICLE 2. Progress and Submission Schedule; Pre-Construction Conference; Time of Starting Work

2.1 Within 10 Calendar Days after execution of this Agreement, the Contractor shall prepare and submit to the Engineer for review an estimated progress schedule indicating the starting and completion dates of the various stages of the Work and a schedule of Shop Drawing submissions.

2.2 Before starting the Work, a conference will be held to review the above schedules, to establish procedures for handling Shop Drawings and other submissions and to establish a working understanding between the parties as to the Project. Present at the conference will be the Engineer, Project Representative, the Contractor, his superintendent, the Owner and any others who may have an interest in the Project.

2.3 Prior to starting the Work, the Contractor will furnish the Engineer certificates of insurance as required by the appropriate provisions of the Contract Documents.

2.4 The Work contemplated hereunder shall be commenced within ten (10) Calendar Days after receipt by the Contractor of written Notice to Proceed from the Engineer and shall be completed within the time limits set forth in the Special Provisions or as specified elsewhere in the Contract Documents.

2.5 If the Contractor is delayed in the performance of the Work by any neglect of Owner or Engineer, or by an employee, agent or representative of either, or by changes ordered in the Work, or by the combined action of workmen (either those employed on the Work or in any industry essential to the conduct of the Work) in no way caused by or resulting from the default or collusion on the part of the Contractor, or by strikes, lockouts, embargoes, fire, unavoidable casualties, unusual delays in transportation, national emergency, or by any other causes which Contractor could not reasonably control or circumvent, the scheduled completion date and interim completion dates shall be extended for a period equal to the length of such delay if within five Calendar Days after expiration of any such delay Contractor delivers to Engineer a written request for extension for such delay, and such request is approved by the Owner or Engineer, which approval shall not be unreasonably withheld by Owner or Engineer. In case of a continuing cause of delay of a particular nature, Contractor shall be required to make only one such request with respect thereto. Extension of time shall be the Contractor's sole remedy for any such delay (except for Contractor's right to terminate this Agreement pursuant to the provisions of Article 43 hereinafter), unless the same shall be caused by acts constituting intentional interference by the Owner or Engineer with Contractor's performance of the Work and where to the extent that such acts continue after Contractor's notice to Owner or Engineer of such interference. Owner's or Engineer's exercise of any of its rights under Article 20, Changes in the Work, regardless

of the extent or number of such changes, or Owner's exercise of any of its remedies of suspension of the Work, or requirement of correction or re-execution of any defective Work, shall not under any circumstances be construed as intentional interference with Contractor's performance of the Work.

2.6 All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

ARTICLE 3. Plans and Specifications

3.1 It is the intent of the Specifications and Plans to describe a complete Project to be constructed in accordance with the Contract Documents.

3.2 The Contract Documents are complementary; what is called for by one is as binding as if called for by all. If the Contractor finds a conflict, error or discrepancy in the Contract Documents, he will call it to the Engineer's attention in writing before proceeding with the Work affected thereby. In resolving such conflicts, errors and discrepancies, the Contract Documents shall be given precedence in the following order: Agreement, Specifications, Plans. Within the Specifications, the order of precedence shall be as follows: Special Provisions, Addenda, General Conditions, Technical Specifications Provisions. Figure dimensions on Plans shall govern over scale dimensions, and detailed Plans shall govern over general Plans. Any Work that may reasonably be inferred from the Specifications or Plans as being required to produce the intended results shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

ARTICLE 4. Detailed Drawings and Instructions

4.1 Unless otherwise provided, the Contractor shall furnish all labor, materials, equipment, tools, transportation, supplies and incidentals which may be necessary to construct and complete the Work in accordance with the Contract Documents.

4.2 The Engineer will furnish to the Contractor with reasonable promptness additional instructions by means of drawings and/or otherwise necessary information for the proper execution of the Work when, in the opinion of the Engineer, such are required. All drawings and instructions shall be consistent with the Plans and Specifications, true developments thereof, and reasonably inferable therefrom. The Contractor shall do no Work without proper drawings and instructions. In giving such additional instructions, the Engineer shall have authority to make minor changes in the Work, not involving extra cost, and not inconsistent with the purpose of the Work.

4.3 The Contractor shall submit, with such promptness as to cause no delay in the Work or in that of any other Contractor, three (3) copies of all Shop (or setting) Drawings and schedules required for the Work of the various trades and the Engineer shall pass upon them with reasonable promptness. The Contractor shall make any corrections required by the Engineer, file with the Engineer two (2) corrected copies and furnish such other copies as may be needed. The Engineer's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviation from Plans or Specifications, unless the Contractor has, in writing, called the Engineer's attention to such deviation at the time of

submission, nor shall it relieve the Contractor from responsibility for errors of any sort in Shop Drawings or schedules.

4.4 Unless otherwise set forth in the Contract Documents or bidding documents, it shall be the Contractor's sole responsibility to determine subsoil conditions prior to the bidding of the job. If under the terms of the Contract Documents, the responsibility for subsoil conditions is with the Contractor, Contractor hereby represents that he has inspected the location or locations of the Work and has satisfied himself as to the condition thereof, including subsoil conditions, and that the Contract Price as set forth herein is just and reasonable compensation for all Work, including all foreseen or unforeseeable risks, hazards, and difficulties in connection therewith.

4.5 The Engineer will furnish and set stakes as may be necessary for the Contractor in order that the Contractor may construct the Work to the proper grade and alignment.

4.6 The Contractor shall carefully preserve benchmarks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

4.7 The Engineer shall furnish such survey lines and grades as may be necessary for the proper control of the Work; but this shall not relieve the Contractor of responsibility for making careful and accurate measurements and for constructing the Work accurately to the lines furnished by the Engineer. The Contractor shall give the Engineer reasonable notice of his requirements for such survey lines and grade as the Contractor may require.

4.8 The Contractor shall furnish and place, as directed, all necessary guide boards and appurtenances and give such other incidental assistance at the Work site as may be required by the Engineer, for staking out the Work. The Contractor's working operations which interfere with the activities of the Engineer shall be temporarily suspended for such reasonable time as the Engineer may deem necessary. The Contractor shall carefully preserve the points furnished by the Engineer and shall receive no extra compensation for any materials or services furnished by the Contractor incidental to these operations of the Engineer.

ARTICLE 5. Ownership and Copies of Documents, Record Documents and Security Thereof

5.1 All Specifications, Plans and copies thereof furnished by the Owner, through the Engineer, shall remain the Owner's property. They shall not be used on another project, and, with the exception of those sets which have been signed in connection with the execution of the Agreement, shall be returned to the Owner upon completion of the Project.

5.2 The Owner, through the Engineer, will furnish to the Contractor up to three (3) copies of the Specifications and Plans as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

5.3 The Contractor will keep one record copy of all Specifications, Plans, Addenda, modifications, and Shop Drawings at the Work site in good order and annotated to show all changes made during the construction process. These shall be made available to the Engineer as the Project is completed.

ARTICLE 6. Patent Fees and Royalties

The Contractor will pay all license fees and royalties and assume all costs incidental to the use of any invention, design, process or device which is the subject of patent rights or copyrights held by others. The Contractor will indemnify and hold harmless the Owner and the Engineer and anyone directly or indirectly employed by the Owner from and against all claims, damages, losses and expenses (including attorney's fees) arising out of any infringement of such rights during or after completion of the Work, and shall defend all such claims in connection with any alleged infringement of such rights.

ARTICLE 7. Work by Others and Subcontractors

7.1 The Owner may perform additional work related to the Project or may let other direct contracts therefrom which shall contain general conditions similar to these. The Contractor will afford the other contractors who are parties to such direct contracts (or the Owner, if performing the additional work), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate the Work with other contractors.

7.2 If any part of the Contractor's Work depends upon the work of any such other contractor (or the Owner) for proper execution or results, the Contractor will inspect and promptly report to the Engineer in writing any defects or deficiencies in such work that render it unsuitable for such proper execution and results. The Contractor's failure to report shall constitute an acceptance of the other work as fit and proper for the relationship of his Work except as to defects and deficiencies which may appear in the other work after the execution of this Work.

7.3 The Contractor will do all cutting, fitting and patching of the Work that may be required to make several parts come together properly and fit to receive or be received by such other work. The Contractor will not endanger any work of others by cutting, excavating or otherwise altering other's work and will only cut or alter their work with the written consent of the Engineer.

7.4 Within 10 Calendar Days of execution of this Agreement, the Contractor will submit to the Engineer for acceptance a list of the names of Subcontractors and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for those portions of the Work for which the identity of the Subcontractors and other persons and organizations must be submitted as specified in the Contract Documents. Prior to the execution of the Work, the Engineer will notify the Contractor in writing if either the Owner or the Engineer, after due investigation, has reasonable objection to any Subcontractor, person or organization on such list. The failure of the Owner or the Engineer to make objection to any Subcontractor, person or organization on the list prior to the execution of the Work shall constitute an acceptance of such Subcontractor, person or organization. Acceptance of any such Subcontractor, person or organization shall not constitute a waiver of any right of the Owner or the Engineer to reject defective workmanship, material, equipment, employees of the Contractor, or Work, material or equipment not in conformance with the requirements of the Contract Documents.

7.5 If, prior to the commencing of the Work, the Owner or the Engineer has reasonable objection to and refuses to accept any Subcontractor, person or organization on such list, the Contractor may,

prior to such commencement, either 1) submit an acceptable substitute without an increase in his Contract Price or 2) withdraw his bid and forfeit his bid security. If, after the commencement of the Work, the Owner or the Engineer refuses to accept any Subcontractor, person or organization on such list, the Contractor will submit an acceptable substitute and the Contract Price shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued; however, no such increase in the Contract Price shall be allowed in respect of any substitution unless the Contractor has acted promptly and reasonably in submitting a name with respect thereto prior to the execution of the Work.

7.6 The Contractor will not employ any Subcontractor (whether initially or as a substitute) against whom the Owner or the Engineer may have reasonable objection, nor will the Contractor be required to employ any Subcontractor against whom the Contractor has reasonable objection. The Contractor will not make any substitution for any Subcontractor who has been accepted by the Owner and the Engineer, unless the Engineer determines that there is good cause for doing so.

7.7 The Contractor will be fully responsible for all acts and omissions of his Subcontractors and of persons directly employed by them and of persons for whose acts any of them may be liable to the same extent that the Contractor is responsible for the acts and omissions of persons directly employed by the Contractor. Nothing in the Contract Documents shall create any contractual relationship between any Subcontractor and the Owner or the Engineer or any obligation on the part of the Owner.

7.8 The divisions and sections of the Specifications and the identifications of any Plans shall not control the Contractor in dividing the Work among Subcontractors or delineating the Work to be performed by any trade.

7.9 The Contractor agrees to specifically bind every Subcontractor to all of the applicable terms and conditions of the Contract Documents. Every Subcontractor, by undertaking to perform any of the Work, will thereby automatically be deemed to be bound by such terms and conditions.

7.10 All Work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with Contract Documents. The Contractor shall upon request from the Engineer provide copies of the written subcontract agreements to the Engineer. The Contractor will pay each Subcontractor a just share of any insurance monies received by the Contractor.

ARTICLE 8: Materials, Equipment and Labor; Substitute Material or Equipment

8.1 The Contractor will provide and pay for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the Work.

8.2 The Contractor covenants that all Work shall be done in a good and workmanlike manner and that all materials furnished and used in connection therewith shall be new and approved by the Engineer, except as otherwise expressly provided for in the Plans and Specifications.

8.3 If it is indicated in the Specifications that the Contractor may furnish or use a substitute that is equal to any material or equipment specified, and if the Contractor wishes to furnish or use a proposed substitute, the Contractor will, promptly after the Notice of Award, make written application to the Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the duties imposed by the general design, be similar and/or equal substance to that specified and be suited to the same use and capable of performing the same function as that specified. No substitute shall be ordered or installed without the written approval of the Engineer who shall be the judge of equality.

8.4 All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise specifically provided in the Contract Documents.

ARTICLE 9. Errors, Omissions, Etc.

Should it appear that the Work here intended to be done or any of the materials or matters relative thereto are not sufficiently detailed or explained on the Plans or in the Specifications, or should any error, discrepancy or inconsistency appear between any of the Plans and the Specifications, the Engineer shall furnish additional drawings, details or explanations and shall have power to interpret, correct, adjust and explain all errors, omissions, discrepancies, doubts and misunderstandings between such Plans and Specifications, or between several drawings and Specifications, or between several drawings, and the decision of the Engineer therein shall be final and conclusive.

ARTICLE 10. Permits Laws Taxes and Regulations

10.1 The Contractor will secure and pay for all construction permits and licenses and will pay all governmental and public utility charges and inspection fees necessary for the performance of the Work.

10.2 If the Contractor observes that the Specifications or Plans are at variance therewith, the Contractor will give the Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate modification. If the Contractor performs any of the Work knowing or when with the exercise of due care he should have known, it be contrary to any such laws, ordinances, rules and regulations applicable to said Work and fails to give the Owner or Engineer notice thereof prior to the performance thereof, Contractor shall bear all costs, including reasonable attorney's fees, arising therefrom. Further, Contractor shall observe and abide by and perform all of its obligations hereunder in accordance with all applicable laws, rules and regulations of all governmental authorities having jurisdiction, including the Federal Occupational, Safety and Health Act. Contractor agrees to take affirmative action to not discriminate against any employee or applicant for employment because of race, creed, color or national origin. To the extent applicable, Contractor will comply with all provisions of any executive orders and any rules, regulations, orders, instructions, designations and other directives promulgated by any governmental unit with jurisdiction thereof. Violation of this

provision, after notice, shall be a material breach of this Agreement and may result, at the Owner's option, in a termination or suspension of this Agreement in whole or in part.

10.3 The Contractor will pay all sales, consumer, use and other similar taxes required by the law of the place where the Work is to be performed.

ARTICLE 11. Availability of Lands; Physical and Subsurface Conditions; Reference Points

11.1 The Owner will provide, as indicated in the Contract Documents and not later than the date when needed by the Contractor, the lands upon which the Work is to be done, rights-of-way for access thereto, and such other lands which are designated for the use of the Contractor, the Contractor will provide all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

11.2 The Contractor will properly notify the Owner and Engineer in writing of any subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents. The Engineer will promptly investigate those conditions and advise the Owner in writing if further surveys or subsurface tests are necessary. Promptly thereafter, the Owner will obtain the necessary additional surveys and tests and furnish copies to the Engineer and the Contractor. If the Engineer finds that the results of such surveys or tests indicate subsurface or latent physical conditions differing significantly from those indicated in the Contract Documents, a Change Order shall be issued incorporating the necessary revisions.

11.3 The Engineer will establish such general reference points as in his judgment will enable the Contractor to proceed with the Work. The Contractor will be responsible for the layout of the Work and will protect and preserve the established reference points and will make no changes or relocations without the prior written approval of the Owner and Engineer. He will report to the Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. The Contractor will replace and accurately relocate all reference points so lost, destroyed or moved.

ARTICLE 12. Use of Premises

12.1 The Contractor will confine his equipment, the storage of materials and equipment and the operations of his workmen to areas permitted by law, ordinances, permits or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.

12.2 The Contractor will not load nor permit any part of the structure to be loaded with weights that will endanger the structure, nor will he subject any part of the Work to stresses or pressures that will endanger it.

ARTICLE 13. Engineer's Status During Construction

13.1 The Engineer shall be the Owner's representative during the construction period. All instructions of the Owner to the Contractor shall be issued through the Engineer. The duties and responsibilities and the limitations of authority of the Engineer as the Owner's representative during

construction are set forth in all Articles of these General Conditions and shall not be extended without written consent of the Owner and the Engineer.

13.2 The Engineer will make regular visits to the Work site to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. The Engineer's efforts will be directed toward providing assurance for the Owner that the completed Project will conform to the requirements of the Contract Documents. On the basis of the Engineer's on-site observations as an experienced and qualified design professional, he will advise the Owner as to the progress of the Work and the performance of the Contractor.

13.3 The Engineer will have authority to disapprove of or reject Work which is defective; i.e., is unsatisfactory, faulty or defective, or does not conform to the requirements of the Contract Documents or does not meet the requirements of any inspection, test or approval. The Engineer will also have authority to require special inspection or testing of the Work whether or not the Work is fabricated, installed or completed.

13.4 The Engineer will provide one or more full-time resident Project Representatives to assist the Engineer in carrying out his responsibilities at the Work site during construction activity. The duties, responsibilities and limitations of authority of any such resident project representative shall be as set forth in the pre-construction meeting held by the Engineer.

13.5 Neither the Engineer's authority to act under this article nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the Engineer to the Contractor, any Subcontractor, any of their agents or employees or any other person performing any of the Work.

ARTICLE 14. Engineer's Interpretations and Decisions

14.1 The Engineer will issue with reasonable promptness such written clarifications or interpretations to be consistent with or reasonably inferable from the overall intent of the Contract Documents.

14.2 The Engineer will be the initial interpreter of the terms and conditions of the Contract Documents and the judge of the performance thereunder. In his capacity as interpreter and judge, the Engineer will exercise his best efforts to insure faithful performance by the Contractor. The Engineer will not show partiality and shall not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes and other matters relating to the execution and progress of the Work or the interpretation of or performance under the Contract Documents shall be referred initially to the Engineer for decision, which the Engineer shall render in writing within a reasonable time.

ARTICLE 15. Shop Drawings and Samples

15.1 After checking and verifying all field measurements, the Contractor will submit to the Engineer for approval, in accordance with the accepted schedule of Shop Drawing submissions, five copies (or at the Engineer's option, one reproducible copy) of all Shop Drawings, which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The

data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable the Engineer to review the information as required.

15.2 The Contractor will also submit to the Engineer for approval, with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

15.3 At the time of each submission, the Contractor will, in writing, call the Engineer's attention to any deviations that the Shop Drawing or sample may have from the requirements of the Contract Documents.

15.4 The Engineer will check and approve with reasonable promptness Shop Drawings and samples; however, checking and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. The Contractor will make any corrections required by the Engineer and will return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by the Engineer on previous submissions.

15.5 No Work requiring a Shop Drawing or sample submission shall be commenced until the submission has been approved by the Engineer.

15.6 The Engineer's approval of Shop Drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to such deviations at the time of submission and the Engineer has given written approval to the specific deviation, nor shall any approval by the Engineer relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

ARTICLE 16. Tests and Inspections

16.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness thereof. The Contractor will give the Engineer the required certificates of inspection, testing or approval. All such tests will be in accordance with the methods prescribed by the American Society for Testing and Materials or such other applicable organization as may be required by law or the Contract Documents. If any such Work required so to be inspected, tested, or approved is covered up without written approval or consent of the Engineer, it must, if directed by the Engineer, be uncovered at the Contractor's expense for observation. The cost of all such inspections, test and approvals shall be borne by the Owner unless otherwise provided.

16.2 Any Work which fails to meet the requirements of any such test, inspection or approval and any Work which meets the requirements of any such test or approval but does not meet the requirements of the Contract Documents shall be considered defective. Such defective Work may be rejected, corrected

or accepted as provided elsewhere in the Contract Documents. The costs of all retests and follow up inspections shall be borne by the Contractor.

16.3 Neither observations by the Engineer nor inspections, tests or approvals by persons other than the Contractor shall relieve the Contractor from his obligations to perform the Work in accordance with the requirements of the Contract Documents.

ARTICLE 17 Contractor's Supervision and Superintendence

17.1 The Contractor will supervise and direct the Work efficiently and with skill and attention. The Contractor will be solely responsible for the means, methods, techniques, sequences and procedures of construction. Before undertaking the Work the Contractor will carefully study and compare the Contract Documents and check and verify all figures shown thereon and all field measurements. The Contractor will at once report in writing to the Engineer any conflict, error or discrepancy which he may discover. The Contractor will be responsible to see that the finished Work complies accurately with the Contract Documents.

17.2 The Contractor will keep on the Work site at all times during its progress a resident superintendent satisfactory to the Engineer. The superintendent shall not be replaced without the consent of the Engineer except under extraordinary circumstances. The superintendent will be the Contractor's representative at the site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be as binding as if given to the Contractor.

17.3 The Contractor will provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. He will at all times maintain good discipline and order among his employees and the employees of his Subcontractors at the Work site.

17.4 The Engineer and/or Owner will not be responsible for the acts or omissions of the Contractor, or any Subcontractors, or any agents or employees or any other persons performing any of the Work.

ARTICLE 18. Safety and Protection: Emergencies

18.1 The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to:

18.1.1 All employees on the Work and other persons who may be affected thereby;

18.1.2 All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the Work site; and

18.1.3 Other property at the Work site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

18.2 The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Contractor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection, including posting danger signs and other warnings against hazards and promulgating safety regulations. The Contractor will notify owners of adjacent utilities when execution of Work may affect them. When the use or storage of explosives or other hazardous materials is necessary for the performance of the Work, the Contractor will exercise the utmost care and will carry on such activities under the supervision of properly qualified personnel. All damage, injury or loss to any property referred to in this paragraph caused, directly or indirectly, in whole or in part, by the Contractor, or Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, will be remedied by the Contractor, except damage or loss attributable to the fault of Plans or Specifications or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.

18.3 The Contractor will designate a responsible employee at the Work site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner and the Engineer.

18.4 In emergencies affecting the safety of persons or the Work or property at the Work site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer, is obligated to act, at his discretion, to prevent threatened damage, injury or loss. The Contractor will give the Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved if said emergency is not a direct cause of the neglect of the Contractor or Subcontractor or a deviation by the Contractor from any of the provisions of the Contract Documents.

ARTICLE 19. Access to the Work: Uncovering Finished Work

19.1 The Engineer will at all times have access to the Work. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof by others.

19.2 If any Work is covered contrary to the request of the Engineer, it must, if requested by the Engineer, be uncovered for observation and replaced at the Contractor's expense.

19.3 If any Work has been covered which the engineer has not specifically requested to observe prior to its being covered, or if the Engineer considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such

Work is defective or does not meet the requirements of the Contract Documents, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, and an appropriate Change Order shall be issued depicting all such costs from the Contract Price. If, however, such Work is found to be non-defective and meets the requirements of the Contract Documents, the Contractor will be allowed an increase in the Contract Price or extension of the Contract Time directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction, provided the Engineer first obtained uncovering approval from the Owner.

ARTICLE 20. Changes in the Work

20.1 Without invalidating the Agreement, the Owner may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by Change Orders. Upon receipt of a Change Order, the Contractor will proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any Change Order causes an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, an equitable adjustment will be made as provided in the Contract Documents.

20.2 The Engineer may authorize minor changes or alterations in the Work not involving extra cost and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order.

20.3 Additional Work performed by the Contractor without authorization of a Change Order will not entitle him to an increase in the Contract Price or an extension of the Contract Time, except in the case of an emergency as provided in elsewhere herein.

20.4 The Owner will execute any appropriate Change Order prepared by the Engineer covering changes in the Work to be performed and work performed in an emergency and any other claim of the Contractor for a change in the Contract Time or the Contract Price which is approved by the Owner and Engineer.

20.5 It is the Contractor's responsibility to notify his Surety of any changes affecting the general scope of the Work or changes in the Contract Price and the amount of the applicable bonds shall be adjusted accordingly. The Contractor will furnish proof of such adjustment to the Engineer upon its occurrence.

ARTICLE 21. Change of the Contract Price

21.1 The Contract Price constitutes the total compensation payable to the Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by the Contractor shall be at the Contractor's expense without change in the Contract Price.

21.2 The Contract Price may only be changed by a Change Order. If the Contractor is entitled by the Contract Documents to a change in the Contract Price, the claim shall be in writing delivered to the Engineer within five (5) calendar days of the occurrence of the event giving rise to the claim. All valid

claims for adjustments in the Contract Price shall be determined by the Engineer. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

21.3 The value of any Work covered by a Change Order or of any claims for a change in the Contract Price shall be determined in one of the following ways:

21.3.1 Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved;

21.3.2 By mutual acceptance of a lump sum;

21.3.3 By cost and a mutually acceptable fixed amount for overhead and profit;

21.3.4 If none of the above methods is agreed upon, the value shall be determined by the Engineer on the basis of costs and a percentage for overhead and profit. Costs shall only include labor (payroll, payroll taxes, fringe benefits, workmen's compensation, etc.), materials, equipment, directly related to the Work involved. The maximum percentage which shall be allowed for Contractors combined overhead and profit shall be as follows:

21.3.4.1 For all such Work done by his own organization, the Contractor may add up to fifteen percent (15%) of actual net costs for combined overhead and profit; provided that no overhead or profit shall be allowed on costs incurred in connection with premiums for public liability insurance or other special insurance directly related to such Work. In such case and also under this paragraph, the Contractor will submit in the form prescribed by the Engineer, an itemized cost breakdown together with supporting data.

21.4 The amount of credit to be allowed by the Contractor to the Owner for any such changes in cost, will be the amount of the actual net cost plus fifteen percent (15%).

ARTICLE 22. Change of Contract Time

22.1 The Contract Time may only be changed by a Change Order. If the Contractor is entitled by the Contract Documents to make a claim for an extension in the Contract Time, the claim shall be in writing delivered to the Engineer within five (5) calendar days after expiration of any such delay of the occurrence of the event giving rise to the claim. All valid claims for adjustment in the Contract Time shall be determined by the Engineer. Any change in the Contract Time resulting from any such claim shall be incorporated into a Change Order.

22.2 The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of the Contractor, if he makes a claim therefrom as provided in this Agreement. Such delays shall include, but not be restricted to, acts or neglect by any separate Contractor employed by the Owner, fires, floods, labor disputes, epidemics, abnormal weather conditions, or acts of God.

22.3 All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article shall not exclude recovery for damages (including compensation for additional professional services) for delay by either party.

ARTICLE 23. Neglected Work

If the Contractor should neglect to prosecute the Work in accordance with the Contract Documents, including any requirements of the progress schedule, the Owner, after five (5) Calendar Day's written notice to the Contractor may, without prejudice to any other remedy, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against the Contractor, in which case a Change Order shall be issued incorporating the necessary revisions in the Contract Documents including an appropriate reduction in the Contract Price. If the payments then or thereafter due to the Contractor are not sufficient to cover such amount, the Contractor will pay the difference to the Owner.

ARTICLE 24. Warranty and Guarantee: Correction, Removal or Acceptance of Defective Work

24.1 The Contractor warrants and guarantees to the Owner that all materials and equipment will be new unless otherwise specified and that all Work will be of good quality and free from faults or defects and in accordance with the requirements of the Contract Documents and of any inspections, tests or approvals referred to elsewhere in the Contract Documents. All unsatisfactory Work, all faulty or defective Work and all Work not conforming to the requirements of the Contract Documents or of such inspections, tests or approvals shall be considered defective. Prompt notice of all defects shall be given to the Contractor. All defective Work, whether or not in place, may be rejected.

24.2 If required by the Engineer, prior to approval of final payment, the Contractor will promptly, without cost to the Owner and as required by the Engineer, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Engineer, remove it from the Work site and replace it with non-defective Work. If the Contractor does not correct such defective Work or remove and replace such rejected Work within a reasonable time, all as required by written notice from the Engineer, the Owner may have the deficiency corrected or the rejected Work removed and replaced. All direct or indirect costs of such correction or removal and replacement, including compensation for additional professional services shall be paid by the Contractor, and an appropriate Change Order shall be issued deducting all such costs from the Contract Price. The Contractor will also bear the expenses of making good all Work of others destroyed or damaged by his correction, removal or replacement of his defective Work.

24.3 If, after the approval of final payment and prior to the expiration of one (1) year after the date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, the Contractor will, promptly, without cost to the Owner and in accordance with the Owner's written instructions, either correct such defective Work, or, if it has been rejected by the Owner, remove it from the Work site and replace it with non-defective Work. If the Contractor does not promptly comply with the terms of such instructions, the Owner may have the defective Work corrected or the

rejected Work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, will be paid by the Contractor.

24.4 If, instead of requiring correction or removal and replacement of defective Work, the Owner (prior to approval of final payment) and also the Engineer prefer to accept it, they may do so. In such case, if acceptance occurs prior to approval of final payment, a Change Order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price; or, if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by the Contractor.

ARTICLE 25. Application for Partial Payment

25.1 Prior to the first Friday of the following month for which payment is to be requested, the Contractor shall submit to the Engineer a detailed estimate of the amount earned for the separate portions of the Work for the previous month, and request payment. As used in this Article, the words "amount earned" means the value, on the date of the estimate for partial payment, of the Work completed in accordance with the Contract Documents, and the value of approved materials delivered to the Project site suitably stored and protected prior to incorporation into the Work. If the Contractor's estimate of amount earned conforms with the Engineer's evaluation, the Engineer will calculate the amount due the Contractor and make recommendation to the Owner for payment.

25.2 After deducting the retain amounts and the amount of all previous partial payments made to the Contractor, the amount earned as of the end of the previous month will be made payable to the Contractor after the fourth Tuesday of the following month.

25.3 The Contractor warrants and guarantees that title to all Work, materials and equipment covered by an application for payment, will have passed to the Owner prior to the making of the application for payment free and clear of all liens, claims, security interests and encumbrances (hereafter in these General Conditions referred to as "liens"); and that no Work, materials or equipment covered by an application for payment will have been acquired by the Contractor or by any other person performing the Work at the Work site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

25.4 The Engineer will, within fifteen (15) Calendar Days after receipt of application for payment, either indicate in writing his approval of payment and present the application to the Owner, or return the application to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the application. The Owner will pay the Contractor the amount approved by the Engineer and Owner.

ARTICLE 26. Prompt Payment to Subcontractors

The Contractor shall pay any subcontractor within ten days of the prime contractor's receipt of payment from the municipality for undisputed services provided by the subcontractor. The contract must require the prime contractor to pay interest of 1 ½ percent per month or any part of a month to the subcontractor on any undisputed amount not paid on time to the subcontractor. The minimum monthly interest penalty

payment for an unpaid balance of \$100 or more is \$10. For an unpaid balance of less than \$100, the prime contractor shall pay the actual penalty due to the subcontractor. A subcontractor who prevails in a civil action to collect interest penalties from a prime contractor must be awarded its costs and disbursements, including attorney's fees, incurred in bringing the action.

ARTICLE 27. Approval of Payment

27.1 The Engineer's approval of any payment requested in an application for payment shall constitute a representation by the Engineer to the Owner, based on the Engineer's on-site observations of the Work in progress as an experienced and qualified design professional and on their review of the application for payment and the supporting data, that the Work has progressed to the point indicated; that, to the best of their knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning Project upon completion, to the results of any subsequent tests called for in the Contract Documents and any qualifications stated in his approval); and that the Contractor is entitled to payment of the amount approved.

27.2 The Engineer's approval of final payment shall constitute an additional representation by the Engineer to the Owner that the conditions precedent to the Contractor's being entitled to final payment as set forth in the Agreement have been fulfilled.

27.3 The Engineer may refuse to approve the payment if, in the Engineer's opinion, the Engineer is unable to make such representations to the Owner. They may also refuse to approve any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved, to such extent as may be necessary in their opinion to protect the Owner from loss because:

27.3.1 The Work is defective;

27.3.2 Claims have been filed or there is reasonable evidence to suggest such filing thereof;

27.3.3 The Contract Price has been reduced because of modifications or changes;

27.3.4 The Owner has been required to correct defective Work or complete the Work;

27.3.5 Unsatisfactory performance of the Work, including failure to clean up.

ARTICLE 28. Project Completion

28.1 Prior to final payment, the Contractor may, in writing to the Owner and the Engineer, certify that the entire Project is complete and request that the Engineer issue a certificate of completion. Within a reasonable time thereafter, the Owner, Contractor and Engineer will make an inspection of the Project to determine the status of completion. If the Engineer and Owner do not consider the Project complete, they will notify the Contractor in writing giving reasons thereof. If the Engineer and Owner consider the Project complete, they will prepare and deliver to the Owner an application for final payment.

28.2 The Owner shall have the right to exclude the Contractor from the Project after the date of completion, but the Owner will allow the Contractor reasonable access to complete or correct items of repair and maintenance.

ARTICLE 29. Final Payment

29.1 After the Contractor has completed any corrections to the satisfaction of the Engineer and delivered all maintenance and operating instruction, schedules, guarantees, bonds, certificates of inspection and other documents, all as required by the Contract Documents, he may make application for final payment. The final application for payment shall be accomplished by such supporting data as the Engineer may require, together with complete and legally effective releases or waivers (satisfactory to the Owner) of all liens arising out of the Contract Documents and the labor and services performed and the material and equipment furnished thereunder. In lieu thereof and as approved by the Owner, the Contractor may furnish receipts of releases in full; an affidavit of the Contractor that the releases and receipts include all labor, services, material and equipment for which a lien could be filed, and that all payrolls, State and Federal withholding taxes, material and equipment bills, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied; and consent of the Surety, if any, to final payment. If any Subcontractor or supplier fails to furnish a release or receipt in full, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any lien.

29.2 If, on the basis of his observation and review of the Work during construction, his final inspection and his review of the final application for payment all as required by the Contract Documents, the Engineer is satisfied that the Work has been completed and the Contractor has fulfilled all of his obligations under the Contract Documents, he will, within fifteen (15) Calendar Days after receipt of the final application for payment, indicate in writing his approval of payment and present the application to the Owner for payment. Otherwise, he will return the application to the Contractor, indicating in writing his reasons for refusing to approve final payment, in which case the Contractor will make the necessary corrections and resubmit the application. The Owner, will, within twenty (20) Calendar Days of presentation of an approved application for payment, and receipt of final payment documents pay the Contractor the amount approved by the Engineer.

ARTICLE 30. Retention of a Portion of the Contract Sum

The Owner may retain up to a maximum of ten percent (10%) of value of Work completed and requested for payment. After fifty percent (50%) of the Work has been completed, the Contractor may request consideration for a reduction in the retained amount. Where the Owner is subject to the provisions of Minnesota State Statutes 429.041 the maximum retained amount shall be five percent (5%) released with approval of the governing body. Those amounts released shall be considered not required to be retained to protect the Owner's interest in satisfactory completion of the Agreement.

ARTICLE 31. Liquidated Damages

The parties hereto recognize that failure on the part of the Contractor to complete the Work within the time period set forth herein above, shall cause damage to the Owner; and should the contractor not complete the Work within that period of time, or otherwise be guilty of substantial violation of this Agreement, the Owner may deduct amounts per the following schedule per calendar day after the completion date and all legal and Engineering costs related thereto, for each day exceeding said completion date, from the total Contract Price to be paid to the Contractor, and among its other

remedies, terminate this Agreement and complete the Work by whatever method the Owner may deem expedient, at the expense of the Contractor; and such action by Owner shall not relieve Contractor of its liability to Owner for any damages caused by the Contractor's default, including, but not limited to, the excess expense of finishing the Work over the unpaid balance of the Contract Price. In the event a dispute arises between the Contractor and Owner regarding an alleged default by the Contractor or the assessment of liquidated damages, and if said dispute is submitted for litigation, and in the further event that the Owner prevails thereon, liquidated damages shall include court costs and reasonable attorney's fees as allowed by law. In the event the Owner elects to complete the Work following Contractor's default as above set forth, the Contractor agrees to extend its full cooperation of the Work contemplated under this Agreement. The amount deducted under this paragraph shall not be construed as a penalty, but rather as liquidated damages resulting from the noncompletion of the Work within the specified time. The schedule of damages shall be as specified below based upon the original contract amount:

<i>From More Than</i>	<i>Up To and Including</i>	<i>Charge per Calender Day</i>
\$0	\$500,000	\$200
\$500,000	\$1,000,000	\$300
\$1,000,000	Unlimited	\$500

ARTICLE 32. Waivers of Claims and Continuing Obligations

32.1 The Contractor's obligation to perform the Work and complete the Project in accordance with the Contract Documents shall be absolute. Neither approval of any payment by the Engineer, nor the issuance of a certificate of completion, nor any payment by the Owner to the Contractor under the Contract Documents, nor any use or occupancy of the Project or any part thereof by the Owner, nor any act of acceptance by the Owner nor any failure to do so, nor any correction of faulty or defective Work by the Owner shall constitute an acceptance of Work not in accordance with the Contract Documents.

32.2 The making and acceptance of payments shall constitute:

32.2.1 A waiver of all claims by the Owner against the Contractor other than those arising from unsettled liens, from faulty or defective Work appearing after final payment or from failure to comply with the requirements of the Contract Documents or the terms of any special guarantees specified therein; and

32.2.2 A waiver of all claims by the Contractor against the Owner other than those previously made in writing and still unsettled.

ARTICLE 33. Indemnification

33.1 To the fullest extent permitted by law, the Contractor shall indemnify and save harmless, the Owner and Engineer of and from loss or damage caused to any person or property by reasons of any carelessness or neglect in the doing or making of this improvement or furnishing of material and by reason or failure to pay all laborers, materials, mechanics, and subcontractors, and all persons who shall supply said Contractor with materials, provisions and supplies for the performance and completion of said Agreement to promptly pay all just debts, dues and demands incurred in the performance of said Agreement, and of and from all expenses of inspection and/or of whatever kind of nature, which shall

be caused by delay or failure in the performance and completion of this Agreement, and further to indemnify and save harmless of and from all suits and action of the Owner and Engineer on account of any injuries or damages sustained by any person or persons by reason of any act, omission, or negligence or by the use of improper or defective materials on the part of said Contractor in the performance of any part of this Agreement, and further to indemnify and protect and save the Owner and Engineer harmless against any or all demands, fees, or royalties for any patented invention, materials, methods, arrangements, or process of manufacturer of any infringement thereon, that may be used or be in any manner connected with the construction, erection, or maintenance of the Work, material, or any part thereon encompassed by this Project.

33.2 The Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

33.3 In any and all claims against the Owner or the Engineer of any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, the indemnification obligation under this Article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or from the Contractor or any Subcontractor under Worker's Compensation acts, disability benefit acts or other employee benefit acts.

33.4 The obligations of the Contractor under this Article shall not extend to the liability of the Engineer, his agents or employees arising out of (a) the preparation or approval or maps, drawings, opinions, reports, surveys, Change Orders, designs or Plans and Specifications or (b) the giving of or the failure to give directions or instructions by the Engineer, his agents or employees, provided such giving or failure to give is the primary cause of injury or damage.

ARTICLE 34. Contract Bonds

The Contractor will furnish performance, payment and maintenance bonds as security for the faithful performance, payment and maintenance of all his obligations under the Contract Documents. These bonds shall be in amounts of at least 100% of the Contract Price and in such form and with such Sureties as approved by the Securities Exchange and by the Insurance Commissioner of the State in which the Project is located. Prior to execution of the Contract Documents, the Owner may require the Contractor to furnish such other bonds, in such form and with such Sureties as he may require.

ARTICLE 35. Insurance

35.1 The Contractor shall provide (from insurance companies acceptable to the Owner) the insurance coverage designated hereinafter and pay all costs.

35.2 Before commencing Work under this Agreement, the Contractor shall furnish the Owner with certificates of insurance specified herein showing the type, amount, class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:

"The insurance covered by this certificate will not be cancelled or materially altered, except after 10 days written notice has been received by the Owner."

35.3 In case of the breach of any provision of this Article, the Owner, at his option, may take out and maintain, at the expense of the Contractor, such insurance as the Owner may deem proper and may deduct the cost of such insurance from any monies which may be due or become due the Contractor under this Agreement.

ARTICLE 36. Contractor and Subcontractor Insurance

The Contractor shall not commence Work on this Agreement until he has obtained all the insurance and it has been reviewed by the Owner, nor shall the Contractor allow any Subcontractor to commence Work on his subcontract until all similar insurance required for that portion of the Work has been so obtained and reviewed. Review of the insurance by the Owner shall not relieve or decrease the liability of the Contractor hereunder.

ARTICLE 37. Compensation and Employer's Liability Insurance

The Contractor shall maintain during the life of this Agreement the statutory Worker's Compensation, in addition to, Employer's Liability Insurance in an amount not less than \$100,000 for each occurrence and a combined single limit of liability of \$1,000,000 for each occurrence for all of his employees to be engaged in Work on the Project under this Agreement and, in case any such Work is sublet, the Contractor shall require the Subcontractor similarly to provide Worker's Compensation and Employer's Liability Insurance for all of the latter's employees to be engaged in such Work. Where Work under this Agreement includes any water or navigational exposure, coverage shall be included to cover the Federal Longshoremen's and Harborworker's Act and the Federal Jones Act.

ARTICLE 38. Public Liability (including Automotive) and Property Damage Insurance

38.1 The Contractor shall maintain during the life of this Agreement such public liability and property damage insurance and automobile public liability and property damage insurance and shall protect him, the Owner, the Engineer, and any Subcontractor performing Work covered by this Agreement from claims for damages for personal injury, including accidental death, as well as from claims for property damage, which may arise from negligent operations under this Agreement, whether such operations are by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them, and the amounts of such insurance shall be not less than:

(1) Public liability insurance in an amount not less than \$500,000 for injuries, including wrongful death to any one person, and subject to the same limit for each person in an amount not less than \$1,000,000 for each occurrence.

(2) "Broad Form" property damage liability insurance in an amount not less than \$500,000 for each occurrence.

38.2 The Contractor's public liability insurance and property damage insurance shall provide the primary coverage on all claims arising out of the performance of the Agreement, and shall name the Owner, its officers, agents and employees, and the Engineer as additional insureds therein.

ARTICLE 39. Builders Risk All Risk Insurance

Unless otherwise modified in the Special Provisions, the Contractor shall secure and maintain during the life of this Agreement, Builders Risk All Risk Insurance coverage for 100 percent of the Contract Price. Such insurance shall not exclude coverage for earthquake, landslide, flood, collapse, or loss due to the results of faulty workmanship, and shall provide for losses to be paid to the Contractor and the Owner as their interest may appear.

ARTICLE 40. Insurance Coverage for Special Conditions

When the construction is to be accomplished within a public or private right-of-way requiring insurance coverage, the Contractor shall conform to the particular requirements and provide the required insurance. The Contractor shall include in his liability policy all endorsements that the said authority may require for the protection of the authority, its officers, agents and employees. Insurance coverage for special conditions, when required, shall be provided as set forth in the Special Provisions.

ARTICLE 41. Cleaning Up

The Contractor will keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work, and at the completion of the Work he will remove all waste materials, rubbish and debris from and about the premises and will remove all items of personal property such as all tools, construction equipment and machinery, and surplus materials, and further will leave the site broom-clean and ready for occupancy by the Owner. The Contractor will restore to the original condition those portions of the Work site not designated for alteration by the Contract Documents.

ARTICLE 42. Owner's Right to Stop or Suspend Work

42.1 If the Work is defective, or the Contractor fails to supply sufficiently skilled workmen or suitable materials or equipment, or if the Contractor fails to make prompt payments to Subcontractors, or for labor, materials or equipment, the Owner may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

42.2 The Owner may, at any time and without cause, suspend the Work or any portion thereof, for a period of not more than one hundred eighty (180) days by notice in writing to the Contractor and the Engineer which shall fix the date on which Work shall be resumed. The Contractor will resume the Work on the date so fixed.

ARTICLE 43. Owner's Right to Terminate

43.1 If the Contractor is adjudged bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or similar laws, or if he repeatedly fails to supply sufficiently skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to Subcontractors, or for labor, materials or equipment, or if he disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction, or if he disregards the authority of the Engineer, or if he otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and his Surety seven (7) Calendar Days written notice, terminate the services of the Contractor and take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the Work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Project, including compensation for additional professional services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor will pay the difference to the Owner. Such costs incurred by the Owner will be determined by the Engineer and incorporated into a Change Order.

43.2 Where the Contractor's services have been so terminated by the Owner, said termination shall not affect any rights of the Owner against the Contractor or his Surety then existing or which may thereafter accrue. Any retention or payment of monies by the Owner due the Contractor will not release the Contractor or his Surety from liability.

43.3 Upon seven (7) Calendar Days written notice to the Contractor and the Engineer, the Owner may, without cause and without prejudice to any other right or remedy, elect to abandon the Project and terminate the Agreement. In such case, the Contractor and Engineer shall be paid for all Work executed and any expense sustained plus a reasonable profit.

ARTICLE 44. Contractor's Right to Terminate

If, through no act or fault of the Contractor, the Work is suspended for a period of more than one hundred eighty (180) Calendar Days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any application for payment within thirty (30) Calendar Days after it is submitted, or the Owner fails to pay the Contractor any sum approved by the Engineer within sixty (60) Calendar Days of its approval and presentation, then the Contractor may, upon seven (7) Calendar Days written notice to the Owner and the Engineer, terminate the Agreement and recover from the Owner payment for all Work executed.

ARTICLE 45. Miscellaneous

45.1 Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to him who gives the notice.

45.2 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder, and in particular but without limitation, the warranties, guarantees, and obligations imposed upon the Contractor and the rights and remedies available to the Owner and Engineer thereon, shall be in addition to and not a limitation of any otherwise imposed or available by law, by special guarantee or other provisions of the Contract Documents.

45.3 The Contract Documents shall be governed by the law of the place where the Project is located.

45.4 Except as otherwise provided, or approved in writing, Contractor shall not assign this Agreement or sublet it as a whole without the written consent of the Owner; nor shall the Contractor assign any monies due or to become due to it hereunder, without the previous written consent of the Owner. Owner may, however, assign this Agreement to any other party or entity, provided Owner continues to be responsible for the performance by such assignee of all undertakings of the Owner hereunder. Subject to the foregoing, this Agreement shall inure to the benefit of and be binding on the parties hereto and their respective successors and assigns.

45.5 Contractor shall treat all information relating to the Project and all information supplied to the Contractor by the Owner and/or Engineer as confidential and propriety information of the Owner and/or Engineer and shall not permit its release to any other parties or make any public announcement or any publicity releases without the Owner's written authorization. Contractor shall also require Subcontractors and vendors to comply with this Agreement.

45.6 In performing its obligations hereunder, Contractor shall be deemed an independent Contractor and not an agent or employee of Owner and/or Engineer. Contractor shall have the exclusive authority to manage, direct and control the Work subject to the terms and conditions of this Agreement and approval of Owner and/or Engineer as provided herein. Owner is interested in only the results obtained and not in the methods used in achieving the results.

CITY SPECIAL PROVISIONS

1. General

These Special Provisions contain items of specific instruction and subject matter concerning construction detail and/or are modifications to the General Conditions and Standard Specifications. The Contractor shall conduct his work in conformance with the specifications set forth herein and in accordance with the Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition, which is incorporated by reference to these specifications, and also in accordance with the Standard Utility Specifications prepared by the City Engineers Association of Minnesota (CEAM).

2. Project Schedule

The City of Ramsey anticipates, but does not guarantee award of this project on June 27, 2017. Construction is anticipated to commence on or about July 10, 2017.

3. Time for Completion and Liquidated Damages

The Contractor shall complete the work on or before August 25, 2017. Failure to complete the project within this specified time shall result in the payment as liquidated damages according to the schedule contained in Table 1807-1 of the Minnesota Department of Transportation Standard Specifications for Construction, 2016 Edition.

4. Working Hours

The work shall be carried out during normal daylight working hours in accordance with local ordinance and so as not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived in writing by the Engineer in conjunction with qualified local authority. Normal working hours in the City of Ramsey are considered to be from 7:00 a.m. to 10:00 p.m. on Monday through Saturday. The contractor shall provide 72 hour advance notice before working on Saturday. City Council approval is required for Sunday work.

5. Maintenance of Traffic

All traffic control devices shall conform and be installed in accordance to:

- The “Minnesota Manual on Uniform Traffic Control Devices” (MN MUTCD);
- Part 6, “Field Manual for Temporary Traffic Control Zone Layouts” (Field Manual);
- The Speed Limits in Work Zones Guideline;
- The Minnesota Flagging Handbook;
- The Minnesota Standard Signs Manual;

- The Traffic Engineering Manual;

The Contractor shall submit the proposed traffic control layout, designed by a traffic engineer, to the Engineer for approval at least seven (7) days prior to the start of construction. At least 24 hours prior to placement, all traffic control devices shall be available on the Project for inspection by the Engineer. The Contractor shall modify his/her proposed traffic control layout and/or devices as deemed necessary by the Engineer.

The Contractor shall have an operator on call at all times to insure traffic movement within the project area. Local access to pedestrian facilities shall be maintained at all times. The Contractor shall be responsible for the immediate repair or replacement of all traffic control devices that become damaged, moved or destroyed, of all lights that cease to function properly, and of all barricade weights that are damaged, destroyed, or otherwise fail to stabilize the barricades. Material storage for the project shall be along the edge of the existing roadway. Barricades with flashers shall be placed at each end of materials and equipment stored on the edge of the road. Cones shall be placed at each end directing traffic towards the middle of the road and at intervals along the length of the materials as specified in the MNDOT manual. If there is a break large enough for parallel parking a vehicle between stored materials, then a flasher shall be placed at each end of the space.

The Contractor shall notify the local Police and Fire Departments prior to commencing construction that will restrict traffic on any City street to the degree that emergency traffic could not be immediately facilitated. The Contractor shall provide necessary signs, flashers and barricades for any parking or driving lane closures. All signing shall conform to the MnDOT Manual of Uniform Traffic Control Devices. All plans for lane closures shall be submitted to the Engineer for approval a minimum of 48 hours prior to any closures.

The cost of all work related to continuation and control of traffic, including maintenance of traffic, provision of continued access, and the placement, maintenance or removal of traffic control devices should be included in the bid item unit price for Traffic Control. In the event the Contractor fails to maintain the street or provide signing, the Owner may perform the work and deduct the cost from any amount due the Contractor.

6. Cleanup and Restoration

When the work has been completed, the Contractor shall remove from the site all extra materials, equipment, debris and other supplies. All surfaces disturbed during the construction period shall be returned to their original condition or better.

7. Work Area

The right of way width is 120 feet. The Contractor's operations shall be confined to these public right-of-ways. The Contractor shall secure the permission of the Engineer prior to entering onto any other lands, including easement areas.

8. Permits

The Contractor will be required to obtain a NPDES Stormwater Construction Permit from the Minnesota Pollution Control Agency, and a City contractor's license.

9. Barricades, Guards and Safety Equipment

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights, and guards as required shall be placed and maintained by the contractor during the progress of the construction work. All material piles, excavation equipment, and materials which may serve as obstructions to traffic or hazards shall be enclosed by fences or barricades and shall be protected by adequate lighting when visibility is poor. The rules and regulations of local authorities respecting safety provisions shall be observed.

10. Preconstruction Conference Required

Prior to initiating the work a preconstruction conference shall be scheduled and held with the contractor and his subcontractors, the City, utility companies (including fiber optic lines) or others with an interest in the project. The Contractor shall submit documentation for review at the preconstruction conference which: identifies construction personnel responsible for the work and project safety; provides a list of emergency or after hour contacts with their afterhours phone numbers; and identifies subcontractors and material suppliers. The Contractor shall prepare and submit a written schedule of the work, identifying work components and showing work start and completion dates required to comply with the schedule in the contract documents. The Contractor shall prepare and submit a list of material submittals that are required to comply with specified standards and will submit certificates of compliance or a schedule for compliance submittal.

No work is authorized on the project until the Notice to Proceed is issued. Once work has commenced, the Contractor shall continuously pursue completion in accordance with the approved schedule.

11. Construction Staking

Construction staking shall be provided by the City Engineering department. The Contractor shall provide a 48 hour notice for initial grade stakes and 24 hour notice for replacement stakes. All replacement staking shall be paid for by the Contractor.

12. Protection of Utilities

The Contractor is advised that utilities which include electric, gas, telephone, cable TV, fiber optic lines, sanitary sewer, storm sewer, and watermain are located within or near the project area anticipated for excavation. It is the Contractor's responsibility to obtain all locations from the

respective utility companies. It is understood that no additional compensation shall be due the Contractor because of the presence and protection of those utilities and appurtenances. The Contractor shall comply with the provisions of Minnesota Statutes Chapter 216 related to underground construction and utility protection (Gopher State One call).

13. Maintenance during Construction

Once the Contractor commences work on the project, the construction area shall be maintained for the remainder of the project by the Contractor at their expense. Necessary signs and barricades shall be furnished by the Contractor. All existing surfaces not scheduled for removal shall be protected. All equipment which operates on bituminous or concrete surfaces shall be equipped with rubber tires. The Contractor shall provide reasonable access to all properties adjacent to the work. The cost of providing and maintaining continuous access where applicable, shall be included in the lump sum bid item price for Traffic Control. Any disturbed paved areas at intersections with public or private roads/driveway accesses must be brought to grade with class 5 at the end of each work day, unless road is closed for construction.

All unpaved surfaces shall be bladed and made passable at the end of each business day, unless road is closed for construction. Grading the surface will also be as directed by the Engineer when the travel lane is deemed impassable.

14. Surface Water and Sedimentation Control

The Contractor shall take reasonable efforts to prevent soils from being deposited onto street surfaces. Temporary earth stockpiles shall have suitable erosion control measures in place to prevent this material from migrating onto the street and into the storm sewer system. The Contractor shall have a sweeper on site during construction or must have the availability of one on site within three hours. Streets shall be left clean at the end of each working day.

Contractor will be expected to provide a water truck for dust control. Water is available at the automated water fill station located at the Public Works Facility on Jaspar Street and 142nd Avenue NW. Water will not be allowed to be drawn from City hydrants.

15. Tree Protection

The contractor shall employ the following tree protection measures to encourage the survival of trees affected by construction. Roots larger than one half inch in diameter which have been fractured as a result of grading operations shall be sawed flush with a bow saw or loppers as soon as possible after being disturbed. No unnecessary vehicles shall be allowed in the tree root zone to avoid compaction of soil.

16. Turf Establishment

The Contractor shall reestablish turf with hydroseed and hydromulch in all disturbed areas. The seed mix and application rates shown in the plans shall be used.

17. Basis of Payment

Payment shall be made for the work on the basis specified below. The cost of any additional labor materials, tool and supplies which have not been specifically identified in this section for payment, but required to complete the project as per the plans and specifications shall be considered incidental to the project.

1. *Mobilization* – Payment shall be made on a lump sum basis for the mobilization of equipment.
2. *Clearing and Grubbing Tree* – Payment shall be made on a per acre basis as compensation for all equipment, material, and labor costs required for the removal and disposal of trees and stumps located by area for removal per the plans.
3. *Remove Watermain* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for the removal and disposal of watermain.
4. *Remove Bituminous Pavement* – Payment shall be made on a per square yard basis as compensation for all equipment, material, and labor costs required for the removal and disposal of bituminous pavement.
5. *Saw Cutting Pavement* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required to saw cut pavement per class of material as marked in the field.
6. *Salvage Concrete Pipe, Storm* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for salvage and installation of concrete storm sewer pipe.
7. *Salvage Gate Valve and Box* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for salvage and installation of gate valve and box based upon size.
8. *Salvage Hydrant* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for salvage of hydrant.
9. *Salvage Pipe Apron* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for salvage and installation of pipe apron.

10. *Common Excavation* – Payment shall be made on a per cubic yard basis as compensation for all equipment, material, and labor costs required for the excavation, loading, removal, transport, placement and disposal of on-site borrow material as directed by the Engineer. The limits for quantity determinations will not extend beyond the authorized grading sections as staked, except as authorized prior to the work by the Engineer.
11. *Granular Borrow* – Payment shall be made on a per cubic yard basis as compensation for all equipment, material, and labor costs required for the excavation, transport, and placement of granular borrow material at a location directed by the Engineer.
12. *Dewatering* – Payment shall be made on a lump sum basis as compensation for all equipment, material, and labor costs required for the installation and maintenance of any dewatering measures.
13. *Furnish and Install Aggregate Base Class 5* – Payment shall be made on a per cubic yard basis as compensation for all equipment, material, and labor costs required for the loading, transportation, placement, and compaction of aggregate base. Aggregate base from the City stockpile located at the City Public Works campus, 14210 Jasper Street, shall be used. The Contractor shall furnish a loader and operator to load and haul from the stockpile.
14. *Furnish and Install PVC Sanitary Sewer Pipe* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for the installation of PVC sanitary sewer pipe based upon size.
15. *Furnish and Install PCV Sanitary Sewer Pipe Plug* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for the installation of PVC sanitary sewer pipe plug based upon size.
16. *Connect to Existing Sanitary Sewer Manhole* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required to connect to the existing sanitary sewer manhole.
17. *Clean and Video Tape Pipe Sewer* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required to clean and video tape the sanitary sewer pipe. A copy of the video shall be supplied to the City.
18. *Furnish and Install Gate Valve and Box* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for installing gate valves and box based upon size.
19. *Furnish Hydrant* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for furnishing hydrants.

20. *Install Hydrant* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for the installation of hydrants.
21. *Connect to Existing Watermain* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required for the connection to existing watermain.
22. *Furnish and Install DIP Watermain* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for the installation of DIP watermain based upon size and class. Watermain 8” and larger shall be class 52. Watermain 6” and smaller shall be class 53.
23. *Furnish and Install Ductile Iron Fittings for Watermain* – Ductile Iron Pipe weights are based on Tyler Union waterworks catalog tables. Payment shall be made on a per pound basis as compensation for all equipment, material, and labor costs required for the installation of ductile iron fittings.
24. *Furnish Casting Assembly* - Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required to furnish sewer castings.
25. *Install Casting* – Payment shall be made on a per each basis as compensation for all equipment, material, and labor costs required to install sewer castings.
26. *Furnish and Install Sanitary Manhole* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for the installation of sanitary manholes.
27. *Traffic Control* – Payment shall be made on a lump sum basis as compensation for all equipment, material and labor costs required for the installation and maintenance of traffic control measures (signage, barricades, flasher, etc.), as directed by the Engineer, for any local traffic disruptions or temporary closures.
28. *Silt Fence* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material and labor costs required for the installation, removal, and disposal of silt fence. The payment shall be made as follows: 75 percent upon installation of the silt fence, 25 percent after the permanent surfaces are established and the silt fence is removed.
29. *Inlet Protection* – Payment shall be made on a per each basis as compensation for all equipment, material and labor costs required for the installation and maintenance of the required inlet protection, as directed by the Engineer.
30. *Sediment Control Log Type Straw* – Payment shall be made on a per lineal foot basis as compensation for all equipment, material, and labor costs required for the installation, removal, and disposal of sediment control log type straw.

31. *Hydroseeding* – Payment shall be made on a per acre basis as compensation for all equipment, material and labor costs required for the establishment of seed in disturbed areas as directed by the Engineer. Seed, fertilizer, and mulch shall be compensated per the basis shown on the pay estimate.



CITY ENGINEERS ASSOCIATION OF MINNESOTA
Engineering Our Cities' Futures

STANDARD SPECIFICATIONS

2600 Trench Excavation and Backfill/Surface Restoration

2611 Watermain and Service Line Installation

2621 Sanitary Sewer and Storm Sewer Installation

2631-CIPPS Sewer Pipe Rehabilitation - Cured In Place Pipe Systems

2641 – Pipeline Rehabilitation - Pipe Bursting Method

2013 Edition

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SECTION 2600 – STANDARD SPECIFICATIONS FOR TRENCH EXCAVATION & BACKFILL/SURFACE RESTORATION

2600.1 DESCRIPTION

This work shall consist of excavation, trenching, backfilling, and restoration of existing surfaces for the construction of underground utilities.

The use of the term "Plans, Specifications and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are an enforceable component of the Contract Documents.

All references to MnDOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation "Standard Specifications for Construction", and all supplements and amendments thereto, published prior to the date of advertisement for bids.

All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

2600.2 MATERIALS

A Granular Materials

Granular materials furnished for foundation, bedding, encasement, backfill, or other purposes as may be specified shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone, or slag that shall be so graded as to meet the gradation requirements specified herein for each particular use by the material manufacturer or as indicated in the Plans, Specifications, or Special Provisions.

A1 Granular Material Gradation Classifications

Granular materials furnished for use in Foundation, Bedding, Encasement, or Backfill construction shall conform to the following requirements:

Foundation materials shall have one hundred percent (100%) by weight passing the one and one-half inch (1 1/2") sieve and a maximum of ten percent (10%) by weight passing the No. 4 sieve. Not less than fifty percent (50%) of the material by weight that is retained on the No. 4 sieve shall have one (1) or more crushed faces. Hard, durable crushed carbonate quarry rock may be used for Foundation materials.

Bedding and encasement materials for flexible pipe shall meet the requirements of MnDOT Specification 3149.2B1, Granular Borrow, except that one hundred percent (100%) by weight shall pass the one inch (1") sieve.

Backfill materials shall consist of suitable existing trench materials, except as otherwise specified in the Special Provisions. Suitable material shall be defined as a mineral soil free of foreign materials (rubbish, organics, and debris), frozen clumps, oversize stone, rock, concrete or bituminous chunks, and other unsuitable materials that may damage the pipe, prevent thorough compaction, or increase the risks of settlement.

A gradation report, certified by an approved independent testing laboratory, of the proposed granular materials shall be furnished to the Engineer before any of the granular materials are delivered to the project.

A2 Granular Material Use Designations

Granular materials provided for Foundation, Bedding, Encasement, or Backfill use as required by the Plans, Specifications, and Special Provisions, either as part of the pipe item work unit or as a separate contract item, shall be classified as to use in accordance with the following:

<u>Material Use</u>	<u>Designation Zone Designation</u>
Granular Foundation	Placed below the bottom of pipe grade as replacement for unsuitable or unstable soils, to achieve improved foundation support.
Granular Bedding	Placed below the pipe midpoint, prior to pipe installation, to facilitate proper shaping and to achieve uniform pipe support. For flexible pipe installation, placed below the pipe midpoint to a point six inches (6") below the bottom of pipe or twenty five percent (25%) of the diameter below the pipe, whichever is greater.
Granular Encasement	Placed below an elevation one foot above the top of pipe, after pipe installation, for protection of the pipe and to assure proper filling of voids or thorough consolidation of backfill.
Granular Backfill	Placed below the surface base course, if any, as the second stage of backfill, to minimize trench settlement and provide support for surface improvements.

In each case above, unless otherwise indicated, the lower limits of any particular zone shall be the top surface of the next lower course as constructed. The upper limits of each zone are established to define variable needs for material gradation and compaction or void content, taking into consideration the sequence of construction and other conditions. The material use and zone designations described above shall only serve to fulfill the objectives and shall not be construed to restrict the use of any particular material in other zones where the gradation requirements are met.

B Insulation

Insulation shall be extruded rigid board material having a thermal conductivity of 0.23 BTU/hour/square foot/degree Fahrenheit/per inch thickness, maximum, at 40°F mean, a comprehensive strength of thirty five (35) psi minimum, and water absorption of one quarter percent (0.25%) by volume minimum. Unless otherwise specified in the Plans, Specifications, or Special Provisions, board dimensions shall measure eight feet (8') long, two or four feet (2' or 4') wide, and one (1), one and one half (1-1/2), two (2), or three (3) inches thick.

C Geotextile Fabric

Geotextile fabric shall meet the requirements of MnDOT Specification 3733 and be used as required by the Plans, Specifications, and Special Provisions.

2600.3 CONSTRUCTION REQUIREMENTS

A General Provisions

A1 Maintenance of Traffic

Whenever work interferes with the flow of traffic along a roadway, the Contractor shall provide traffic control signing and public safety in accordance with the provisions Minnesota Manual on of Uniform Traffic Control Devices (current edition and any amendments), MnDOT Specifications 1404 and 1710, and the Special Provisions. Neither road closures nor detours shall be permitted unless specified in the Special Provisions or authorized by the Engineer. Where road closures or detours are permitted by the Engineer, the Engineer shall determine the appropriate agencies, boards, or departments the Contractor must notify prior to taking the action and the proper advance notice to be provided to each body.

Compliance with this requirement shall not be construed to relieve the Contractor from the responsibility of notifying agencies or institutions whose services may be predicated upon a roadway being opened to traffic or whose services would be hindered if a roadway is closed to traffic. Such agencies or institutions shall include, but not be limited to, the police department, the fire department, municipal bus service, school bus service, and ambulance service, mail delivery, and waste hauler services. The Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

A2 Establishing Line and Grade

The primary line and grade will be established by the Engineer. For trench installation, line and grade stakes will be set parallel to the proposed pipeline at an appropriate offset therefrom as will best serve the Contractor's operations wherever practical. For tunnel installation, line and grade stakes will be set directly above the proposed pipeline setting.

The Contractor shall arrange operations to avoid unnecessary interference with the establishment of the primary line and grade stakes and shall render whatever assistance may be required by the Engineer in accomplishing the staking. The Contractor shall be responsible for preservation of the primary stakes and, if negligent in providing necessary protection, shall bear the full cost of any re-staking.

The Contractor shall be solely responsible for the correct transfer of the primary line and grade to all working points and for construction of the work to the prescribed lines and grades as established by the Engineer.

Unless otherwise specified in the Plans, Specifications, and Special Provisions the watermain shall generally be placed with the minimum specified cover. However, a greater depth may be required to avoid conflicts with other utilities and obstructions. Installation of watermain and services to a depth deeper than specified shall be considered incidental with no additional compensation allowed therefore.

The existing grade shown on the plans is approximate. Modification of the pipe location or differences in existing elevation shall not be cause for additional compensation.

In areas where direct conflicts arise between watermain and water services, with storm sewer, sanitary sewer, sanitary sewer services, sewer forcemains, septic tanks, or subsoil treatment systems, the following shall apply:

Watermain and services located near sewer forcemains:

A minimum of ten feet (10') of separation, measured horizontally between the outer surfaces of the pipes is required.

If ten feet (10') of separation cannot be provided, an approved additional measure of containment must be provided for either the watermain or the sewer forcemain.

Watermain and services located near septic tanks, or subsoil treatment systems:

A minimum of ten feet (10') measured horizontally between the outer surfaces of the watermain, tank and subsoil treatment system is required.

Watermain and services located near gravity sanitary and storm sewers:

A minimum of ten feet (10') measured horizontally between the outer surfaces of the pipes is required.

In locations where local conditions prevent the required separation indicated above (due to the presence of rock, buildings, other significant obstructions), the watermain may be laid closer to gravity sewer if **one** (1) of the following conditions is met:

The bottom of the watermain is laid at least eighteen inches (18") above the top of the sewer on a separate shelf; or

The sewer is constructed of materials and with joints that are equivalent to watermain standards of construction and is pressure tested to assure water tightness prior to backfilling.

Watermain and services crossing gravity sanitary and storm sewers:

A minimum vertical separation of eighteen inches (18") must be provided between the outer surfaces of the pipes, with preference that the watermain cross above the sewer, wherever possible.

One full length of water pipe shall be located so both joints will be as far from the sewer as possible.

Watermain above-water crossings:

The pipe shall be adequately supported and anchored, protected from vandalism, damage and freezing, and accessible for repair or replacement.

Watermain underwater crossings:

A minimum cover of five feet (5') shall be provided over the pipe unless otherwise approved by the Department of Health. When crossing water courses which are greater than fifteen feet (15') in width, the following shall be provided:

1. The pipe shall be of special construction, having flexible, restrained or welded watertight joints
2. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding
3. Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source.

A3 Protection of Surface Structures

All surface structures and features located outside the permissible excavation limits for underground installations, together with those within the construction areas which are indicated in the Plans as being saved, shall be properly protected against damage and shall not be disturbed or removed without approval of the Engineer. Within the construction limits, as indicated on the plans or as directed by the Engineer, the removal of improvements such as pavement, curb, curb & gutter, walks, turf, etc., shall be subject to equivalent acceptable replacement after completion of underground work, with all expense of removal and replacement being borne by the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

Obstructions such as street signs, guard posts, small culverts, mailboxes, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as approved by the Engineer and that nonessential items are properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced in their proper setting at the sole expense of the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

The Contractor shall be responsible for protection of existing overhead utilities and poles. This shall include arranging with the utility owner and arrange paying the utility for holding poles that will be close to the edge of any trench. Holding of poles and repair of any damage to these facilities shall be considered incidental to the project with no additional compensation allowed. If relocation or removal of these facilities is required, the Owner will contact the concerned utility owner and arrange and pay for the relocation or removal at no additional expense to the Contractor.

In the event of damage to any surface improvements, either privately or publicly owned, in the absence of construction necessity, the Contractor will be required to replace or repair the damaged property to the satisfaction of the Engineer and without cost to the Owner.

A4 Interference of Underground Structures

When any underground structure interferes with the planned placement of the pipeline or appurtenances to such an extent that alterations in the work are necessary to eliminate the conflict or avoid endangering effects on either the existing or proposed facilities, the Contractor

shall immediately notify the Engineer and the Owner of the affected structure. When any existing facilities are endangered by the Contractor's operations, the Contractor shall cease work at the site and take such precautions as may be necessary to protect the in-place structures until a decision is made as to how the conflict will be resolved.

Without specific authorization from the Engineer, no utility service shall be disrupted, nor shall any change be made in either the existing structures or the planned installations to overcome the interference. Alterations in existing facilities will be allowed only to the extent that service will not be curtailed and then only when the encroachment or relocation will satisfy all applicable regulations and conditions.

Wherever alterations are required as a result of unforeseen underground interferences not due to any fault or negligence of the Contractor, the Engineer will issue a written order covering any additional or extra work involved and specifying the revised basis of payment, if any. Any alterations made strictly for the convenience of the Contractor, shall be subject to prior approval and shall be at the Contractor's expense. No extra compensation will be allowed for delays caused by the interference of underground structures.

A5 Removal of Surface Improvements

Removal of surface improvements in connection with trench excavation shall be limited to actual needs for installation of the pipeline and appurtenances, based on the allowable trench widths and any other controls imposed in connection with the work. Removal operations shall be coordinated effectively with the excavation and installation operations as will cause the least practical disruption of traffic or inconvenience to the public. The debris resulting from removals shall become the property of the Contractor and shall be disposed of by the Contractor in accordance with MnDOT Specification 2104 and the Special Provisions. Removal debris shall not be deposited at locations that will block access to fire hydrants, private driveways, or other essential service areas, nor obstruct surface drainage. Removal and final disposal of debris shall be accomplished as a single operation wherever possible and, in any event, the debris shall be removed from the site before starting the excavating operations.

Removal of concrete or bituminous structures shall be by methods producing clean-cut breakage to pre-scored lines as will preserve the remaining structure without damage. Removal equipment shall not be operated in a manner that will cause damage to the remaining structure or adjoining property. Where not removed to an existing joint, concrete structures shall be sawed along the break lines to a minimum depth of one-third (1/3) of the structure depth.

Any reusable materials generated during the work, such as aggregate, sod, topsoil, shall be segregated from other waste materials and be stockpiled so as to maintain suitability and permit proper reuse.

The use of drop weight equipment for breaking pavement will be allowed to the extent that the Contractor shall assume full responsibility for any damages caused thereby. The pavement breaking operation shall not be allowed to become a nuisance to the public or a source of damage to underground or adjacent structures. The Engineer reserves the right to order discontinuance of drop weight breaking operations at any time.

A6 Temporary Service Measures

While any open excavations are maintained, the Contractor shall have available a supply of steel plates suitable for temporary bridging of open trench sections where either vehicular or pedestrian traffic must be maintained. Use of the plates shall be as directed or approved by the Engineer and where installed they shall be secured against possible displacement and be replaced with the permanent structure as soon as possible.

B Excavation and Preparation of Trench

B1 Operational Limitations and Requirements

Trench excavation must conform to all local, state and federal requirements. All work must be confined to the limits of the construction and to easements and right of way as indicated on the plans. The Contractor shall install at his expense the necessary trench support to meet the varying soil conditions and to protect existing structures and property. The trench shall be drained to provide stable excavation and permit the pipe to be laid in a dry trench.

Excavating operations shall proceed only so far in advance of pipe laying as will satisfy the needs for coordination of work and permit advance verification of unobstructed line and grade as planned, consistent with the Contractors methods and scheduling. Where interference with existing structures is possible or in any way indicated, and where necessary to establish elevation or direction for connections to in-place structures, the excavating shall be done at those locations in advance of the main operation so actual conditions will be exposed in sufficient time to make adjustments without resorting to extra work or unnecessary delay.

Wherever possible, excavated materials shall be placed in areas that will not block existing vehicle and pedestrian traffic and drainage ways. The Contractor shall review proposed methods of operation with the Engineer prior to beginning the work.

The Contractor shall backfill all trenches at the end of each work day, or upon written authorization of the Engineer, shall provide another approved method of protecting the trench area while work is not being performed.

All installations shall be accomplished by open trench with the exception that boring, jacking and tunnel construction methods shall be employed where specifically required by the Plans, Specifications, or Special Provisions.

The excavating operations shall be conducted so as to carefully expose all existing underground structures without damage. Wherever the excavation extends under or approaches so close to an existing structure as to endanger it in any way, precautions and protective measures shall be taken as necessary to preserve the structure and provide temporary support. Hand methods of excavating shall be utilized to probe for and expose such critical or hazardous installations as gas pipe, power and communication cables, watermain, gravity and pressure sewers, and respective service pipes.

The Engineer shall be notified of any need for blasting to remove materials which cannot be broken up mechanically, and there shall be no blasting operations conducted until the Engineer's approval has been secured. Blasting will be allowed only when proper precautions are taken to protect life and property, and then shall be restricted as the Engineer directs. The hours of blasting operations shall be set by the Owner. The Contractor shall assume full

responsibility for any damages caused by blasting, regardless of the requirements for notification and approval. The Contractor shall secure any required permits for blasting and shall conduct blasting operations in conformance with all applicable local, state and federal laws, regulations, and ordinances.

B2 Classification and Disposition of Materials

Excavated materials will be classified for payment only when specifically provided in the Special Provisions, or the Proposal. All other materials encountered in the excavations will be considered incidental to utility construction, with no additional compensation provided thereto.

Miscellaneous excavated materials that are not specifically identified for payment in the Special Provisions or Proposal, exceed one (1) cubic yard in volume, cannot be re-used within the project limits, and in the opinion of the Engineer requires special means for handling and disposal, may be considered for payment through supplemental agreement as extra work. Miscellaneous excavated materials include but are not limited to organic soils, rubble, wood debris, boulder stone, masonry, concrete fragments, and metals.

Rock excavation shall be defined to include all hard, solid rock in ledge formation, bedded deposits and unstratified masses; all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; and any boulder stone, masonry or concrete fragments exceeding one (1) cubic yard in volume. Materials such as shale, hard pan, soft or disintegrated rock which can be dislodged with a hand pick or removed with a power operated excavator will not be classified as Rock Excavation.

Excavated materials will be classified for reuse as being either Suitable or Unsuitable for backfill or other specified use, subject to selective controls. All suitable materials shall be reserved for backfill to the extent needed, and any surplus remaining shall be utilized for other construction on the project as may be specified or ordered by the Engineer. To the extent practicable, granular materials and topsoil shall be segregated from other materials during the excavating and stockpiling operations so as to permit best use of the available materials at the time of backfilling. Unless otherwise specified in the Plans, Specifications, and Special Provisions, material handling as described above shall be considered incidental with no additional compensation provided.

All excavated materials reserved for backfill or other use on the project shall be stored at locations approved by the Engineer that will cause a minimum of inconvenience to public travel, adjacent properties, and other special interests. The material shall not be deposited so close to the edges of the excavations in a manner that could create hazardous conditions, nor shall any material be placed so as to block the access to emergency services. All materials considered unsuitable by the Engineer, for any use on the project, shall be immediately removed from the project and be disposed of as arranged for by the Contractor with no additional compensation.

B3 Excavation Limitations and Requirements

Trench excavating shall be to a depth that will permit preparation of the foundation as specified and installation of the pipeline and appurtenances at the prescribed line and grade, except where alterations are specifically authorized. Trench widths shall be sufficient to permit the pipe to be laid and joined properly and the backfill to be placed and compacted as specified. Extra width shall be provided as necessary to permit convenient placement of sheeting and shoring and to accommodate placement of appurtenances.

Excavations shall be extended below the bottom of structures as necessary to accommodate any required Granular Foundation material. When rock or unstable foundation materials are encountered at the established grade, additional materials shall be removed as specified or directed by the Engineer to produce an acceptable foundation. Unless otherwise indicated or directed, rock shall be removed to an elevation at least six inches (6") below the bottom surface of the pipe barrel and below the lowest projection of flange and bell/spigot joint. All excavations below grade shall be to a minimum width equal to the outside pipe diameter plus two feet (2'). Rock shall be removed to such additional horizontal dimensions as will provide a minimum clearance of six inches (6") on all sides of appurtenant structures such as valves, housings, access structures, etc.

Where no other grade controls are indicated or established for the pipeline, the excavating and foundation preparations shall be such as to provide a minimum cover over the top of the pipe as specified. Trench widths shall allow for at least six inches (6") of clearance on each side of the flange and bell/spigot joint. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet (2'), subject to the considerations for alternate pipe loading set forth below. The width of the trench at the ground surface shall be held to a minimum to prevent unnecessary destruction of the surface structures.

The maximum allowable trench width at the top of pipe level may be exceeded only by approval of the Engineer, after consideration of pipe strength and loading relationships. Any alternate proposals made by the Contractor shall be in writing, giving the pertinent soil weight data and proposed pipe strength alternate, at least seven (7) days prior to the desired date of decision. Approval of alternate pipe designs shall be with the understanding that there will be no extra compensation allowed for any increase in material or construction costs.

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

The use of granular foundation materials shall not be used as an aid to facilitate installation of pipe in wet soil conditions. Use of these materials in this manner in lieu of providing adequate dewatering measures shall be considered incidental to the construction with no additional compensation allowed therefore.

B4 Sheet piling and Bracing Excavations

All trench excavations that require slope support shall be sheeted, shored, and braced in a manner that will meet all requirements of the applicable safety codes and regulations; comply with any specific requirements of the Contract; and prevent disturbance or settlement of adjacent surfaces, foundations, structures, utilities, and other properties. Any damage to the work under contract, to adjacent structures, or other property, caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to the failure or lack of sheet piling, shoring, or bracing, through negligence or fault of the Contractor in any manner shall be repaired at the Contractor's expense and without delay.

The Plans, Specifications, and Special Provisions may require special precautions to protect life and property. The Engineer may order other precautions when excavation conditions appear to warrant additional measures. Failure of the Engineer to order correction of improper or

inadequate sheeting, shoring, or bracing shall not relieve the Contractor's responsibilities for protection of life, property, and the work.

The Contractor shall assume full responsibility for proper and adequate placement of sheeting, shoring, and bracing, to prevent displacement. Bracing shall be so arranged as to provide ample working space and without increase of stress or strain on the in-place structures to any extent that may cause damage.

Sheeting, shoring and bracing materials shall be removed only when and in such manner as will assure adequate protection of the in-place structures and prevent displacement of supported grounds. Sheeting and bracing shall be left in place only as required by the Plans, Specifications, and Special Provisions or ordered by the Engineer. Otherwise, sheeting and bracing may be removed as the backfilling reaches the level of respective support. Wherever sheeting and bracing is left in place, the upper portions shall be cut and removed to an elevation of three feet (3') or more below the established surface grade or as the Engineer may direct.

All costs of furnishing, placing and removing sheeting, shoring, and bracing materials, including the value of materials left in place as required by the Contract, shall be included in the prices bid for pipe installation and will not be compensated for separately. When sheeting, shoring, or bracing materials are left in place by written order of the Engineer, in the absence of specific requirements of the Contract, payment will be made for those materials by supplemental agreement.

B5 Preparation and Maintenance of Foundations

Foundation preparations shall be conducted as necessary to produce a stable foundation and provide continuous and uniform pipe bearing between bell holes. The initial excavating or backfilling operations shall produce a subgrade level slightly above finished grade as will permit hand shaping to finished grade by trimming of high spots and without the need for filling of low spots to grade. Final subgrade preparations shall be such as to produce a finished grade at the centerline of the pipe that is within three tenths of a foot (0.03') of a straight line between pipe joints and to provide bell excavation at each joint as will permit proper joining of pipe and fittings.

In excavations made below grade to remove rock or unstable materials, the backfilling to grade shall be made with available suitable materials unless placement of Granular Foundation or Bedding material is specified or is ordered by the Engineer. Placement of the backfill shall be in relatively uniform layers not exceeding eight inches (8") in loose thickness. Each layer of backfill shall be compacted thoroughly, by means of approved mechanical compaction equipment, as will produce uniform pipe support throughout the full pipe length and facilitate proper shaping of the pipe bed.

It shall be the Contractor's responsibility to notify the Engineer of changing soil conditions which may be of poor bearing capacity and when organic soils are encountered. Where utilities are placed on unstable soils without notification of the Engineer, the Contractor shall be responsible for all repairs and correction of the installation without further compensation.

Care shall be taken during final subgrade shaping to prevent any over-excavation. Should any low spots develop, they shall only be filled with approved material, which shall have optimum moisture content and be compacted thoroughly without additional compensation to the Contractor. The finished subgrade shall be maintained free of water and shall not be disturbed

during pipe lowering operations except as necessary to remove pipe slings. The discharge of trench dewatering pumps shall be directed to natural drainage channels or storm water drains. Draining trench water into sanitary sewers or combined sewers will not be permitted.

The Contractor shall install and operate a dewatering system of wells or points to maintain pipe trenches free of water whenever necessary or as directed by the Engineer. Unless otherwise specified in the Plans, Specifications, and Special Provisions such work shall be considered incidental.

All costs of excavating below grade and placing foundation or bedding aggregates as required shall be included in the bid prices for pipe items to the extent that the need for such work is indicated in the Contract provisions and the Proposal does not provide for payment under separate Contract Items. Any excavation below grade and any foundation or bedding aggregates required by order of the Engineer in the absence of Contract requirements will be compensated for separately.

If examination by the Engineer reveals that the need for placement of foundation aggregate was caused by the Contractor's manipulation of the soils in the presence of excessive moisture or lack of proper dewatering, the cost of the corrective measures shall be borne by the Contractor.

B6 Contaminated Materials and Regulated Wastes

If during the course of the Project, the Contractor unexpectedly encounters any of the following conditions indicating the possible presence of contaminated soil, contaminated water, or regulated waste, the Contractor shall immediately stop work in the vicinity, and notify the Engineer.

At the direction of the Engineer, a documented inspection and evaluation will be conducted prior to the resumption of work. The Contractor shall not resume work in the suspected area without authorization by the Engineer.

Indicators of contaminated soil, groundwater or surface water include, but are not limited to the following:

- (1) Odor including gasoline, diesel, creosote (odor of railroad ties), mothballs, or other chemical odor.
- (2) Soil stained green or black (but not because of organic content), or with a dark, oily appearance, or any unusual soil color or texture.
- (3) A rainbow color (sheen) on surface water or soil.

Indicators of regulated wastes include, but are not limited to the following:

- (1) Cans, bottles, glass, scrap metal, wood (indicators of solid waste and a potential dump site).
- (2) Concrete and asphalt rubble (indicators of demolition waste).
- (3) Roofing materials, shingles, siding, vermiculite, floor tiles, transite or any fibrous material (indicators of demolition waste that could contain asbestos, lead or other chemicals).
- (4) Culverts or other pipes with tar-like coating, insulation or transite (indicators of asbestos).

- (5) Ash (ash from burning of regulated materials may contain lead, asbestos or other chemicals).
- (6) Sandblast residue (could contain lead).
- (7) Treated wood including, but not limited to products referred to as green treat, brown treat and creosote (treated wood disposal is regulated).
- (8) Chemical containers such as storage tanks, drums, filters and other containers (possible sources of chemical contaminants).
- (9) Old basements with intact floor tiles or insulation (could contain asbestos), sumps (could contain chemical waste), waste traps (could contain oily wastes) and cesspools (could contain chemical or oily wastes).

Discovery of contaminated soil, contaminated water, or regulated waste on State right of way, State property, and State funded projects shall be handled in accordance with guidance procedures of the MNDOT Office of Environmental Services (OES) and the MPCA requirements for materials handling, disposal, re-use and remediation.

Discovery of contaminated soil, contaminated water, or regulated waste on projects or properties that are not under the ownership or financed by the State shall be handled in accordance with guidance procedures of the MPCA requirements for materials handling, disposal, re-use and remediation.

C Trenchless Pipe Installation

The Contractor shall inspect and verify soil conditions as necessary in order to determine the type of construction to employ. Natural and/or manmade obstructions may be encountered in the soil. These contract documents do not warrant the nature or condition of the soils, and do not warrant that natural or manmade obstructions will not be encountered, nor guarantee the extent to which rocks, boulders, or other obstructions, regardless of size, may be encountered during boring operations. The Contractor shall not be entitled to additional compensation for any natural or manmade obstructions encountered during trenchless construction.

The Contractor shall be responsible for protecting all existing utilities within the construction limits.

C1 Jacking/Boring

The terms "auger", "boring", "jack", "jacking", and "tunneling" in the proposal, specifications, and plans refers only to trenchless construction.

The minimum diameter of the casing pipe shall be four inches (4") greater than the outside diameter of the bell of the carrier pipe.

The Contractor shall prevent excavated materials from flowing back into the excavation during the trenchless construction. This shall include the use of a shield conforming to the size and shape of the casing that will prevent materials from flowing into the leading edge of the casing. The machine used shall be capable of controlling line and grade and shall conform to the size and shape of the casing pipe.

No jacking/augering of pipe will be allowed below the water table unless the water table has been lowered sufficiently to keep the water below the pipe being installed. The use of water

under pressure (jetting) or puddling will not be permitted to facilitate jacking/augering operations.

If any installation is augered, the head shall be approved by the Engineer and the auger shall be located six inches (6") behind the lead edge of the casing or carrier pipe.

The jacking system shall be provided with an integral grout pipe and casing pipe. A one inch (1") grout pipe shall be tack welded to the front edge of the first length of casing pipe. The grout pipe shall be extended with the casing pipe, but not fastened to the casing pipe during the remaining jacking operations. After the pipes are through to the receiving pit, the grout pipe shall be cut free from the casing pipe. The grout pipe shall be pulled back through the embankment applying positive piston pressure on the grout along the outside of the casing pipe throughout the pulling operation. A cement slurry grout mix with as little water as possible shall be used. Bentonite shall not be used to fill voids. The Engineer shall approve grout and backfill material prior to placement of any material.

Deviation from the pipe grade, as provided by the Engineer, in excess of five tenths of a percent (0.05%) may be cause for removal and relaying of the pipe by the Contractor with no additional compensation allowed therefore.

If a void develops, the jacking or boring operation shall be stopped immediately and the void shall be filled by an approved method.

The Contractor shall take the following precautions when boring:

- Extend casing through entire distance bored.

- Check grade and alignment after each casing section is installed.

- Coordinate operations to provide continuous support to surrounding earth materials.

- Excavation shall be carried on in such a manner as to provide adequate support to surface structures and roads above and adjacent to the boring and not create any hazards to overhead traffic and other activities.

- These contract documents do not guarantee the extent to which rocks, boulders, or other obstructions, regardless of size, may be encountered during boring operations. No extra compensation will be made for removal of rocks, boulders or other natural or manmade obstructions encountered during trenchless construction or excavation.

- All voids caused by boring shall be filled by pressure grouting. The grout material shall consist of sand cement slurry of at least two (2) sacks of cement per cubic yard and a minimum of water to assure satisfactory placement. All slurry shall be pre-approved by the Engineer prior to use by the Contractor.

The Contractor shall take the following precautions when jacking:

- The jacking machine shall be capable of controlling line and grade.

- Progressively push carrier pipe through completed casing.

Strap two (2) wooden saddle blocks to each pipe length to provide support at regular intervals.

Center carrier pipe in casing at all times.

Partially fill annular space between casing and carrier pipe with dry blown sand. Space shall be considered filled when dry sand blows out of opposite end of casing pipe.

Seal each end of the casing with a concrete bulkhead after the sand has been deposited.

The location, size, and configuration of all jacking pits shall be subject to approval of the Engineer.

C2 Directional Boring

Direction boring/drilling installation shall be accomplished where required on the Plans or in the Special Provisions to minimize disturbance of existing surface improvements. The installer shall have a minimum of five (5) years of experience in this method of construction and have successfully installed at least ten thousand feet (10,000') of eight inch (8") or larger diameter pipe to specified grades. The field supervisor employed by the Contractor shall have at least five (5) years of experience and shall be at the site at all times during the boring/drilling installation.

The Contractor shall submit boring/drilling pit locations to the Engineer before beginning construction. Boring pits may be located within roadway right-of-way and easements. Any other boring pit locations that may be desired by the Contractor for boring or other uses shall be the responsibility of the Contractor to attain authorization, including use of private property.

Unless otherwise provided in the Special Provisions, the Contractor shall be compensated for the restoration work only within the areas at the connection points, or other locations as may be approved by the Engineer. The Contractor shall be responsible for repairs, without compensation, for any other repair areas, including pit/boring points and areas above the drilled pipe where drilling fluid pressure may have caused heaving or damage to pavement and other surfaces.

The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe between appurtenances such as valves, manholes, etc., without intermediate pits. The guidance system shall be capable of installing pipe within one and one half inch (1 ½") of the plan vertical dimensions and two inches (2") of the plan horizontal dimensions. The Contractor shall remove and reinstall pipes which vary in depth and alignment from these tolerances.

Pull back forces shall not exceed the allowable pulling forces for the pipe being installed. Drilling fluid shall be a mixture of water and bentonite clay, and shall be suitable for existing soil conditions. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

D Placement of Insulation

Rigid insulation board shall be placed within the pipe encasement zone, six inches (6") above the pipe.

Insulation boards shall be placed with the long dimension parallel to the centerline of the pipe. Boards shall be placed in a single layer with tight joints. No continuous joints or seams shall be placed directly over the pipe. If two (2) or more layers of insulation boards are used, each layer shall be placed to cover the joints of the layer immediately below.

The Contractor shall exercise caution to ensure that all joints between boards are tight during placement and backfilling with only extruded ends placed end to end or edge to edge.

Backfill material shall be placed in such a manner that construction equipment does not operate directly on the insulation, and compacted with equipment which exerts a contact pressure of less than eighty (80) psi.

E Pipeline Backfilling Operations

All pipeline excavations shall be backfilled to restore preexisting conditions as the minimum requirement, and fulfill all supplementary requirements indicated in the Plans, Specifications, and Special Provisions. The backfilling operations shall be started as soon as conditions will permit on each section of pipeline, so as to provide continuity in subsequent operations and restore normal public service as soon as practicable. All operations shall be pursued diligently, with proper and adequate equipment, to assure acceptable results.

The backfilling shall be accomplished with the use of Suitable Materials selected from the excavated materials to the extent available and practical. Should the materials available within the trench section be unsuitable or insufficient, the required additional materials shall be furnished from outside sources as provided in the Special Provisions, or as arranged otherwise through supplemental agreement.

Backfill material selection shall be such as to make the best and fullest utilization of what is available, taking into consideration particular needs of different backfill zones. Material containing stone, rock, or chunks of any sort shall only be utilized where and to the extent there will be no detrimental effects. Placement of backfill material containing stones, boulders, chunks, greater than eight inches (8") in any dimension shall not be allowed.

All flexible pipe shall be bedded in accordance with ASTM Specification D2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". Where existing soils do not meet the requirements of bedding and encasement materials, the Contractor shall furnish the required granular materials. Placement and compaction of bedding and encasement materials around the pipe shall be considered incidental to the installation of the pipe.

Compaction of materials placed within the pipe bedding and encasement zones shall be accomplished with portable or hand equipment methods, so as to achieve thorough consolidation under and around the pipe and avoid damage to the pipe. Above the cover zone material, the use of heavy roller type compaction equipment shall be limited to safe pipe loading.

Backfill materials shall be carefully placed in uniform loose thickness layers up to twelve inches (12") thick spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline. Granular backfill may be placed in layers up to twelve inches (12") above an elevation one foot (1') above the top of the pipe.

Each layer of backfill material shall be compacted effectively, by approved mechanical or hand methods, until there is no further visual evidence of increased consolidation or the density of the compacted layer conforms to the density requirements specified in the Special Provisions. Compaction of each layer shall be completed acceptably before placing material for a succeeding layer thereon. The manner of placement, compaction equipment, or procedure effectiveness shall be subject to approval of the Engineer.

All surplus or waste materials remaining after completion of the backfilling operations shall be disposed of in an acceptable manner within twenty four (24) hours after completing the backfill work on each particular pipeline section. Disposal at locations within the project limits shall be as specified, or as approved by the Engineer; otherwise, disposal shall be accomplished outside the project limits at the Contractor's discretion. The backfilling and surplus or waste disposal operations shall be a part of the work required under the pipeline installation items, without until final cleanup.

Compaction of backfill within Roadbed areas shall meet the density requirements of MnDOT Specification 2105.3 F1. Compaction of backfill in all other areas shall be as required in the Special Provisions.

Until expiration of the guarantee period, the Contractor shall assume full responsibility and expense for all backfill settlement and shall refill and restore the work as directed to maintain an acceptable surface condition, regardless of location. All additional materials required shall be furnished without cost to the Owner.

Any settlement of road surfaces placed under this Contract and that are within the guarantee period that are in excess of one inch (1"), as measured by a ten foot (10') straight edge-shall be considered failure of the mechanical compaction. The Contractor shall be required to repair such settlement without cost to the Owner.

F Restoration of Surface Improvements

Wherever any surface improvements such as pavement, curbing, pedestrian walks, fencing, or turf have been removed, damaged or otherwise disturbed by the Contractor's operations, they shall be repaired or replaced to the Engineer's satisfaction, as will restore the improvement in kind and structure to the preexisting condition. Each item of restoration work shall be done as soon as practicable after completion of installation and backfilling operations on each section of pipeline.

In the absence of specific payment provisions, as separate Contract Items, the restoration work shall be compensated for as part of the work required under those Contract Items which necessitated the destruction and replacement or repair, and there will be no separate payment. If separate pay items are provided for restoration work, only that portion of the repair or reconstruction which was necessitated by the Contract work will be measured for payment. Any improvements removed or damaged unnecessarily or undermined shall be replaced or repaired at the Contractor's expense.

G Maintenance and Final Cleanup

All subgrade surfaces shall be maintained acceptably until the start of surfacing construction or restoration work, and until the work has been finally accepted. Additional materials shall be

provided and placed as needed to compensate for trench settlement and to serve as temporary construction pending completion of the final surface improvements.

Final disposal of debris, waste materials, and other remains or consequences of construction, shall be accomplished intermittently as new construction items are completed and shall not be left to await final completion of all work. Cleanup operations shall be considered an incidental part of the work covered under the Contract Items.

If disposal operations and other cleanup work are not conducted properly as the construction progresses, the Engineer may withhold partial payments until such work is satisfactorily performed or the Engineer may deduct the estimated cost of its performance from the partial estimate value.

2600.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Complete-in-Place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items.

A Rock Excavation

Rock Excavation shall be measured by volume in cubic yards. Depth shall be measured from the top of the rock to a point six inches below the outside barrel of the pipe and width shall be the inside diameter of the pipe plus twenty four inches (24") (12" from each side). The minimum width of measurement shall be four feet (4').

B Granular Materials

Granular materials furnished and placed as special foundation, bedding, encasement, or backfill construction will be measured by weight or volume of material furnished by the Contractor from outside sources and placed within the limits defined. Unless otherwise specified, volume will be determined by vehicular measure (loose volume) at the point of delivery. Measurements will not include any materials required to be placed as a component part of other Contract Items as may be specified.

C Geotextile Fabric

Where geotextile fabric is used for improving pipe foundation, it shall be measured by the square yard of material installed.

D Insulation

Rigid board insulation shall be measured on a square yard basis installed to the specified thickness noted on the Plans, Specifications, and Special Provisions and shall include all materials, equipment, and labor required for placement.

2600.5 BASIS OF PAYMENT

All costs of excavating to foundation grade, preparing the foundation, placing and compacting backfill materials, restoring surface improvements, and other work necessary for prosecution

and completion of the work as specified, shall be included for payment as part of the pipe and pipe appurtenance items without any direct compensation being made.

In the absence of special payment provisions, all costs of restoring surface improvements as required, disposal of surplus or waste materials, maintenance and repair of completed work, and final cleanup operations shall be incidental to the Contract Items under which the costs are incurred.

Granular materials furnished for foundation, bedding, cover, or backfill placement as specified in connection with pipe or structure items will only be paid for as separate Contract Items to the extent that the Proposal contains specific Pay Items. Otherwise the furnishing and placing of granular materials as specified shall be incidental to the pipe or structure item without any direct compensation being made.

Materials utilized for filling annular spaces due to jacking/boring and drilling fluids for directional boring shall be incidental to the installation of the casing and pipe installed.

Contaminated Materials and Regulated Wastes not anticipated in the plans, specifications and special provisions and unexpectedly discovered during construction shall be compensated for as negotiated by supplemental agreement.

Contaminated Materials and Regulated Wastes specifically identified for payment in the plans, specifications, and special provisions, will be paid for under separate Contract Items provided in the Proposal.

SECTION 2611 – STANDARD SPECIFICATIONS FOR WATERMAIN AND SERVICE LINE INSTALLATION

2611.1 DESCRIPTION

This work shall consist of the construction of watermain and building service pipelines utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of potable water. The work includes the relocation or adjustment of existing facilities as may be specified in the Plans, Specifications and Special Provisions.

The use of the term "Plans, Specifications, and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are an enforceable component of the Contract Documents.

All references to MnDOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation "Standard Specifications for Construction", and all supplements and amendments thereto, published prior to the date of advertisement for bids.

All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following American Water Works Association (AWWA) Specifications have been referenced in this Specification:

- C104 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- C105 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
- C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids
- C111 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C115 American National Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
- C116 AWWA Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
- C150 American National Standard for Thickness Design of Ductile-Iron Pipe
- C151 American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- C153 American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service
- C301 AWWA Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
- C304 AWWA Standard for Design of Prestressed Concrete Cylinder Pipe 26
- C500 AWWA Standard for Metal-Seated Gate Valves for Water Supply Service (Includes addendum C500a-95.)
- C502 AWWA Standard for Dry-Barrel Fire Hydrants (Includes addendum C502a-95.)
- C504 AWWA Standard for Rubber-Seated Butterfly Valves
- C509 AWWA Standard for Resilient-Seated Gate Valves for Water Supply Service (Includes addendum C509a-95.)

C515 AWWA Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service

C550 AWWA Standard for Protective Interior Coatings for Valves and Hydrants

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

C605 AWWA Standard for Underground Installation of Polyvinyl Chloride (PVC and PVCO) Pressure Pipe and Fittings for Water

C651 AWWA Standard for Disinfecting Water Mains

C800 AWWA Standard for Underground Service Line Valves and Fittings

C900 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Transmission and Distribution (Includes addendum C900a-92.)

C901 AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service

C904 AWWA Standard for Cross-Linked Polyethylene (PEX) Pressure Pipes, 1/2 In. (12 mm) Through 3 In. (76 mm) for Water Service

C905 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., (350mm Through 1,200mm), for Water Transmission and Distribution

C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution and Transmission

C907 AWWA Standard for Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 In. Through 8 In. (100mm Through 200mm) for Water, Wastewater, and Reclaim Water Service

AWWA C908 Standard for PVC Self-Tapping Saddle Tees for Use on PVC Pipe

ASTM A48 Standard Specification for Gray Iron Castings

ASTM A536 Standard Specification for Ductile Iron Castings

ASTM B88 Standard Specification for Seamless Copper Water Tube

ASTM C270 Standard Specification for Mortar for Unit Masonry

ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections

ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)

ASTM D2446 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Controlled Outside Diameter

ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

ASTM F594 Standard Specification for Stainless Steel Nuts

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter

ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing

ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution Systems

Service installations shall include either Branch Service Lines or Tapped Service Lines in accordance with the standards set forth herein.

Tapped Service installations shall include all water service lines less than three inches (3") nominal inside diameter pipe. The component parts of a tap service installation shall include a corporation stop coupling complete with watermain tap and saddle where required; a curb stop coupling complete with service box; and service piping extending from the corporation stop to the curb stop coupling and beyond to the property line or to the limits as established by the Engineer.

Branch Service installations shall include all water service lines of three inches (3") nominal inside diameter pipe and larger. The component parts of a branch service installation shall include a tapping sleeve and valve or a tee connection and valve complete with valve box, and piping extending from the watermain connection, to the property line or to the limits as specified by the Engineer.

All references to "structure" shall include any man-made object that is not otherwise exempted by special terminology or definition.

2611.2 MATERIALS

All materials required for this work shall be new material conforming to requirements of the reference specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

At the request of the Engineer, the Contractor shall submit, in writing, a list of materials and suppliers for approval.

A Certificate of Compliance shall be furnished stating that the materials furnished have been tested and are in compliance with the specification requirements.

A Water Pipe Materials

All pipe furnished for watermain and branch line installations shall be of the type, kind, size, and class indicated for each particular line segment as shown in the Plan and designated in the Contract Items. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be subject to approval of the Engineer.

A1 Ductile Iron Pipe and Ductile Iron and Gray Iron Fittings

The pipe furnished shall be Ductile Iron pipe and pipe fittings furnished shall be of the Ductile Iron or Gray Iron type as specified for each particular use of installation. When Gray Iron is specified, either type may be furnished. Gray Iron may not be substituted for Ductile Iron unless specifically authorized in the Special Provisions.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for potable water, and thickness design shall conform to AWWA C 150. In addition, the pipe shall comply with the following supplementary provisions:

- (1) Fittings shall conform to the requirements of AWWA C110 (Gray Iron and Ductile Iron Fittings) or AWWA C153 (Ductile Iron Compact Fittings) for the joint type specified.
- (2) Unless otherwise specified all pipe and fittings shall be furnished with cement mortar lining meeting the requirements of AWWA C104 for standard thickness lining. All exterior surfaces of the pipe and fittings shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

Fittings specified to be furnished with fusion bonded epoxy external coating and/or interior lining shall conform to the requirements of AWWA C550 and C116/A21.16, with 6-8 mil nominal thickness.

- (3) Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.
- (4) The nuts and bolts shall be constructed of corrosion resistant, high-strength, low-alloy steel with a ceramic filled, baked on fluorocarbon resin. The nuts and bolts shall be in compliance with ANSI/AWWA C111/A21.11 (Current Revision).
- (5) Conductivity shall be maintained through pipe and fittings with an external copper jumper wire or specialty gaskets which are capable of meeting conductive requirements. Wedge type connectors will not be allowed.

A2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

Polyvinyl chloride (PVC) pressure pipe shall be manufactured with compounds conforming to ASTM D1784 and shall conform to the requirements of AWWA C-900, C-905, Fusible C-900, and Fusible C905, for the size, grade, and pressure class indicated on the Plans, Specifications, and Special Provisions. Fittings shall be the same pressure class as the pipe and shall conform to AWWA C907 and C908. PVC pressure pipe and fittings shall have a pressure rating of one hundred sixty (160) psi or greater, unless otherwise provided in the special provisions. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to ductile iron or cast iron pipe equivalent outside diameters.

A3 Polyethylene (PE) Pressure Pipe and Fittings

Polyethylene pressure pipe and fittings shall be manufactured with compounds conforming to ASTM D3350 and shall conform to ASTM D3035 and AWWA C-901 (for 0.5" to 3" diameters) and ASTM F714 and AWWA C906 (for 4" to 65" diameters) for the size, grade and pressure class indicated on the plans, specifications and special provisions. Polyethylene pipe and fittings shall be PE 3608 or PE 4710 for potable water transmission and pressure rating of one hundred sixty (160) psi or greater, unless otherwise provided in the special provisions. The pipe and fittings shall be manufactured from the same resin type, grade, and cell classification. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to Ductile Iron pipe equivalent outside diameters for pipe diameters greater than three inches (3"). The method of joining material shall be by the Thermal Butt- Fusion Method in accordance with ASTM 3261.

The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used.

B Fire Hydrants

Fire hydrants shall be of the type, size, and construction specified in the Plans and shall conform to the applicable requirements of AWWA C-502.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants shall be furnished in conformance with the following supplementary requirements:

- (1) Hydrants shall have a five inch (5") (nominal diameter) main valve opening of the type that opens against water pressure.
- (2) Hydrant barrels shall be two (2) piece, non-jacket type, with flanged joint above finished grade line and with mechanical joint connection at the hub end for joining a six inch (6") ductile iron branch pipe.
- (3) Hydrant operating rod shall be equipped with a breakable joint coinciding with the flange joint above the grade line.
- (4) Hydrant bury length shall be measured from the bottom of the branch pipe connection to the finished ground line at the hydrant.
- (5) Hydrants shall have two (2) outlet nozzles for two and one half inch (2-1/2") (I.D.) hose connection and one outlet nozzle for four inch (4") (I.D.) steamer connection. All outlet nozzle threads shall be National Standard Fire-Hose Coupling Screw Threads (NFPA 1963).
- (6) Hydrant operating mechanisms shall be provided with "O" ring seals preventing entrance of moisture and shall be lubricated through an opening in the operating nut or bonnet.
- (7) Hydrants shall be provided with outlets for drainage in the base or barrel, or between the base and barrel, unless the Special Provisions require that drain outlets be omitted or plugged.

- (8) The hydrant operating nut shall be rotated counterclockwise to open.
- (9) Detailed drawings, catalog information, and maintenance data shall be furnished as requested by the Engineer.
- (10) Hydrant body bolts shall be corrosion resistant, stainless steel conforming to the requirements of ASTM F593 and F594, alloy group 1, 2, 3, suitable for exterior use above and below ground. Bolts shall conform to manufacturer recommendation for tensile strength and torque.

C Valves and Valve Housing

C1 Valve Housings

Valve housings shall be of ductile or cast iron, High Density Polyethylene or masonry construction as specified in the Plans, Specifications, and Special Provisions for the particular valve size or installation. Masonry manhole or vault type units shall be constructed in accordance with the provisions of MnDOT Specification 2506. Precast Concrete Manholes shall conform to ASTM Specification C-478 suitable for HS 20 traffic loading for all units located in driving areas. Ductile or cast iron valve boxes and all castings for manhole or vault type units shall conform to the requirements of MnDOT Specification 3321.

C2 Gate Valves

Gate Valves shall conform to all applicable requirements of AWWA C-500 or AWWA C-509 or AWWA C-515, together with such supplementary requirements as may be covered in the Plans, Specifications, and Special Provisions. Unless otherwise specified gate valves shall comply with the following supplementary requirements:

- (1) Gate valves meeting the requirements of AWWA C-500 shall be two-faced, double disc type, with parallel seats. Gate valves meeting the requirements of AWWA C-509 and C-515 shall be single disc type with resilient seat bonded or mechanically attached to either the gate or valve body, and the wedge shall be ductile iron fully encapsulated with EPDM rubber, shall be symmetrical and seal equally well with flow in either direction without misalignment. All valves shall be provided with a two-inch square operating nut opening counterclockwise and mechanical joint ends.
- (2) All gate valves shall be non-rising stem (NRS) type furnished with O-Ring stem seals.
- (3) All gate valves sixteen inches (16") or larger in size shall be arranged for operation in the horizontal position and shall be equipped with bypass valves.
- (4) All gears on gate valves shall be cut tooth steel gears, housed in heavy ductile or cast iron extended type grease cases of approved design.
- (5) All gate valves shall have an open indicating arrow, the manufacturer's name, pressure rating and year of manufacture cast on the valve bodies.
- (6) All internal and external surfaces of the valve body and bonnet shall have an epoxy coating, complying with ANSI/AWWA C550.

- (7) All gate valves shall have stainless steel body bolts unless otherwise specified.

C3 Butterfly Valves

Butterfly valves shall be manufactured in conformance with all applicable requirements of AWWA C-504 for 150 p.s.i. working pressure minimum, together with such supplementary requirements as may be covered in the Plans, Specifications, and Special Provisions. Unless otherwise specified, the butterfly valves furnished shall comply with the following supplementary requirements.

- (1) The butterfly valves shall be short body of ductile or cast iron with mechanical joint ends.
- (2) The butterfly valves shall be rubber seated with ductile or cast disc, non-rising stem type furnished with O-ring stem seals.
- (3) The butterfly valves shall be equipped with a two-inch square operating nut opening counterclockwise.
- (4) The butterfly valves shall be designed for direct burial installation.
- (5) All butterfly valves shall have an open indicating arrow, the manufacturer's name, pressure rating and year of manufacture on the valve bodies.
- (6) All internal and external surfaces of the valve body and bonnet shall have an epoxy coating, complying with ANSI/AWWA C550.
- (7) All butterfly valves shall have stainless steel body bolts unless otherwise specified.

D Water Service Pipe and Fittings

Water service pipe of 3 inches or larger inside diameter shall conform to the requirements as set forth under the provisions of 2611.2.

Water service pipe of less than three inches (3") in inside diameter shall conform to the requirements of ASTM B 88 for Seamless Copper Water Tube, Type K, Soft Annealed temper; Polyethylene Pipe as per AWWA C901 and ASTM D3350, or Polyvinyl Chloride Pipe and fittings as per a ASTM D1785, D2241, D2466, D2467 and D2740, or Cross-linked Polyethylene (PEX) pipe as per ASTM F876, ASTM F877, and AWWA C904, NSF/ANSI Standard 61 for potable water distribution, as specified on the Proposal or in the Special Provisions. Water service piping supplied shall include markings indicating the type, pressure class, testing certification, and use for potable water systems.

Corporation stops, saddles, curb stops, and curb stop service boxes shall conform to the requirements of AWWA C800 be as detailed in the Plans, Specifications, and Special Provisions or approved designations.

Saddles for Polyethylene Pipe shall conform to the requirements of AWWA C800, and shall be thermal fusion polyethylene type; ductile iron with dual stainless steel straps, spring washers, bolts and washers; or stainless steel sleeve type, with stainless steel bolts, nuts, and spring

washers. Stainless steel bolts, nuts, and washers. Spring washers shall be manufactured from type 304 stainless steel, special "spring grade". Saddles shall include threaded outlet tapping sleeves and Nitrile Butadiene Rubber (NBR) gaskets.

All fittings for copper tubing shall be cast brass, having uniformity in wall thickness and strength, and shall be free of defects affecting serviceability. All copper pipe fittings shall be flared or compression type. All threads for underground service line fittings shall conform to the requirements of AWWA C-800. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer. Fittings for thermoplastic pipe types shall be of the same material and pressure class as the piping.

Curb stop service boxes shall be gray iron conforming to the requirements of ASTM A 48 for Class 20 or higher tensile strength and shall have at least twelve inches (12") of vertical adjustment for the cover depth specified in the Plans, Specifications, and Special Provisions.

E Polyethylene Encasement Material

Polyethylene encasement material shall conform to the requirements of AWWA C-105 for tube type installation and 8 mil nominal film thickness.

F Mechanical Joint Restraints

Mechanical joint restraints shall be ductile iron conforming to the requirements of ASTM A536 and AWWA C-600. Joint restraints shall be American, US Pipe, Star Pipe Products, or EBBA Iron Mega-Lug type, and be designed to withstand the design pressures indicated in the Plans, Specifications, and Special Provisions. Mechanical joint restraints shall be fusion bonded epoxy coated meeting the requirements of AWWA C-116.

All nuts, bolts, and tie rod type restraints shall be stainless steel, corrosion-resistant coating, or coated with an owner approved rustproofing material.

G Mortar

Mortar for use in masonry construction shall meet the requirements of MNDOT 2506.2B and ASTM C270.

H Concrete

Concrete used for cast-in-place masonry construction shall be produced and furnished in accordance with the provisions of MnDOT Specification 2461 for the mix design indicated in the Plans, Specifications, or Special Provisions. The requirements for Grade B concrete shall be met where a higher grade is not specified. Type 3, air-entrained, concrete shall be furnished and used in all structures having weather exposure.

I Tracer Wire for Non-Conductive Pipe

Tracer wire for use with all thermoplastic pipe types shall be Underwriters Laboratories (UL) listed for use in direct burial applications. Tracer wire shall be a minimum 12 AWG copper clad steel rated to 30 volts, High Molecular Weight Polyethylene (HMWPE) meeting ASTM D-1248, with designation identified on the outside of the wire casing.

2611.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

Installation of ductile iron watermains and their appurtenances shall conform to the requirements of AWWA C-600, the Plans, Specifications and Special Provisions.

Installation of Polyvinyl Chloride (PVC) pipe and their appurtenances shall conform to the requirements of AWWA C605, and the bedding and backfill conditions specified by the Manufacturer, Plans, Specifications, and Special Provisions.

Installation of Polyethylene Pipe and their appurtenances shall conform to the requirements of AWWA M55 and to the bedding and backfill conditions specified by the Manufacturer, Plans, Specifications, and Special Provisions.

No existing valves or hydrants shall be operated by individuals other than personnel from the City Public Works Department. Only under emergency conditions or after specific authorization is given by the City Public Works Department shall the Contractor operate valves or hydrants.

Installation of pipe and fittings shall also conform to the following general guidelines:

A1 Inspection and Handling

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work.

During the process of unloading delivered materials, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged material and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site.

All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fittings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping.

During pipe laying operations each pipe section and shall be inspected by the Contractor. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair.

A2 Pipe Laying Operations

Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper placement and joining of the pipe and fittings at the prescribed grade and alignment without unnecessary hindrance. All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench, and they shall

be kept clean. The watermain materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped or dumped into the trench.

As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved encasement and backfill materials.

When pipe laying is not in progress, all open ends of the pipe line shall be closed by watertight plugs or other means approved by the Engineer. If water is present in the trench, the plugs shall remain in-place until the trench is pumped completely dry.

When connecting to existing stubs, the Contractor shall prevent dirt or debris from entering the existing pipe.

A3 Aligning and Fitting of Pipe

The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe and so as to leave a smooth square-cut end. Pipe shall be cut with approved mechanical tools. Flame cutting will not be allowed under any conditions. All rough edges shall be removed from the cut ends of pipe and, where rubber gasket joints are used, the outer edge shall be rounded or beveled by grinding or filing to produce a smooth fit.

When necessary to deflect pipe from a straight line either in the vertical or horizontal plane, to avoid obstructions, plumb stems, or produce a long radius curve when permitted, the amount of deflection allowed at each joint shall not exceed the limits to maintain a satisfactory joint seal in conformance with AWWA C-600 for ductile iron pipe mechanical and push-on joints, AWWA C-605 for PVC pipe and AWWA M55 for PE pipe. The maximum angular deflection at any joint for other pipe materials and joints shall not exceed the manufacturer's recommendations. If the specified alignment requires angular deflections greater than recommended or allowed, the Contractor shall provide appropriate bends or shorter pipes such that the maximum angular deflection is not exceeded.

A4 Blocking and Anchoring of Pipe

All plugs, caps, tees, bends, and other thrust points shall be provided with reaction backing, or movement shall be prevented by attachment of suitable restraining devices or tie rods, in accordance with the requirements of the Plans, Specifications, and Special Provisions.

In the absence of other specified requirements for reaction backing or restraining devices, the following provisions shall apply:

- (1) All horizontal bends exceeding twenty (20) degrees deflection, and all caps, plugs, and branch tees shall be provided with concrete buttress blocking.
- (2) All vertical bends exceeding twenty (20) degrees deflection shall be provided with concrete buttress blocking at the low points and with metal tie rod or strapping restraints at the high points.
- (3) Offset bends made with standard offset fittings need not be strapped or buttressed.

(4) Hardwood blocking shall not be used.

Concrete buttresses shall be poured against firm, undisturbed ground and shall be formed in such a way that the joints will be kept free of concrete and remain accessible for repairs. The concrete mix used in buttress construction shall meet the requirements for Grade B concrete in conformance with MnDOT Specification Section 2461. Buttress dimensions shall be a minimum of twelve inches (12") in thickness, and the minimum area, in square feet shall be as follows.

<u>PIPE SIZE</u>	<u>TEE OR PLUG</u>	<u>1/4 BEND</u>	<u>1/8 BEND</u>	<u>1/32 BEND 1/16 BEND</u>
6"	2.9	3.1	1.6	0.8
8"	3.7	5.3	2.9	1.4
10"	5.7	8.1	4.4	2.2
12"	8.1	13.4	6.6	3.2
16"	15.1	21.4	11.6	5.9
20"	23.2	30.2	18.1	9.3
24"	33.6	48.5	26.1	13.3

Contractors are instructed to size concrete buttress blocking on fittings and dead ends where the blocking must withstand the pressure of larger main line fittings equipped with reducers, for the larger sized main line thrust and not for smaller fitting size only. This is of particular importance on tees and crosses where the main size is reduced on the run from large to small size by use of reducers.

All metal parts of tie rod or strap type restraints shall be galvanized or coated with other approved asphaltic type rustproofing.

All necessary fittings, bands, tie rods, nuts, and washers, and all labor and excavation required for installation of reaction restraints shall be incidental to the installation of the pipe, unless a specific payment item is provided in the bid proposal.

A5 Polyethylene Encasement of Pipeline

Wherever so required by the Plans, Specifications, or Special Provisions the pipeline, including valves, fittings, and appurtenances, shall be fully encased in polyethylene film meeting the requirements of these Specifications. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, off-sets, etc. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc.

The polyethylene tubing shall be installed on the pipe prior to being lowered into the trench. Tubing length shall be sufficient to provide a minimum overlap at all joints of one foot or more. Overlap may be accomplished with a separate sleeve tube placed over one end of the pipe prior to connecting another section of pipe, or by bunching extra overlap material at the pipe ends in accordion fashion. After completing the pipe jointing and positioning the overlap material, the overlap shall be secured in place with plastic adhesive tape wrapped circumferentially around the pipe not less than three (3) turns.

After encasement, the circumferential slack in the tubing film shall be folded over at the top of the pipe to provide a snug fit along the barrel of the pipe. The fold shall be held in place with

plastic adhesive tape applied at intervals of approximately three feet (3') along the pipe length. Also, any rips, punctures, or other damage to the tubing shall be repaired as they are detected. These repairs shall be made with adhesive tape and overlapping patches cut from sheet or tubing material.

At odd-shaped appurtenances such as gate valves, the tubing shall overlap the joint and be secured with tape, after which the appurtenant piece shall be wrapped with a flat film sheet or split length of tubing by passing the sheet under the appurtenance and bringing it up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Wherever encasement is terminated, it shall extend for at least two feet (2') beyond the joint area.

Openings in the tubing for branches, service taps, air valves and similar appurtenances shall be made by cutting an X-shaped slit and temporarily folding back the film. After installing the appurtenance, the cut tabs shall be secured with tape and the encasement shall be completed as necessary for an odd-shaped appurtenance.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants encased in polyethylene tubing shall have plugged drain outlets.

B Connection and Assembly of Joints

Where rubber gasket joints are specified, care shall be taken during the laying and setting of piping materials to insure that the units being joined have the same nominal dimension of the spigot outside diameter and the socket inside diameter. A special adaptor shall be provided to make the connection when variations in nominal dimension might cause unsatisfactory joint sealing.

Immediately before making the connection, the inside of the bell or socket and the outer surface of the spigot ends shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. Insertion of spigot ends into the socket or bell ends shall be accomplished in a manner that will assure proper centering and insertion to full depth. The joint seal and securing requirements shall be as prescribed below for the applicable pipe and joint type.

B1 Ductile Iron Pressure Pipe and Fitting Joints

B1a Push-On Joints

The circular rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be flexed inward and inserted in the gasket recess of the bell socket. A thin film of approved gasket lubricant shall be applied to either the inside surface of the gasket or the outside surface of the spigot end, or to both. Care shall be taken while inserting the spigot end to prevent introduction of contaminants. The joint shall be completed by forcing the spigot end to the bottom of the socket by the use of suitable pry-bar or jack type equipment. Spigot ends which do not have depth marks shall be marked before assembly to insure full insertion. The use of the bucket on the excavation equipment to force the pipe into the socket shall not be permitted.

B1b Mechanical Joints

The last eight inches (8") of the outside spigot surface and the inside bell surface of each pipe and appurtenance joint shall be painted with a thin film of approved gasket lubricant after being thoroughly cleaned. The gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end. The rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be painted with a thin film of approved gasket lubricant and be placed on the spigot end with the thick edge toward the gland

After the spigot end is inserted into the socket to full depth and centered, the gasket shall be pressed into place within the bell evenly around the entire joint. After the gland is positioned behind the gasket, all bolts shall be installed and the nuts tightened alternately to the specified torque, such as to produce equal pressure on all parts of the gland.

Unless otherwise specified, the bolts shall be tightened by means of a suitable torque-limiting wrench to within a foot-pound range of: 45 to 60 for 5/8 inch bolts; 75 to 90 for 3/4 inch bolts; 85 to 100 for 1 inch bolts; and 105 to 120 for 1-1/4 inch bolts. After tightening, all exposed parts of the bolts and nuts shall be completely coated with an approved asphaltic type rust preventive material.

B1c Flanged Joints

Flanged joints shall be installed only in above grade or exposed locations and shall conform to the requirements of AWWA C115 Specifications, the Plans, Specifications and Special Provisions. Flanged joints shall have full face gaskets.

B2 Polyvinyl Chloride Pipe Joints

B2a Push-On Joints

The circular rubber gasket shall be bonded to the inner wall of the gasket recess of the bell socket. Installation of pipe spigot into the bell socket shall conform to the requirements for Ductile Iron Push-On Joints as set forth under the provisions of 2611.3B1a.

B3 Polyethylene Pipe Joints

Polyethylene pipe joints shall conform to the requirements of AWWA C-906, and shall be made by the Thermal Butt-Fusion Method, Mechanical Flange Adaptor Method, Mechanical Joint Adaptor Method and Mechanical Transition Fittings. Mechanical joints shall include stainless steel pipe stiffeners. Compression fittings are not allowed for pipe diameters greater than two inches (2") in diameter.

B4 Tracer Wire for Non-conductive Pipe

Tracer wire shall be installed along the length of all non-conductive mainline pipes, laterals, and services with vertical riser to the surface, at gate valve boxes, hydrants, curb boxes, and/or utility location boxes as required by the Special Provisions. Tracer wire shall be taped, clamped or affixed to the pipe in another manner as approved by the Engineer.

Splicing tracer wire shall be by mechanical split bolt type or a crimp type compression fitting fully encased in approved electrical insulation putty. A twelve inch (12") tracer wire loop shall be provided on each side of a spliced connection.

C Water Service Installations

Water service facilities consisting of Tap Service Lines and Branch Service Lines, complete with all required appurtenances, shall be installed as required by in the Plans, Specifications, and Special Provisions, in accordance with all pertinent requirements for main line installations together with the provisions hereof.

It shall be the responsibility of the Contractor to keep an accurate record of the location, depth and size of each service connection and other pertinent data such as the location of curb stops and pipe endings. Tap locations shall be recorded in reference to survey line stationing. Curb stops shall be tied to definable land marks such as building corners, lot corner markers, hydrants, gate valves, etc. Pipe terminals at the property line shall be marked to the ground surface with a suitable wood timber four by four inch (4"x4"), eight feet (8') long set vertically into the ground with the top two feet (2') painted blue. Approved record keeping forms will be furnished by the Engineer and the completed records shall be submitted by the Contractor upon completion of the work.

Water service lines shall normally be installed by trenching and be subject to the same requirements as prescribed for the main pipeline installation, except for those which may not be pertinent or applicable. Where water service lines are installed alongside of sanitary service lines, installation shall be such as to maintain the minimum specified clearances between pipelines and provide proper and adequate bearing for all pipes and appurtenances.

Water service lines shall be installed to provide a minimum of six inches (6") of clearance shall be maintained in crossing over or under other structures. Where the service pipe may be exposed to freezing due to insufficient cover or exposure from other underground structures, the water pipe shall be insulated as directed by the Engineer.

C1 Tee Branch Service Lines

Tee branch service piping shall be of the type, size, and wall thickness specified. The pipe and appurtenances shall have rubber gasketed push-on or mechanical joints. Tee branch service lines shall be provided as required by the Plans.

Installation of tee branch service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations.

C2 Tapped Service Lines

Service piping shall be of the size and type specified. Unless otherwise specified, minimum pipe size for tap service installations shall be one inch (1") nominal inside diameter. Larger size pipe may be specified for commercial and industrial uses or for some domestic service as specifically identified.

Installation of service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations, subject to the exceptions and supplementary provisions set forth hereinafter.

Installation of tapped service lines shall be performed while the mainline watermain is at system operating pressure. Dry tapping watermain pipe will not be allowed.

Unless otherwise indicated, service piping may be laid directly on any solid foundation soil that is free of stones and hard lumps. However, when specified or ordered, aggregate materials shall be furnished and placed as necessary to secure proper foundation drainage, pipe covering, or backfill support.

Tapped service piping of three quarters inch (3/4") to and including one and one quarter inches (1 1/4") in diameter shall be installed in one piece without intermediate joint couplings between the corporation stop and the curb stop. Service pipe of one and one half inches (1-1/2") in diameter and larger shall be furnished in standard roll lengths to eliminate any intermediate joints. When full roll lengths are less than the service length the rolls may be joined with approved couplings.

Unless otherwise specified, connection of tapped service lines to the watermain shall be made at an angle of not more than twenty two (22) degrees from the horizontal. A double wrap of Teflon tape shall be placed on the corporation stop threads prior to installation in the main.

Unless otherwise indicated, tap service lines shall be installed on a straight line at right angles to the watermain or property line as directed by the Engineer. In the absence of specific requirements, the service line shall be terminated at the property line, where it shall be connected to an existing line or, in the case of undeveloped property, it shall be capped, plugged, or peened as approved by the Engineer.

The flaring of new copper tubing ends shall be accomplished only with the use of the proper size and type of tools as designed for the purpose. Tubing shall be cut squarely and all edge roughness shall be removed prior to flaring. All couplings shall be tightened securely, so the flared end fits snugly against the bevel of the fitting without leakage. The flared joint couplings shall be made up without the use of jointing compounds.

The service pipe and curb stop coupling depth shall be such as to maintain not less than the specified minimum cover. The service box shall be connected to or centered over the curb stop and be firmly supported on concrete blocking as required by the Plans, Specifications, and Special Provisions. Clearance shall be provided so the service box does not rest on the water pipe. Service boxes shall be installed plumb.

The service boxes shall be brought to proper surface grade when the final ground surface has been established.

D Setting Valves, Hydrants, Fittings and Specials

Valves, hydrants, fittings, and specials shall be provided and installed as required by the Plans, Specifications, and Special Provisions with the exact locations and setting as directed by the Engineer, and with each installation accomplished in accordance with the requirements for installation of mainline pipe to the extent applicable. Support blocking, reaction backing, and anchorage devices shall be provided as required by the Plans, Specifications, and Special Provisions or as otherwise ordered by the Engineer.

Hydrants shall be installed plumb, with the height and orientation of nozzles as shown in the Plans or as directed by the Engineer. Unless otherwise specified, the hydrants shall be connected to the mainline pipe with six inch (6") diameter pipe, controlled by an independent valve.

When a hydrant with an open drain outlet is set in clay or other impervious soil, a drainage pit of at least one cubic yard shall be excavated below and around the hydrant base and the pit shall be filled with Foundation Material to a level six inches (6") above the drain outlet. MnDOT 3733 geotextile Type V, or other material approved by the Engineer, shall be carefully placed over the rock to prevent backfill material from entering voids in the rock drain. Hydrants located where the groundwater table is above the drain outlet shall have the outlet drain hole plugged or the drain tube cut off to prevent draining, and shall be equipped with a tag stating, "Pump After Use".

Valve boxes shall be centered over the valve wrench nut and be installed plumb, with the box cover flush with the surface of the finished pavement or at such other level as may be directed.

Valve box adaptors for use to stabilize the valve box in a centered position over the valve wrench nut shall include a rubber gasket between the adaptor plate and valve body. The adaptor shall be epoxy coated conforming to the requirements for fittings in section 02611.2A1, or as otherwise allowed by the plans, specifications and special provisions. Gate valve box adaptors shall be incidental to the valve box unless otherwise provided in the bid proposal.

Masonry valve pit structures, for valves with exposed gearing or operating mechanisms, shall be constructed in accordance with the details shown in the Plans and with the applicable provisions of these Specifications.

Drainage blow-offs, air vents, and other special appurtenances shall be provided and installed as required by the Plans, Specifications, and Special Provisions.

All dead ends shall be closed with approved plugs or caps and shall be equipped with suitable blow-off facilities.

E Disinfection of Watermains

Before being placed in service, the completed water main shall be disinfected. Disinfection materials and procedures, and the collection and testing of water samples, shall be in accordance with the provisions of AWWA C-651. After the final flushing of watermain, the water shall be tested for bacteriologic quality and found to meet the standards prescribed by the Minnesota Department of Health.

Where an existing watermain is cut for the installation of any fitting, the pipe and fittings proposed to be installed shall be disinfected prior to installation as follows:

- (1) The interior of the pipe and fittings shall be cleaned of all dirt and foreign material.
- (2) The interior of the pipe and fittings shall be thoroughly swabbed or sprayed with a one percent (1%) minimum hypochlorite solution.

Unless otherwise indicated in the Plans, Specifications, and Special Provisions, the Contractor shall furnish all materials and perform the disinfecting, flushing, and testing as necessary for meeting the water quality requirements.

The flushing operations and the form of chlorine and method of application to be used shall be subject to approval by the Engineer.

F Electrical Conductivity Test

The Contractor shall perform a conductivity test within one week after completion of pressure testing of the main on all watermains to ensure continuous conductivity for the purpose of tracing watermain for utility location. Sufficient conductivity shall be provided to allow for the location of watermain, services, hydrant leads, and laterals for mainline segments at least one thousand two hundred (1,200) linear feet in length

G Hydrostatic Testing of Watermains

After the pipe has been laid, including fittings and valves and blocking, all newly-laid pipe or any section between valves thereof, unless directed otherwise by the Engineer, shall be subject to hydrostatic pressure of one hundred fifty (150) pounds per square inch. The duration of each such test shall be at least two (2) hours.

Each section of pipe to be tested shall be filled with water and all air expelled at the highest point. The required taps to expel air or to fill the watermain shall be supplied and installed by the Contractor and shall be three quarters inch (3/4") and shall include an approved service saddle when required.

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

The pressure gauge shall be a standard pressure gauge. The dial shall register from 0 - 200 psi and have a dial size of four and one half inches (4 ½") with one (1) psi increments.

The hydrostatic test, pressure requirement for an acceptable test shall be a maximum pressure drop of two (2) psi during the last hour of the two (2) hour pressure test.

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

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

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

H Operational Inspection

At the completion of the project and in the presence of the Engineer and the Contractor, representatives of the Owner shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb and centered; and that water is available at all curb stops.

2611.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Pipe will generally be designated by size (inside diameter or span), strength class, kind or type, and laying condition. Payment shall include all component parts thereof as described or required to complete the unit, but excluding any item covered by a separate pay item. Lineal measurement of piping will include the running length of any special fittings (tees, wyes, bends, gates, etc.) installed within the line of measure between specified terminal points.

A Water Pipe

Mainline pipe and service pipe of each kind and size will be measured separately by the overall length along the axis of the pipeline, from beginning to end of each installation and without regard to intervening valves or specials. Terminal points of measure will be the spigot or cut end, base of hub or bell end, center of valves or hydrants, intersecting centers of tee or wye branch service connections, and center of corporation stop or curb stop couplings.

B Valves

Valves of each size and type will be measured separately as complete units, including the required manhole or valve box setting.

C Corporation Stops

Corporation stops of each size and type will be measured separately by the number of units installed, including the watermain tap and saddle.

D Curb Stops

Curb stops of each size and type will be measured separately by the number of units installed, including the required curb box.

E Hydrants

Hydrants will be measured by the number of units installed.

F Air Vents

Air vents of each type and size will be measured separately by the number of complete units installed, including the required manhole or valve box setting.

G Polyethylene Encasement

Polyethylene encasement of pipe will be measured by the linear foot of pipe encased of each specified size.

H Ductile and Gray Iron Fittings

Ductile Iron and Gray Iron fittings shall be measured by the pound without joint accessories or on an each basis as specified on the Proposal or in the Special Provisions. Joint accessories including tie rods, joint restraints, nuts and bolts shall be incidental to the watermain unless otherwise provided on the Proposal or in the Special Provisions.

The standard weight of Ductile Iron and Gray Iron fittings, for payment basis, shall be as published in AWWA C-153 and C-110, respectively.

I Polyvinyl Chloride or Polyethylene

Polyvinyl Chloride or Polyethylene fittings shall be measured on an each basis as specified and shown on the Proposal or in the Special Provisions.

J Access Structures

Access structures, such as valve boxes, service boxes, manholes and vaults, will be measured for payment only when and to the extent that the Proposal contains specific items therefore. Otherwise, the required structures are included for payment as part of the pipe appurtenance (Gate Valve, Curb Stop, Air Vent, etc.) item which is served. When applicable, measurement will be by the number of individual units installed of each type and design.

2611.5 BASIS OF PAYMENT

Payment for construction of water distribution facilities will be made as detailed in the method of measurement and as shown on the Bid Proposal or detailed in the Special Provisions. Payment shall include all costs of furnishing and installing the complete facility as required by the Plans, Specifications, and Special Provisions.

Payment shall be made for Watermain Pipe, Service Pipe, and Tapped Service Pipe, of each size and kind at the appropriate Contract prices per linear foot installed. All costs of pipeline disinfection, leakage testing, pipe jointing materials, dead end plugs and caps, making connections to existing facilities, blocking and anchorage materials, and other work necessary for proper installation of pipe as specified shall be included for payment as part of the pipe item, without any direct compensation being made therefore unless specific pay items are included on the Proposal.

Payment shall be made for Valves, Corporation Stops, Curb Stops, Hydrants, Air Vents, Polyethylene Encasement, Insulation, and other specially identified appurtenant items, at the appropriate Contract prices per unit of measure for each size and type or kind installed.

Access structures such as Valve Boxes, Service Boxes, Manholes, and Vaults will be paid for as separate items only when separate pay items are included on the Proposal.

Payment for rearrangement of in-place facilities or vertical offset of proposed facilities shall be made under specially named items at the appropriate Contract prices per unit of measure and shall be compensation in full for all costs of performing the work as specified.

All costs of excavating to foundation grade, preparing the foundation, placing and compacting backfill materials, restoring surface improvements, and other work necessary for prosecution and completion of the work as specified, shall be included for payment as part of the pipe and pipe appurtenance items without any direct compensation being made therefore, unless specific pay items are included on the Proposal.

Watermain connections shall be paid per each connection to new watermain. All necessary labor, materials, and work required to make the connection shall be included in the price per each as provided in the bid proposal.

Installation of tracer wire for thermoplastic and other non-conductive pipe materials shall be considered incidental with no direct compensation made thereto, except where noted otherwise.

SECTION 2621 – STANDARD SPECIFICATIONS FOR SANITARY SEWER AND STORM SEWER INSTALLATION

2621.1 DESCRIPTION

This work shall consist of the construction of pipe sewers utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of sewage, industrial wastes, or storm water. The work includes construction of manhole and catch basin structures and other related items as specified.

The use of the term "Plans, Specifications and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are an enforceable component of the Contract Documents.

All references to MnDOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation "Standard Specifications for Construction", and all supplements and amendments thereto published prior to the date of advertisement for bids.

All references to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following specifications have been referenced in this Specification:

AASHTO M198 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

AASHTO M294 Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter

ASTM A48 Standard Specification for Gray Iron Castings

ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings

ASTM A798 Standard Practice for Installing Factory Made Corrugated Steel Pipe for Sewers and Other Applications

ASTM C12 Standard Practice for Installing Vitrified Clay Pipe Lines

ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

ASTM C270 Standard Specification for Mortar for Unit Masonry

ASTM C301 Standard Test Methods for Vitrified Clay Pipe

ASTM C361 Standard Specification for Reinforced Concrete Low Head Pressure Pipe

ASTM C425 Standard Specification for Compression Joints for VCP and Fittings

ASTM C443 Standard Specification for Joints Concrete Pipe and Manholes Using Rubber Gaskets

ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections

ASTM D543 Standard Practice for Evaluating the Resistance of Plastics to Chemical Reagents

ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings

ASTM C700 Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated

ASTM C969 Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications

ASTM D2751 Standard Specification for ABS Pipe and Fittings

ASTM D3034 Standard Specification for PVC Sewer Pipe and Fittings

ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3262 Standard Specification for “Fiberglass” (Glass Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D3839 Standard Guide for Underground Installation of “Fiberglass” (Glass Fiber Reinforced Thermosetting Resin) Pipe
ASTM D4161 Standard Specification for Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F679 Specification for Large-Diameter PVC Sewer Pipe and Fittings
ASTM F949 Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F1417 Standard Practice for Installation Acceptance of Plastic Non pressure Sewer Lines Using Low Pressure Air
ASTM F2736 Standard Specification for 6 to 30 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe And Double Wall Pipe
ASTM F2764 Standard Specification for 30 to 60 in. [750 to 1500 mm] Polypropylene (PP) Triple Wall Pipe and Fittings for Non Pressure Sanitary Sewer Applications
AWWA C104 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
AWWA C110 American National Standard for Ductile-Iron and Gray-Iron Fittings
AWWA C111 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115 American National Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C116 Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings
AWWA C150 American National Standard for Thickness Design of Ductile-Iron Pipe
AWWA C151 American National Standard for Ductile-Iron Pipe, Centrifugally Cast
AWWA C153 American National Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants

2621.2 MATERIALS

All materials required for this work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

At the request of the Engineer, the Contractor shall submit in writing a list of materials and suppliers for approval. Suppliers shall submit a Certificate of Compliance that the materials furnished have been tested and are in compliance with the specifications.

A Sewer Pipe and Service Line Materials

All pipe furnished for main sewer and service line installations shall be as indicated for each particular line segment as shown in the Plans and designated in the Contract Items. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be products specifically manufactured for this purpose and subject to approval by the Engineer.

A1 Vitrified Clay Pipe and Fittings

Vitrified clay extra strength pipe and fittings shall conform to the requirements of ASTM M-65 for the size and type and class specified, subject to the following supplementary provisions:

- (1) Unless otherwise specified, the pipe and fittings shall be non-perforated, full circular type, either glazed or unglazed.
- (2) All pipe and fittings manufactured with bell-and-spigot ends shall be furnished with factory fabricated compression joints conforming to the requirements of ASTM C-425.
- (3) In lieu of the bell-and-spigot jointing requirements, the pipe and fittings may be furnished with plain ends, in which case the jointing shall be by means of compression couplings conforming to the requirements of ASTM C-425, Type B.
- (4) All clay pipe fittings (wyes, tees, bends, plugs, etc.) shall be of the same pipe class and joint design as the pipe to which they are to be attached.
- (5) Pipe and fittings manufactured to the standards of AASHTO 52;65 may be accepted by prior approval of the Engineer.

A2 Ductile Iron Pipe and Ductile Iron and Gray Iron and Fittings

The pipe furnished shall be Ductile Iron pipe and pipe fittings furnished shall be of the Ductile Iron or Gray Iron type as specified for each particular use of installation. When Gray Iron is specified, either type may be furnished. Gray Iron may not be substituted for Ductile Iron unless specifically authorized in the Special Provisions.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water, and thickness design shall conform to AWWA C 150. In addition, the pipe shall comply with the following supplementary provisions:

- (1) Fittings shall conform to the requirements of AWWA C110 (Gray Iron and Ductile Iron Fittings) or AWWA C153 (Ductile Iron Compact Fittings) for the joint type specified.
- (2) Unless otherwise specified all pipe and fittings shall be furnished with cement mortar lining meeting the requirements of AWWA C104 for standard thickness lining. All exterior surfaces of the pipe and fittings shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

Fittings specified to be furnished with fusion bonded epoxy external coating and/or interior lining shall conform to the requirements of AWWA C550 and C116/A21.16, with 6-8 mil nominal thickness.

- (3) Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.
- (4) The nuts and bolts shall be constructed of corrosion resistant, high-strength, low-alloy steel with a ceramic filled, baked on fluorocarbon resin. The nuts and bolts shall be in compliance with ANSI/AWWA C111/A21.11 (Current Revision).
- (5) Conductivity, when required by the Special Provisions, shall be maintained through pipe and fittings with an external copper jumper wire or specialty gaskets which are capable of meeting conductive requirements. Wedge type connectors will not be allowed.

A3 Reinforced Concrete Pipe and Fittings

Reinforced concrete pipe, fittings and specials shall conform to the requirements of ASTM C-76 (Reinforced Concrete Pipe) with rubber O-ring or profile joints for the type, size, and strength class specified, subject to the following supplementary provisions:

- (1) All branch fittings such as tees, wyes, etc. shall be cast as integral parts of the pipe. All fittings and specials shall be of the same strength class as the pipe to which they are attached.
- (2) Joints shall meet the requirements of ASTM C-361, and ASTM C443.
- (3) Lift holes will not be permitted unless specifically authorized in the Plans, Specifications, and Special Provisions

A4 Corrugated Steel Pipe and Fittings

Corrugated Steel (CS) Pipe and fittings shall conform to the requirements of MnDOT 2501, 2503, and 3226 (CS) Pipe for the application, type, size and sheet thickness specified. Joints for joining CS Pipe shall be the band type or bell/spigot type, soil-tight and watertight, with preformed gasket seals meeting MnDOT 3726. Fittings and bands for joining pipe sections shall be of the same material and thicknesses as the mainline pipe.

Specialty coatings for the pipe shall be as indicated in the Plans, Specifications, and Special Provisions.

A5 Polyvinyl Chloride Pipe and Fittings

Smooth walled polyvinyl chloride pipe and fittings shall conform to the requirements of ASTM D-3034 and ASTM F-679 for the size, standard dimension ratio (SDR), and strength requirements indicated on the Plans, Specifications, and Special Provisions. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543.

Pipe fittings shall be of the same class and grade as specified for the pipe, unless otherwise specified in the special provisions.

Unless otherwise specified, all pipe and fittings shall be SDR 35 and connections shall be push-on with elastomeric gasket joints which are bonded to the inner wall of the gasket recess of the bell socket.

PVC pipe and fittings for pressure sewer and forcemains shall meet the requirements of 2611.2 A3 for watermain class pipe.

Corrugated polyvinyl chloride pipe and fittings with smooth interior shall conform to the requirements of ASTM F-949 for the size and wall thickness indicated on the Plans, Specifications, and Special Provisions. Unless otherwise specified, all pipe and fittings shall be push-on with snug fit elastomeric joints meeting tightness requirements of ASTM D-3212 and ASTM F477.

A6 Cast Iron Soil Pipe

Unless otherwise specified in the Plans, Specifications, and Special Provisions, cast iron soil pipe shall be service weight pipe meeting the requirements of ASTM A-74 and the Plans, Specifications, and Special Provisions. Unless otherwise specified, pipe joints shall be push-on, sealed with elastomeric gaskets, meeting the requirements of ASTM C-564.

A7 Acrylonitrile-Butadiene-Styrene Pipe

Acrylonitrile-Butadiene-Styrene (ABS) solid wall pipe and fittings shall conform to the requirements of ASTM D-2751 and shall be gasket seal joints, assembled as recommended by the pipe manufacturer. Unless otherwise specified, all pipe and fittings shall be push-on with snug fit elastomeric joints meeting tightness requirements of ASTM D-3212 and ASTM F477. Solvent cemented joints, assembled as recommended by the pipe manufacturer, shall be provided only where specifically indicated in the Plans, Specifications, and Special Provisions.

A8 Corrugated Polyethylene Pipe

Dual-Wall and Triple-Wall Corrugated Polyethylene Pipe (PE/HDPE) for gravity sewers shall conform to the requirements of AASHTO M-294 and Section 18 of the AASHTO Standard Specifications for Highway Bridges for storm sewer pipe sizes twelve inch (12") through sixty inch (60"). Joints shall be bell and spigot push-on type, soil-tight and watertight joints in accordance with ASTM D3212 and ASTM F477. Pipe manufacture, watertight joint testing, and installation shall conform to current MnDOT requirements, ASTM C969, and as indicated in the Plans, Specifications, and Special Provisions.

A9 Solid Wall High Density Polyethylene Pipe

Solid wall HDPE for pressure and gravity sewer pipes shall meet the requirements of 2611.2A4.

A10 Fiberglass Reinforced Pipe

Fiberglass Reinforced Pipe (FRP/GRP) for gravity sewers shall meet requirements of ASTM D3262 for Glass-Fiber-Reinforced Thermosetting Resin pipe, such as reinforced thermosetting-resin pipe (RTRP) and reinforced polymer mortar pipe (RPMP; natural polymers not included) for use in gravity-flow systems. The pipe shall be manufactured with polyester resin systems with a proven history of performance in this application.

The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.

Sand used to manufacture the pipe and fittings shall be minimum ninety eight percent (98%) silica sand with a maximum moisture content of two tenths of a percent (0.2%).

Pipe resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally effect the performance of the products.

Gaskets shall be supplied by approved gasket manufacturers and be suitable for the service intended. Minimum pressure rating of gaskets shall be two hundred fifty (250) psi.

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound to provide watertight joints meeting the requirements of ASTM D4161. Joints at tie-ins, when needed, may utilize fiberglass, gasket-sealed closure couplings.

Fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Properly protected standard ductile iron, fusion-bonded epoxy-coated steel and stainless steel fittings are allowed unless otherwise stated in the Special Provisions.

The actual outside diameter (eighteen inch (18") to forty eight inch (48")) of the pipes shall be in accordance with ASTM D3262. Other pipe diameter OD's shall be per manufacturer's literature.

Pipe shall be supplied in nominal lengths of twenty feet (20') except where noted otherwise on the drawings. Actual laying length shall be nominal $\pm 1/4$ inches. At least ninety percent (90%) of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.

Pipe ends shall be square to the longitudinal pipe axis with a maximum tolerance of eight inch (1/8").

Pipe shall be marked identifying each pipe with the name of manufacturer, plant location, code date of manufacturer, nominal pipe size, pipe stiffness designation and ASTM D3262.

Service lateral connections (wye, tee, bend) to the sanitary sewer shall be as recommended by the main line sewer pipe manufacturer recommendation.

A11 Polypropylene Pipe

Corrugated Polypropylene Pipe (PP) for gravity sewers shall be Dual-Wall (six inch (6") to thirty inch (30") diameter) pipe conforming to ASTM F2736 and Triple Wall (thirty inch (30") to sixty inch (60") diameter) pipe conforming to ASTM F2764. Pipe joints shall be bell and spigot push-on type, soil-tight and watertight joints in accordance with ASTM D3212 and ASTM F477., and shall conform to the requirements of AASHTO M-294 and Section 18 of the AASHTO Standard Specifications for Highway Bridges for storm sewer pipe sizes twelve inch (12") through sixty inch (60"). Pipe manufacture, watertight joint testing, and installation shall conform to current MnDOT requirements, ASTM C969, and as indicated in the Plans, Specifications, and Special Provisions.

A12 Tracer Wire for Non-conductive Pipe

Tracer wire shall be installed along the length of all non-conductive mainline pipe, laterals, and services with vertical riser to the surface, at manholes, catch basins, stubs, laterals, services, and/or utility location boxes as required by the Special Provisions. Tracer wire shall be taped, clamped or affixed to the pipe in another manner as approved by the Engineer.

Splicing tracer wire shall be by mechanical split bolt type or a crimp type compression fitting fully encased in approved electrical insulation putty. A twelve inch (12") tracer wire loop shall be provided on each side of a spliced connection.

B Metal Sewer Castings

Metal castings for sewer structures such as manhole frames and covers, catch basin frames, grates and curb boxes, shall conform to the requirements of ASTM A-48 (Gray Iron Castings), subject to the following supplementary provisions:

- (1) Casting assemblies or dimensions, details, weights, and class shall be as indicated in the detailed drawings for the design designation specified. Unless otherwise specified, the castings shall be Class 30 or better.
- (2) Lid-to-frame surfaces on round casting assemblies shall be machine milled to provide true bearing around the entire circumference.
- (3) Casting weight shall be not less than ninety five percent (95%) of theoretical weight for a unit cast to exact dimensions, based on four hundred forty two (442) pounds per cubic foot.
- (4) A Certificate of Compliance shall be furnished with each shipment of castings stating that the materials furnished have been tested and are in compliance with the specification requirements.
- (5) Unless otherwise specified, sanitary sewer manholes shall have self-sealing lids and concealed pick holes.

C Precast Concrete Manhole and Catch Basin Sections

Precast concrete riser sections and appurtenant units (grade rings, top and base slabs, special sections, etc.) used in the construction of manhole and catch basin structures shall conform with the requirements of ASTM C-478, MnDOT 2506 and the following supplementary provisions:

- (1) The precast sections and appurtenant units shall conform to all requirements as shown on the detailed drawings.
- (2) Joints of manhole riser sections shall be tongue and groove with rubber "O" ring or profile gaskets.
- (3) Sanitary sewer inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection, watertight boot, or any watertight connection arrangement approved by the Engineer that allows differential settlement of the pipe and manhole wall to take place.

- (4) Air-entrained concrete shall be used in the production of all units. Air content shall be maintained within the range of five (5) to seven (7) percent (%).
- (5) A Certificate of Compliance shall be furnished with each shipment of precast manhole and catch basin sections stating that the materials furnished have been tested and are in compliance with the specification requirements.
- (6) Lift holes will not be permitted in precast manholes.

D Mortar

Mortar for use in masonry construction shall meet the requirements of MNDOT 2506.2B and ASTM C270.

E Concrete

Concrete used for cast-in-place masonry construction shall be produced and furnished in accordance with the provisions of MnDOT Specification 2461 for the mix design indicated in the Plans, Specifications, or Special Provisions. The requirements for Grade B concrete shall be met where a higher grade is not specified. Type 3, air-entrained, concrete shall be furnished and used in all structures having weather exposure.

2621.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

The Contractor shall take all necessary precautions to handle and install all pipe and appurtenances as recommended by the manufacturer, Engineer, Plans, Specifications, and the Special Provisions.

Installation of PVC pipe and fittings for pressure sewer and forcemains shall meet the requirements of 2611.3 for watermain class pipe.

A1 Inspection and Handling

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged materials and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site. All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fillings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping.

All work and materials are subject to tests by the Owner at such frequency as may be determined by the Engineer.

While suspended and before being lowered into laying position, each pipe section and appurtenant unit shall be inspected by the Contractor to detect damage or unsound conditions

that may need corrective action or be cause for rejection. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

A2 Pipe Laying Operations

Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper laying and joining of the units at the prescribed grade and alignment without unnecessary deviation or hindrance.

All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench and they shall be kept clean. The sewer materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped into the trench.

Unless otherwise permitted by the Engineer, bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start on the downgrade end and proceed upgrade. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

Connection of pipe to existing lines or previously constructed manholes or catch basins shall be accomplished as shown in the Plans or as otherwise approved by the Engineer. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment, deflections at joints shall not exceed that which will assure watertight joints and shall comply with the pipe manufacturer recommendations.

Entrance of foreign matter into pipeline openings shall be prevented at all times to the extent that suitable plugs or covering can be kept in place over the openings without interfering with the installation operations.

Installation of thermoplastic pipe shall conform to ASTM D-2321; FRP/GRP pipe to ASTM D3839, and the manufacturers' recommendations; ASTM A798 for CS pipe.

A3 Connection and Assembly of Joints

All pipe and fitting joints shall fit tightly and be fully closed. Spigot ends shall be marked as necessary to indicate the point of complete closure. All joints shall be soil tight and watertight in all sanitary sewer and storm sewer pipe.

A4 Bulkheading Open Pipe Ends

All pipe and fitting ends left open for future connection shall be bulkheaded by approved methods prior to backfilling. Unless otherwise specified or approved, all openings of twenty four inches (24") in diameter or less shall be closed off with prefabricated plugs or caps and all openings larger than twenty four inches (24") in diameter shall be closed off with masonry bulkheads.

Prefabricated plugs and caps shall be of the same material as the pipe material, or an approved alternate material, and they shall be installed with watertight seal as required for the pipeline joints. Masonry bulkheads shall be constructed with clay or concrete brick to a wall thickness of eight inches (8").

Bulkheads installed for temporary service during construction may be constructed with two inch (2") timber planking securely fastened together and adequately braced, as an alternate to the masonry construction.

B Appurtenance Installations

Appurtenance items such as aprons, trash guards, gates and castings shall be installed where and as required by the Plans and in accordance with such standard detail drawings or supplementary requirements as may be specified.

Casting assemblies installed on manhole or catch basin structures shall be set in a full mortar bed and be adjusted to the specified elevation without the use of shims or blocking.

Sewer aprons shall be subject to all applicable requirements for installation of pipe. All aprons and outfall end sections shall have the last three (3) sections tied. Two (2) tie bolt fasteners shall be placed in each of the last three joints, one on each side of top center at the sixty (60) degree point (from vertical). Tie bolt diameter shall be: 1/2 inch for 12" to and including 21" pipe; 5/8 inch for 24" to and including 36" pipe; 3/4 inch for 42" to and including 54" pipe; and 1" for 60" and larger pipe. The tie bolts shall be of a design approved by the Engineer.

C Sewer Service Installations

Main sewer service connections and building service sewer pipe shall be installed as provided for in the Contract and as may be directed by the Engineer. The sewer service connections and pipe lines shall be installed in conformance with all applicable requirements of the main sewer installation and as more specifically provided for herein.

The Engineer, with the assistance of the Contractor, shall keep accurate records of all service installations as to type, location, elevation, point of connection and termination, etc. This service record shall be maintained jointly by the Contractor and Engineer on forms provided by the Engineer. The service installations shall not be backfilled until all required information has been obtained and recorded.

The main sewer service connection shall consist of installing a Branch Tee or Wye section in the main sewer line at designated locations or providing an insert type Saddle Tee or Wye fitting in a pipe cut-out where specified. Orientation of service connection fitting shall be as shown in the standard drawings unless otherwise directed by the Engineer.

Where the depth of cover over the main sewer invert is greater than fifteen (15) feet (or such other maximum as may be indicated), the service connection shall be extended upward by means of a Service Riser Section.

Unless otherwise specified, service pipe shall be installed at right angles to the main sewer and at a straight line grade to the property line. The standard and minimum grades shall be a uniform rise of one inch (1") in four feet (4') (two percent (2%)) for sanitary service lines and one

inch (1") in eight feet (8') (one percent (1%)) for storm sewer service lines. These minimum grades may be reduced (by not more than one-half (1/2) pitch) where the Engineer so approves in the case of restrictive elevation differences.

Building service pipe lines shall generally be kept as deep as required to serve the building elevation and maintain the specified minimum pipe grades. Pipe bends shall be provided as necessary to bring the service lines to proper location and grade. Pipe bends shall not exceed twenty two and one half (22-1/2) degrees without approval of the Engineer.

Unless otherwise indicated, service pipe installation shall terminate at property line or as designated on the Plans, with a gasketed plug placed in the end, at which point the Contractor shall furnish and set a four inch by four inch (4" x 4") wooden timber six feet (6') to eight feet (8') in length embedded four feet (4') below grade, or approved steel post to mark the exact end of pipe. The timber or post shall be set vertically, with the top two feet (2') painted green.

Wherever service line connections to the main sewer are permitted or required to be made by the open cut-out method in the absence of a built-in Tee or Wye fitting, the connection shall be made by using an approved type of Saddle Tee or Wye fitting. The pipe cut-out shall be made with an approved type coring machine or by other approved methods producing a uniform, smooth circular cut-out as required for proper fit. The cut-out discs shall be retrieved and shall not be allowed to remain within the main sewer pipe. The Saddle Tee shall be securely fastened to the main sewer pipe by means of epoxy resin or other approved adhesive. The entire connection fitting shall be encased in concrete to a minimum thickness of six inches (6") and as may be shown in the standard drawings.

Wherever service line connections to the main sewer are required to be made by means of built-in Branch Tee or Wye fittings, the Contractor shall, in the absence of such fitting, remove a section of the main sewer pipe and replace it with the required Branch Tee or Wye section connected by means of an approved sleeve coupling.

Sanitary sewer service lines shall not be connected to a manhole at an elevation more than twenty four inches (24") above the crown of the outgoing sewer. Where the elevation difference is greater than twenty four inches (24"), the connection shall be made by means of an Outside Drop Connection in accordance with the details shown in the standard drawings.

All pipe and fitting openings at temporary terminal points shall be fitted with suitable plugs or shall be bulkheaded as required for the main sewer pipe.

D Manhole and Catch Basin Structures

Manholes, catch basins, and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, storm sewer manholes and catch basins shall be constructed on a precast or cast-in-place concrete base and the barrel riser sections, and cone section shall all be of precast concrete. Sanitary sewer manholes shall be constructed with precast concrete integral base with pre-formed invert barrel section and with watertight boots at all pipe locations. All units shall be properly fitted and sealed to form a completely watertight structure. Manholes and catch basin structures shall be fabricated to provide a twelve inch (12") or sixteen inch (16") barrel section immediately below the cone or top slab whenever possible.

Barrel and cone height shall be such as to permit placement of at least two (2) and not more than six (6) standard two-inch (2") precast concrete or high density polyethylene adjusting immediately below the casting assembly. Sanitary manhole adjustment rings and casting flange shall be fitted with specified method/materials as indicated in the Special Provisions to reduce inflow and infiltration. Storm sewer manhole and drainage structure adjustment rings and casting flange shall be wrapped with a Type 2 Geotextile fabric meeting MnDOT 3733.

Unless otherwise specified or approved, manholes and catch basins shall have an inside barrel diameter at the bottom of forty eight inches (48") minimum and the inside diameter at the top of the cone section and all adjusting rings shall be of the same size and shape as the casting frame. Casting assemblies shall be as specified in the Plans

Concrete cast-in-place base shall be poured on undisturbed or firmly compacted foundation material which shall be trimmed to proper elevation. The bottom riser section shall be set in fresh concrete or mortar and all other riser section joints of the tongue and groove design shall be sealed with rubber gaskets. The concrete base under an outside drop connection shall be monolithic with the manhole base.

Wherever special designs so require or permit, and as may be approved by the Engineer, a precast concrete base may be used or the structure may be constructed with solid sewer brick or block units or with cast-in-place concrete. Any combination of cast-in-place concrete and brick or block mortar construction will be allowed and may be required where it is impossible to complete the construction with standard precast manhole sections.

All manhole and catch basin structure doghouses shall be completely filled with mortar, concrete masonry, or concrete to completely seal the pipes into the structure wall. When formed inverts are specified, the inside bottom of each manhole and catch basin shall be shaped with fresh concrete to form free flow invert troughs.

When connecting to an existing sanitary sewer manhole without an existing opening for sewer pipe, the Contractor shall be required to core-drill an opening of the correct size and elevation for the proposed sanitary sewer facility. The Contractor shall set the connecting pipe through the full thickness of the wall flush with the inner face of the wall. Connection to the structure shall be made with a watertight joint, by means of a rubberized boot. The Contractor shall ensure the flow line of the manhole is constructed in a manner to provide steady flow from the new sanitary line to the existing sanitary line. The flow line and the core-drilled hole are to be grouted smooth. The Contractor shall install a plug in the connecting pipe once the connection is complete and construction has advanced to the next manhole to prevent rainwater or sediment from entering the existing system. The plug shall be removed once all the proposed sanitary sewer mains on the project have been installed, tested, inspected, and approved.

E Sanitary Sewer Leakage Testing

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by Others. Each test section of the sewer shall be subjected to exfiltration testing, either by hydrostatic or air test method as described below and at the Contractor's option. The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test.

If the ground water level is greater than three feet above the invert elevation of the upper manhole and the Engineer so approves, infiltration testing may be allowed in lieu of the exfiltration testing, in which case the allowable leakage shall be the same as would be allowed for the Hydrostatic Test.

All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs and standpipes as required.

E1 Air Test Method

E1a Gravity Sewers

All gravity sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by Others. Each test section of the sewer shall be subjected to exfiltration testing by the ASTM F1417 (low pressure air) test method regardless of pipe material.

The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test. All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs and standpipes as required.

The sewer pipe section under test shall be clean at the time of testing but the pipe may be wetted. Pneumatic balls shall be used to plug the pipe ends at manholes. Low pressure air shall be introduced to the plugged line until the internal air pressure reaches three and one half (3.5) psi greater than the average back pressure of any ground water pressure that may submerge the pipe. At least two (2) minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started. During this time the Contractor shall check all plugs to detect plug leakage. If plugs are found to leak, air shall be bled off, the plugs shall be retightened, and the air shall be reintroduced into the line.

The sewer section under test will be accepted as having passed the air leakage test when the rate of air loss as measured by pressure drop, does not exceed a specified amount in a specified time. Pressure drop may be determined by using the table below, or calculated by use of the formulas provided below.

TABLE
Minimum Specified Time Required for a 0.5 psig Pressure Drop for Size and Length of Pipe Indicated for Q = 0.0015 CFM/SF

Pipe Diameter (Inches)	Minimum Time (Min:Sec)	Length for Min. Time (Feet)	Time for increased Length (Sec)	Specification Time for Length (L) Shown (Min:Sec)								
				100 Ft.	150 Ft.	200 Ft.	250 Ft.	300 Ft.	350 Ft.	400 Ft.	450 Ft.	
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50	
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	28:11	30:32	34:54	39:16	
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	
*27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:18	50:30	57:42	64:54	
*30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	
*33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	
*36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	

*NOTE - Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than twenty four inches (24") in diameter.

FORMULA

The formula below calculates the specified minimum time required for a **1.00 psig pressure drop** from a starting pressure of 3.5 psig to a final pressure of 2.5 psig using a leakage rate of 0.0015 cubic feet/minute/square foot of internal surface.

Calculate all test times by the following formula:

$$T = 0.085 DK/Q$$

where:

T = shortest time allowed for the **air pressure to drop 1.0 psig**, sec.

K = 0.000419 DL but not less than 1.0,

Q = leak rate = 0.0015 CFM/SF,

D = measured average inside diameter of sewer pipe, in., and

L = length of test section, ft.

E2 Hydrostatic Test Method

E2a Gravity Sewers

After bulkheading the test section, the pipe shall be subjected to a hydrostatic pressure produced by a head of water at a depth of three feet (3') above the invert elevation of the sewer at the upstream manhole of the test section. In areas where ground water exists, this head of water shall be three feet (3') above the existing water table.

The water head shall be maintained for a period of one (1) hour during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for an extended period of one (1) hour the water head shall be maintained as the test period. During the test

period, the measured water loss within the test section, including service stubs, shall not exceed an infiltration / exfiltration rate of thirty five (35) gallons / inch diameter / mile / day.

If measurements indicate exfiltration within a test action section is not greater than the allowable maximum, the section will be accepted as passing the test.

E2b Pressure Sewers

For sewers designated as pressure pipe sewers, the sewer shall be subjected to hydrostatic testing under 2611.3G Hydrostatic Testing of Watermains, except the hydrostatic testing pressure shall be two (2) times the maximum design operating pressure, but not less than one hundred (100) psig and the duration of the test shall be one hour.

E3 Test Failure and Remedy

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

F Deflection Test

Deflection tests shall be performed on all plastic gravity sewer pipes. The test shall be conducted after the sewer trench has been backfilled to the desired finished grade and has been in place for thirty (30) days.

The deflection test shall be performed by pulling a rigid ball or nine-point mandrel (MnDOT Technical Memorandum 98-24-B-01 or latest revision) through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to ninety five percent (95%) of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed five percent (5%) of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the Engineer.

All testing shall be performed by the Contractor at his expense without any direct compensation being made therefore, and he shall furnish all necessary equipment and materials required.

F1 Test Failure and Remedy

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the Engineer. The replaced section shall be retested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and retesting shall be at the Contractor's expense.

G Televising

Sewer line televising may be required by the Engineer, at the cost of the Contractor, if visual inspection, leakage testing, or deflection testing indicate the sewer has not been constructed in accordance with these specifications and the requirements of the Plans, Specifications, and Special Provisions.

2621.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions.

Complete-in-place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items. Linear measurement of piping will include the running length of any special fittings (tees, wyes, elbows, gates, etc.) installed within the line of measure between specified terminal points.

A Sewer Pipe

Sewer pipe of each design designation will be measured by length in linear feet along the line of pipe. Terminal points of measurement will be the pipe end at free outlets; the point of connection with in-place pipe; the center of manholes or catch basins; the point of centerline intersections at branch fittings; or the point of juncture with other appurtenances or units as defined.

Separation of quantities according to "depth zone classification", when so designated in the Pay Item, will be determined by depth of pipe invert below the ground surface profile.

B Manholes

Manholes of each design designation will be measured by number of each constructed complete-in-place, including the base and castings as required, but excluding any excess depth greater than eight feet (8') measured from top of manhole cover to invert elevation of lowest pipe.

Excess manhole depth of each design designation will be measured by the linear foot difference in depth between the eight feet (8') allowed as standard and the actual increased depth as constructed.

C Catch Basins

Catch basins of each design designation will be measured by number of each constructed complete-in-place, including the base and castings as required, but excluding any excess depth greater than five feet (5') measured from top of grate (low point) to invert elevation of lowest outlet pipe.

Excess catch basin depth of each design designation will be measured by the linear foot difference in depth between the five feet (5') allowed as standard and the actual increased depth as constructed.

D Outside Drop Connection

Outside drop connections of each design will be measured by linear foot constructed complete-in-place, and shall include granular encasement, fittings, any special piping required, including coring holes and watertight boots for existing manholes for the drop connection. Measurement shall be made vertically from the invert of the lower outside drop invert to the upper outside drop invert.

E Service Connection

Service Connections of each design will be measured by number of each constructed complete-in-place as specified.

F Service Pipe

Service pipe of each design will be measured separately by length in linear feet, horizontally along the line of installation, between the service end and the point of juncture with the main pipe connection fitting.

G Special Pipe Fittings

Special pipe fittings (wyes, tees, bends, etc.) of each design designation will be measured by number of each installed complete-in-place as specified, but excluding any such fittings required to be installed as a component part of any other Work Unit.

H Appurtenant Items

Appurtenant items such as aprons, trash guards, gates and other prefabricated units or assemblies as identified by Pay Item name will be measured separately by number of each installed complete-in-place as specified.

2621.5 BASIS OF PAYMENT

Payment for sewer pipe and service pipe items at the Contract prices per linear foot of pipe of each design shall be compensation in full for all costs of providing a complete-in-place pipeline, including excavation, foundation preparation, backfilling, leakage testing, restoration of surface improvements, disposal of surplus or waste materials, final cleanup, and such other work as may be specified, but excluding the construction of other structures or special sections and the placement of special fittings, appurtenances or materials specifically designated for payment under other Contract Items.

Payment for manhole, catch basin, outside drop connection, service connection, and other structures as specified, at the Contract prices per structure, shall be compensation in full for all costs of constructing each unit complete-in-place as specified, including all required castings, special fittings, base or encasement, and appurtenant materials as specified for the complete structure or section, but excluding such additional work as may be designated for payment under other Contract Items.

Where the specified standard manhole, catch basin, or outside drop connection depths are exceeded, the excess depth of each design will be paid for separately as linear footage items

and payment at the Contract prices therefor shall be compensation in full for all costs of providing the extra depth.

Special pipe fittings such as wyes, tees and bends will be paid for as separate Contract Items to the extent they are required to be installed in the sewer pipe and service pipe lines and not as a component part of a complete-in-place structure (outside drop connections, service connections, etc.)

Appurtenant items such as aprons, trash guards, drainage gates, and other prefabricated units or assemblies and specials as designated will be paid for as separate Contract Items to the extent they are not included as a component part of any complete-in-place structure.

SECTION 2631 CIPPS – STANDARD SPECIFICATIONS FOR SEWER PIPE REHABILITATION WITH CURED IN-PLACE PIPE SYSTEMS (CIPPS)

2631.1 CIPPS DESCRIPTION

A General

This work shall consist of the rehabilitation of pipelines and conduits by the installation of a resin-impregnated flexible tube Cured-In-Place Pipe System (CIPPS). The rehabilitation of pipelines shall be constructed by the installation of a resin-impregnated flexible tube which, when cured, shall be continuous and tight-fitting throughout the entire length of the original pipe. The CIPP shall extend the full length of the original pipe and provide a structurally sound, joint less and watertight new pipe within the existing pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.

Neither the CIPP system, nor its installation, shall cause adverse effects to any downstream facilities. The use of the product shall not result in the formation or production of any detrimental compounds or by-products that may affect downstream structures, pumps, pipe, equipment and wastewater treatment facilities. The Contractor shall notify the Engineer and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and residents.

The use of the term "Plans, Specifications, and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are an enforceable component of the Contract Documents.

All references to MnDOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation "Standard Specifications for Construction", and all supplements and amendments thereto, published prior to the date of advertisement for bids.

All references to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following specifications have been referenced in this Specification:

ASTM - F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

ASTM - F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pull in and inflate and Curing of a Resin-Impregnated Tube

ASTM - D543 Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents

ASTM - D638 Standard Test Method for Tensile Properties of Plastics

ASTM - D790 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM - D792 Standard Test Methods for Density and Specific Gravity of Plastics by displacement.

ASTM - F2019-03 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

ASTM - D2122-98(2004) Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM - D2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

ASTM - D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe

B Qualifications

The Contractor shall be responsible for all aspects of the design of the liner pipe. The Contractor shall guarantee that the installed liner is capable of sustaining outside loads, resist chemical attack that normally occurs in sanitary and storm sewer systems, and will maintain hydraulic characteristics over a fifty (50) year design life.

Unless provided otherwise in the plans or Special Provisions, the existing sewer pipe shall be considered to be in a fully deteriorated condition, is not structurally sound, and cannot support soil and live loads. The cured-in-place pipe shall be designed to support hydraulic, soil, and live loads.

The sewer products are intended to have a fifty (50) year or greater design life, and in order to minimize the Owner's risk, only proven products with substantial successful long term track records will be approved.

B1 Manufactured Products and Installation

Contractors must meet all of the following criteria:

- a. For a Product to be considered acceptable, a minimum of 100,000 linear feet or two hundred fifty (250) manhole-to-manhole line sections of successful wastewater collection system installations in the U.S. must be documented to the satisfaction of the Engineer. In addition, at least 50,000 linear feet of the product shall have been in successful service within the State for a minimum of five (5) years.
- b. The Contractor's personnel must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 5 (five) years active experience in the commercial installation of the product bid. In addition, the Contractor's personnel must have successfully installed at least 100,000 feet of the same product bid. The Field Supervisor/Foreman shall have a minimum five (5) years as a foreman/superintendent for a cured-in-place lining crew (installing actual

product included with this bid/proposal), and a minimum of 100,000 lineal feet of cured-in-place lining, diameters up to and including twenty-four inches (24") installed under his/her supervision. Such experience shall include the actual product, by trade name, Contractor proposes to install. Acceptable documentation of these minimum installations must be submitted to the Engineer.

- c. Sewer rehabilitation products submitted for approval must provide Third Party Test Results supporting the long term performance and structural strength of the product and such data shall be satisfactory to the Engineer. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without independent third party testing verification.

2631.2 CIPPS MATERIALS

A General

All materials required for this work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

All materials shipped to the project site shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP manufacturer to avoid damage. Damage includes but is not limited to, gouging, abrasion, flattening, cutting, puncturing, and ultra-violet (UV) degradation. All damaged materials shall be promptly removed from the project site at no cost to the Owner. On site material storage locations shall be approved by the Engineer.

A1 CIPPS Fabric Tube

The CIPPS fabric "Tube" shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, ASTM D 5813 & ASTM F2019. The fabric Tube shall be capable of absorbing and carrying resins, manufactured to withstand installation pressures and curing temperatures, have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections.

The fabric Tubes shall have a uniform thickness that when compressed at installation pressures will equal the specified nominal tube thickness.

The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.

The fabric tube shall be manufactured to a size and length that when installed will tightly fit the internal circumference and length of the original pipe. Allowance shall be made for

circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be allowed.

The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance from the starting manhole to the terminating manhole or access point, plus that amount required to run-in and run-out for the installation process.

The outside and/or inside layer of the fabric tube (before inversion/pull-in, as applicable) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wet-out) procedure.

No material shall be included in the fabric tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the felt fabric and the activated resin containing a colorant. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No materials shall be included in the tube that is subject to delamination in the CIPPS.

The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.

Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813. The outside of the fabric tube shall be marked every five feet (5') with the name of the manufacturer or CIPP system, manufacturing lot and production footage.

The nominal fabric tube wall thickness shall be constructed to the nearest 0.5 mm increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.

The resin shall be a corrosion resistant polyester or vinyl ester resin and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the CIPP for this application. The resin shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.

A2 CIPPS Structural Requirements

The physical properties and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the materials used, and the degree of cure executed. It shall be the responsibility of the Contractor to control these variables and to provide a CIPP system which meets or exceeds the minimum properties specified herein:

1. The CIPP shall be designed as per ASTM standards. The CIPP design shall assume no bonding to the original pipe wall.
2. The design engineer shall set the long term (fifty (50) year extrapolated) Creep Retention Factor at thirty three percent (33%) of the initial design flexural modulus as determined by ASTM D-790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.
3. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two (2) layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the work.

Minimum Physical Properties: The cured pipe material (CIPP) shall, at a minimum, meet or exceed the structural properties, as listed in the table below.

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite Per Design
Flexural Modulus Of Elasticity (Short Term)	ASTM D-790	250,000 Psi	Contractor Value
Flexural Strength (Short Term)	ASTM D-790	4,500 Psi	Contractor Value

The required structural CIPP wall thickness shall be based as a minimum, on the physical properties listed above and in accordance with the Design Equations in the appendix of ASTM F 1216, and the following design parameters:

Design Safety Factor	2.0 (1.5 For Pipes 36" Or Larger)
Creep Retention Factor	33%
Ovality	2% Or As Measured By Field Inspection
Constrained Soil Modulus	Per AASHTO LRFD Section 12 And AWWA Manual M45
Groundwater Depth	As Specified Or Indicated On The Plans
Soil Depth (Above The Crown)	As Specified Or Indicated On The Plans
Live Load	H20 Highway
Soil Load (Assumed)	120 Lb/Cu. Ft.
Minimum Service Life	50 Years

The Contractor shall submit, prior to installation of the lining materials, certification of compliance with these specifications and/or the requirements of the pre-approved CIPP system.

Certified material test results shall be included that confirm that all materials conform to these specifications. Materials not complying with these requirements will be rejected.

CIPP Short-Liners or segmental liners shall be of the same materials and meet the structural requirements of the full CIPP Tube liner.

A3 Material Testing Requirements

1. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements.
2. Hydraulic Capacity - Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
3. CIPP Field Samples - When requested by the Owner, the Contractor shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in above have been achieved in previous field applications. Samples for this project shall be made and tested as described herein.

2631.3 CIPPS CONSTRUCTION REQUIREMENTS

The Contractor shall clean the interior of the existing host pipe prior to installation of the CIPP liner. All debris and obstructions that will affect the installation and the final CIPP product shall be removed and disposed of. The CIPP liner shall be constructed of materials and methods, that when installed, shall provide a joint less and continuous structurally sound liner able to withstand all imposed static and dynamic loads on a long-term basis.

A Installation of CIPPS

A1 Access

It will be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work, and provide rights of access to these points. If a street must be closed to traffic because of the orientation of the sewer, the Contractor shall institute the actions necessary to do this for the mutually agreed time period. Traffic Control shall be the responsibility of the Contractor and shall conform to the latest revision of the MMUTCD and other provisions of this specification herein. The Contractor shall keep the roadway open to traffic at all times unless given prior approval by the Engineer.

A2 Water Usage

Water is available from the City at designated locations for cleaning, inversion, and other work items requiring water. Use of an approved double check backflow assembly shall be required. The Contractor shall provide his own approved assembly. The Contractor may use City water

but shall inform the Public Works Department of such use and obtain a meter for documenting water usage. No fees will be charged for water.

A3 Cleaning of Sewer Lines

The Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the CIPP as required in these specifications. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. Moving material from manhole section to manhole section shall not be allowed. As applicable the contractor shall either plug or install a flow bypass pumping system to properly clean the pipe lines. The Contractor shall ensure that no debris is transferred downstream during cleaning operations. The Contractor shall use a vacuum vehicle or similar means to remove debris during cleaning operations. Precaution shall be taken, by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor. Disposal of the cleaning debris shall be in accordance with local, State and Federal Law and shall be incidental to the CIPPS.

A4 Bypassing Wastewater

The Contractor shall provide a by-pass for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for CIPP installation. Installation of the liner shall not begin until the Contractor has installed a sewage by-pass system and all pumping facilities have been installed and tested under full operating conditions including the bypass of mainline and side sewer flows. Once the lining process has begun, existing sewage flows shall be maintained, until the resin/felt tube composite is fully cured, cooled down, fully televised and the CIPP ends finished. The Contractor shall coordinate sewer bypass and flow interruptions with the Engineer at least fourteen (14) days in advance and with the property owners and businesses at least three (3) business days in advance. The pump and bypass lines shall be of adequate capacity and size to handle peak flows. The Contractor shall submit a detail of the bypass plan and design to the Engineer prior to proceeding with any CIPP installation. Compensation for by-pass pumping and all associated plans and approvals shall be included in the price bid for CIPPS Installation.

A5 Inspection of Pipelines

Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation of the CIPPS into the pipelines and it shall be noted so that these conditions can be corrected. A videotape and suitable log shall be kept for later reference by the Owner. The Owner has copies of a video inspection of the sewers to be relined, and these are available for prospective bidders. However, since the deterioration of sewer is an ongoing process, and roots, solids, and deposits can accumulate over time, the Contractor shall base the design of the liner on inspections made immediately prior to installation.

A6 Line Obstructions

It shall be the responsibility of the Contractor to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the

inversion process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, if directed by the Owner, the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.

A7 Public Notification

The Contractor shall make every effort to maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be eight (8) hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:

1. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any problem which could arise.
2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP.

A8 Liner Installation

CIPP installation shall be in accordance with the applicable ASTM standards with the following modifications:

1. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction.
2. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
3. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles. The manufacturer's recommended cure schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.

4. The Contractor shall remove protruding taps to the inside wall of the pipe. In no case shall the pipe be less than ninety five percent (95%) open to flow.

A9 Resin Impregnation

The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To insure a through wet-out, the point of vacuum shall be no further than twenty five feet (25') from the point of initial resin introductions. After vacuum in the tube is established, the vacuum points shall be no further than seventy five feet (75') from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular to the longitudinal axis of the tube as possible. A roller system shall be used to uniformly distribute tie resin throughout the tube. If the Installer proposes an alternate method of resin impregnation, the method must produce the same results and the method approved by the Engineer.

A10 Cool Down

The Contractor shall cool the CIPP in accordance with the manufacturer's recommendations. Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP System manufacturer's recommendations.

A11 Finishing Operations

The installed CIPP shall be continuous over the entire length of a sewer line section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe. Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense. The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal. If any of the service connections leak water between the host pipe and the installed liner, the connection mainline interface shall be sealed to provide a watertight connection. If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacture of the CIPP system.

At all points where the liner pipe has been exposed (such as service connection fittings, or other points where the old pipe must be removed), the liner pipe and fittings shall be encased in cement-stabilized sand or other high density material as specified by the Engineer to prevent deflection due to difference in subsidence. After the encasement material is in place and accepted by the Engineer, backfill is placed and compacted to require finish grade in accordance with the specifications. Particular care should be taken to ensure compaction of earth beneath the lateral/service pipe in order to reduce subsidence and resultant bending at the lateral connection at the sewer main.

A12 Manhole Connections

A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole walls in accordance with the CIPP System manufacturer's recommendations.

A13 Reconnections of Existing Services

Services shall be identified by the Contractor prior to lining work. After the pipe has been reconstructed and tested, the service connections shall be reconnected. It is the Contractor's responsibility to make sure that all service connections are reconnected, unless otherwise directed by the Engineer. A CCTV camera and remote cutting tool shall be used for internal reconnections. The machined opening shall be at least ninety five percent (95%) of the service connection opening and the bottom of both openings must match. The opening shall not be more than one hundred percent (100%) of the service connection opening.

The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris. In the event that service reinstatements result in openings that are greater than one hundred percent (100%) of the service connection opening, the Contractor shall install a CIPP type repair, sufficiently in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of over-cut service connections. Discs of pipe material resulting from service tap cutting shall be collected at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Discs shall not be allowed to pass through the system.

A14 CIPP Short-Liner

The CIPP short-liner shall meet the requirements of the full length CIPP liner and the following:

1. The Short-Liner shall be inserted into the existing sewer line with a power winch and steel cable attached to the end of the liner by use of an appropriate pulling head. Length of the liner to be inserted at any one time shall be governed by the length of the section in need of repair or the maximum length of the installation equipment considering the size and condition of the sewer.
2. A mobile installation unit shall be brought to the site ready to process the liner. The installation unit shall contain heat generating equipment, CCTV facility and other auxiliary miscellaneous equipment necessary for controlling processing of the Short-Liner pipe. The equipment shall be positioned next to the point of entry with minimum obstruction to the other side activities and shall be operated by trained personnel only.
3. The pressure shall be increased to compensate for the heating-cooling transition and it shall be maintained until the temperature at the lowest critical point is 100° F (38° C). This shall constitute completion of the Short-Liner pipe processing. The pipe within the pipe shall be tight fitting and adapted to the existing sewer pipe.

B TESTING AND INSPECTION

B1 Testing

CIPP samples shall be prepared and tested in accordance with ASTM F1216, Section 8.1, using either method proposed. Leakage testing of the CIPP shall be accomplished during cure while under a positive head. CIPP products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g., a removable bladder) must be tested by an alternative method approved by the Engineer.

B2 Inspection

Visual inspection of the CIPP shall be in accordance with ASTM F1216, Section 8.4. The relined pipe shall be continuous without joints through the entire pipe length. The liner shall be free of all visible defects except those resulting from pre-lined conditions which the Contractor has noted prior to lining. There shall be no pits, pinholes, cracks, or crazing, and the surface shall be smooth and free of waviness throughout the pipe. Any defects shall be repaired by the Contractor with no expense to the Owner. Where leakage is observed through the wall of the pipe, the contractor shall institute additional testing including but not limited to air testing, localized testing and any other testing that will verify the leak proof integrity of the installed CIPP to the satisfaction of the Owner.

B3 Televising

Prior to final acceptance of any sanitary sewer relining including short-liners, the Contractor shall inspect by means of remote closed circuit television equipment the entire segment of sanitary sewer, manhole-to manhole. Sewer shall be cleaned prior to inspection. A videotape of the inspection shall be furnished to the City. The following conditions shall apply to the sewer acceptance TV inspection:

1. The videotape shall be in a format to be decided by the Owner, that creates high quality picture and sound and shall be recorded in color.
2. The TV camera shall be pulled through the sewer at a maximum rate of thirty five feet (35') per minute.
3. The camera shall be pulled downstream in all cases.
4. The lens of the camera shall be cleaned at each manhole or when directed by the Owner.
5. The recording shall have an on-screen display showing the following:
 - a. Upstream and downstream manhole numbers
 - b. Footage from the upstream manhole
 - c. Inspection date
6. Sewers shall not be televised within forty eight (48) hours of a rainfall event greater than one half inch ($\frac{1}{2}$ ").
7. The CIPPS shall be re-televised one (1) month prior to expiration of the one-year warranty. A videotape and written report shall be supplied to the City.

2631.4 CIPPS METHOD OF MEASUREMENT

Measurement for CIPP Lining shall be on a linear foot basis, to the nearest whole foot, measured from center of manhole to center of manhole.

2631.5 CIPPS BASIS OF PAYMENT

The proposal form shall cover all work shown on the contract drawings, specifications, and Special Provisions. All costs associated with the work including furnishing of all materials, providing all construction and equipment, and performing all necessary labor, coordination, supervision, and management to fully complete the work, shall be included in the unit or lump sum prices quoted in the proposal form. This work shall include restoration of all surfaces to their original condition or better. Reconnection of all existing services shall be considered incidental to the CIPPS. All work not specifically set forth as a pay item in the proposal form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the amounts and prices submitted in the proposal form.

The following methods of measurement for payment will be used to derive the quantities installed:

1. Site Protection and Restoration
 - a) No separate payment will be made for protection and restoration of roadway surfaces, curb and gutter, landscaping, and other site features unless otherwise specified.
2. Spot Repair to existing pipe
 - a) Bid items have been provided in the proposal for removal and replacement of pipe as Spot or Point Repairs. No additional compensation will be granted for repairs.
3. Cured-in-Place Pipe System (CIPPS)
 - a) Payment shall be made at the unit price as listed on the proposal. All work related to the cleaning, installation and acceptance of the system as a whole shall be considered incidental to CIPPS installation.
 - b) Payment for re-instatement of services shall be at the unit price listed on the proposal per each service, and shall be compensation in full for all materials, labor, equipment, and maintenance necessary to complete the work as required by the plans or required by the Engineer.
 - c) Payment for Short-Liner installations shall be made at the unit price listed on the proposal and shall be compensation in full for all materials, labor, equipment, and maintenance necessary to complete the work as required by the plans or required by the Engineer.

SECTION 2641 – STANDARD SPECIFICATIONS FOR PIPELINE REHABILITATION BY PIPE BURSTING

2641.1 DESCRIPTION

A General

All references to MnDOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation “Standard Specifications for Construction”, and all supplements and amendments thereto, published prior to the date of advertisement for bids.

This specification shall cover the rehabilitation of existing gravity and pressure utility pipelines using pipe bursting methods. Pipe bursting is a process by which the bursting unit fractures the existing pipe while simultaneously installing a new pipe of the same size or larger size pipe in the place of the existing pipe. Existing lateral and service connections are disconnected prior to mainline pipe bursting to reduce lateral pipe/service pipe damage, then reconnected after testing and disinfection of the new pipe as applicable is approved, television inspection of the new pipe is performed, and the installation is completed in accordance with the contract documents.

2641.2 QUALIFICATIONS

The Contractor shall be certified by the particular Pipe Bursting System Manufacturer as a fully trained installer of the pipe bursting system. The Contractor shall provide certifications of training and proficiency in the use of the equipment. Only the Contractor’s employees that are trained and certified shall operate the equipment.

The Contractor shall have a minimum of five (5) years’ experience using the pipe-bursting method proposed and shall have installed no less than 50,000 feet by this method.

2641.3 MATERIALS

Pipe materials meet the requirements described in Sections 2611.2 and 2621.2 of these specifications, and as provided in the Special Provisions and the following:

1. Sizes of the new pipe insertions shall be such to renew the pipe mainline to greater than the original flow capacity.
2. All pipe and fittings shall be made of virgin material. No rework except that obtained from the manufacturer’s own production of the same formulation shall be used.
3. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
4. Tensile strength of the pipe shall be in accordance with manufacturer’s recommendation for the specified purpose and method of installation.
5. Material color shall be as specified with interior of pipe having a light reflective color to allow for viewing for television inspection. The fused pipe joints shall be de-beaded to reduce collection of sediment and allow a camera to pass during inspection.

6. The Contractor shall consult with the selected pipe bursting equipment manufacturer regarding recommendations for the installation of pipe materials specified.

2641.4 SUBMITTALS

The Contractor shall submit the following:

1. Tests for compliance with this specification shall be made as specified herein and in accordance with the applicable ASTM Specification. A certificate from the manufacturer indicating the materials furnished meet the requirements of these specifications.
2. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.
3. Certification of Contractor and assigned personnel training for installing pipe.
4. Detailed submittal of the procedures and method proposed by the Contractor to burst the existing pipe and insert the new pipe.
5. Television inspection reports and video made of the existing pipe and after new pipe installation.

2641.5 DELIVERY, STORAGE, AND HANDLING

The Contractor shall transport, handle, and store pipe and fittings as recommended by the manufacturer. If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Engineer at the Contractor's expense, before proceeding further. Deliver, store and handle other materials as required to prevent damage.

2641.6 LICENSE AGREEMENTS

The Contractor shall submit evidence acceptable to the Owner, such as a certified copy of a license or agreement that it has the authority to use the proposed method from the patent holder and licensed manufacturer. The Contractor agrees to defend, indemnify, and hold harmless the Owner and the Engineer against all claims, suits, and actions or other damages as a result of negligence of any person or property arising out of patent infringement by the Contractor or the Contractor's employee's, agents, the suppliers, or any tier of subcontractors involved in the work.

2641.7 CONSTRUCTION REQUIREMENTS

Before excavation is started, it will be the responsibility of the Contractor to check with the various utility companies and determine the location and depth of the existing utilities in the vicinity of the work area.

Damage to utilities and the resulting repair, temporary service cost, etc., shall be borne by the Contractor. Access pits shall be backfilled in accordance with Section 2600, Trench Excavation and Backfill.

All excavations shall be properly sheeted/shored in accordance with relevant specifications for trench safety systems. Any damage resulting from improperly shored excavations shall be corrected to the satisfaction of the Engineer with no compensation to the Contractor.

All open excavations shall be kept secure at all times by the use of barricades and fencing with appropriate lights and signs, construction tape, covering with steel plates, etc., or as directed by the Engineer.

All lateral and service connections shall be identified, located and excavated prior to the pipe insertion to expedite reconnection. The Contractor shall use excavation methods that will not create a rise or sag at the service or lateral connection for gravity sewers. A rise or sag in the sewer will be repaired by the contractor at no expense to the Owner, in a manner approved by the Engineer.

The location and number of insertion and receiving excavations shall be planned by the Contractor and submitted in writing for approval by the Engineer at least ten (10) days prior to excavation.

One (1) or more receiving pits shall be excavated at the end(s) of the pipe to be replaced or at appropriate points within the length of the existing pipe. Pit shall be centered over the existing pipe. The number of pits for machine and pipe insertion shall be the minimum necessary to most efficiently accomplish the work. The Contractor shall give consideration to the use of excavation required for other purposes such as for sanitary sewer service reconnections and manhole replacement.

Where manholes are used as machine or new pipe insertion pits, the Contractor shall identify such manholes and replace them at no additional cost to the Owner if damaged. Any manhole modification or replacement required shall be considered incidental to the installation of the new pipe. Equipment used to perform the work shall be located away from buildings so as not to create noise impact. Provide a silent engine compartment to reduce machine noise as required to meet local requirements.

The Contractor shall install all pulleys, rollers, bumpers, alignment control devices, and other equipment required to protect existing manholes and pipe components not intended for removal/replacement, and to protect the new pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. If lubrication is used for insertion, the Contractor shall ensure that the lubricant does not backfill existing services. Under no circumstances will the pipe be stressed beyond eighty percent (80%) of its elastic limit as published and recommended by the manufacturer.

Pipe insertion shall be continuous and without interruption from manhole to manhole for sewers, or junction to junction for watermain, except as approved by the Engineer. Upon completion of insertion of the new pipe, and after the relaxation period, the Contractor shall expedite the reconnection of laterals and services so as to minimize any inconvenience to customers. Connection of services shall be in accordance with Sections 2611 and 2621 of these specifications and as provided in the Special Provisions.

The installed pipe shall be allowed the manufacturer's recommended amount of time, but not less than four (4) hours, for cooling and relaxation due to tensile stressing prior to any reconnection of service lines, sealing of the annulus or backfilling of the insertion pit. Sufficient

excess length of new pipe, but not less than four inches (4"), shall be allowed to protrude into manholes. Restraint of pipe ends shall be achieved by means of electrofusion couplings. The electrofusion couplings shall be slipped over pipe ends against manhole wall and fused in place. Installation of electrofusion couplings shall be done in accordance with the manufacturers recommended procedures.

Following the relaxation period, the annular space at the manhole shall be sealed. Sealing shall be made with material approved by the Engineer and shall extend a minimum of eight inches (8") into the manhole wall in such a manner as to form a smooth, uniform, watertight joint.

Fused pipe joints shall be de-beaded to create a smooth flow line. There shall be no ridges or burrs from the fusion method exposed on the interior of the pipe following installation.

Tracer wire shall be installed with the pipe in accordance with 2611 and 2621.

Equipment: The pipe bursting tool shall increase the external dimensions sufficiently, causing breakage of the existing pipe at the same time expanding the surrounding ground. Simultaneously, the new pipe, directly attached to the expander, shall also move forward. See manufacturer's specifications for what size tool should be used in what diameter of pipe, as well as parameters of what size tool for percentage of upsize allowed.

The bursting head shall incorporate a shield/expander to prevent collapse of the hole ahead of the pipe insertion.

Bypass Pumping: The Contractor, when and where required for sanitary sewer replacement, shall provide diversion for the pipe bursting/replacement process. The pumps and by-pass lines shall be of adequate capacity and size to handle all flows. All costs for by-pass pumping required during installation of the pipe shall be incidental to the installation of the pipe, unless otherwise provided in the Special Provisions.

Temporary Water: The Contractor when and where required for watermain replacement, shall provide all labor, materials, and equipment associated with managing, constructing, and maintaining a temporary potable water distribution system for all existing water users which must be taken out of service for a period exceeding eight (8) hours, or as required at the discretion of the Engineer. All costs to provide temporary water required during installation of the pipe shall be incidental to the installation of the pipe, unless otherwise provided in the Special Provisions.

2641.8 TESTING AND INSPECTION

Testing: Tests for compliance with this specification shall be made as described herein and in accordance with the applicable ASTM Specification. A certificate with this specification shall be furnished, upon request, by the manufacturer for all material furnished under this specification.

Inspection: Video inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit color television. Video inspection shall include the following:

- Two (2) copies of the DVD's in mpeg4 format (post) to be submitted to the Owner before final invoice.

- DVD's are to remain property of the Owner; Contractor to retain second copy.
- All flows tributary to reach of sewer being inspected are to be completely by-passed around the reach during inspection if necessary and required by the Owner.
- Pre-construction video of the existing pipe and post construction video inspection upon completion of reconstruction of each reach of pipe, with the voice description, with stationing of services indicated. Data and stationing to be on video.
- Should any portion of the video inspection be of inadequate quality or coverage, as determined by the Owner the Contractor will have the portion re-inspected and video recorded at no additional expense to the Owner.

2641.9 METHOD OF MEASUREMENT

Measurement for pipe bursting shall be on a linear foot basis, to the nearest whole foot, measured from center of manhole to center of manhole or junction point to junction point as indicated on the plans.

2641.10 BASIS OF PAYMENT

Pipe Bursting: The work performed as prescribed by this item will be paid for by the linear foot at the unit price bid for the pipe bursting/replacement at the specified pipe diameter and location which price shall be full compensation for the installation of the new pipe, furnishing and placing of all materials, labor, tools, equipment, cleaning, and preparation of the existing pipe to receive the new pipe, tracer wire, pipe bedding, backfill material, annulus sealing material and launching pits, and video inspection of final installed pipe, bypass pumping, temporary water distribution, traffic control, sealing at manholes, locating, excavating, disconnecting, testing in accordance with the Contract Documents, and all else incidental thereto for which separate payment is not provided under other Items in the Bid Form.

CONSTRUCTION CONTRACT

THIS AGREEMENT (the “Agreement”) is made and entered into this __ day of _____, 2017, by and between _____, a Minnesota Corporation (the “Contractor”) and the City of Ramsey, a Minnesota Municipal Corporation, 7550 Sunwood Drive NW, Ramsey, Minnesota 55303 (the “Owner”).

WITNESSETH

WHEREAS, the City of Ramsey proposes to extend utilites along 0.25 miles of Bunker Lake Boulevard west of Armstrong Boulevard and east of Puma Street, with City Improvement Project No. 17-09 (the “Project”); and

WHEREAS, the plans and specifications necessary for construction of the Project are defined in the Contract Documents and Technical Specifications dated May 30, 2017 (the “Contract Documents”); and

WHEREAS, the work required to complete the Project is defined in the Contract Documents (the “Work”); and

WHEREAS, the Contractor has made a written proposal and bid to the Owner to furnish the material, equipment, labor and everything necessary for the completion of the Work for the price and within the time schedule required by the Contract Documents; and

WHEREAS, the Contractor, as the lowest responsible bidder, has been awarded the contract for the Work by the City; and

WHEREAS, Contractor, in consideration of the payments hereinafter provided, for itself and its successors, as the case may be, hereby covenants and agrees to and with the Owner to perform the Work and furnish the material, under the supervision of the City Engineer; and

WHEREAS, Contractor acknowledges:

1. That it understands the Contract Documents;
2. That it has the equipment, technical ability, personnel and facilities to construct the Project in accordance with the Contract Documents and that it is licensed by all applicable agencies and governmental entities;
3. That the Contract Documents are, in its opinion, appropriate and adequate for the complete construction of the Project in a sound and suitable manner.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, it is agreed and understood as follows:

1. Work Performance. Contractor shall perform the Work as described in the Contract Documents which are incorporated herein by reference. Contractor agrees to comply

with all federal, state, and local laws and ordinances applicable to the services to be performed under this Agreement, including all safety standards. The Contractor shall be solely and completely responsible for conditions of the job site, including the safety of all persons and property during the performance of the services.

2. Commencement of Work. The Contractor shall commence work on the Project within ten (10) days of the date of the Notice to Proceed given by the City Engineer and shall have the Work substantially complete within the period specified in the Contract Documents. Failure to complete the work within this period will be cause for the Contractor to forfeit the amount as required by the Special Provisions terms of the Contract Documents and that it is appropriately licensed by all applicable agencies and governmental entities.
3. Contractor Compensation. The Owner shall compensate Contractor for the Work in the amount of \$_____ based upon the Contractor's accepted bid subject to any additions or deductions provided therein, payment shall be made pursuant to the payment provisions outlined in the Contract Documents.
4. Independent Contractor Relationship. It is expressly understood that the Contractor is an "independent contractor" and not an employee of the City. The Contractor shall have control over the manner in which the services are performed under this Agreement. The Contractor shall supply, at its own expense, all materials, supplies, equipment and tools required to accomplish the work contemplated by this Agreement. The Contractor shall not be entitled to any benefits from the City, including, without limitation, insurance benefits, sick and vacation leave, workers' compensation benefits, unemployment compensation, disability, severance pay, or retirement benefits.
5. Insurance Requirements.
 - A. Liability. The Contractor agrees to maintain commercial general liability insurance in a minimum amount of \$1,500,000 per occurrence; \$2,000,000 annual aggregate. The policy shall cover liability arising from premises, operations, products-completed operations, personal injury, advertising injury, and contractually assumed liability. The City shall be named as an additional insured.
 - B. Automobile Liability. If the Contractor operates a motor vehicle in performing the services under this Agreement, the Contractor shall maintain commercial automobile liability insurance, including owned, hired, and non-owned automobiles, with a minimum liability limit of \$1,000,000, combined single limit.
 - C. Workers' Compensation. The Contractor agrees to comply with all applicable workers' compensation laws in Minnesota.
 - D. Certificate of Insurance. The Contractor shall, prior to commencing services, deliver to the City a Certificate of Insurance as evidence that the above coverage's are in full force and effect.
6. Indemnification. To the fullest extent permitted by law, the Contractor agrees to defend, indemnify and hold harmless the City, and its employees, officials, volunteers and agents from and against all claims, actions, damages, losses and expenses, including attorney fees, arising out of the Contractor's negligence or the Contractor's performance or failure to perform its obligations under this Agreement. The Contractor's indemnification obligation shall apply to the Contractor's subcontractor(s), or anyone directly or indirectly employed or hired by the Contractor, or anyone for whose acts the Contractor

- G. Governing Law. This Agreement shall be governed by and interpreted in accordance with the laws of the State of Minnesota. All proceedings related to this Agreement shall be venued in the State of Minnesota.
- H. Waivers. The waiver by either party of any breach or failure to comply with any provision of this Agreement by the other party shall not be construed as, or constitute a continuing waiver of such provision or a waiver of any other breach of or failure to comply with any other provision of this Agreement.
- I. Ownership of Documents. All reports, plans, specifications, data, maps, and other documents produced by the Contractor in the performance of services under this Agreement shall be the property of the City.
- J. Government Data. The Contractor agrees to maintain all data received from the City in the same manner as the City as required under the Minnesota Government Data Practices Act, Minnesota Statutes, Chapter 13.
- K. Counterparts. This Agreement may be signed in counterparts, each of which shall be deemed an original, and which taken together shall be deemed to be one and the same document.
- L. Savings Clause. If any court finds any portion of this Agreement to be contrary to law, invalid, or unenforceable, the remainder of the Agreement will remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in triplicate counterparts the day and year first above written.

CONTRACTOR:

OWNER:

CITY OF RAMSEY

By: _____

By: _____

Sarah Strommen, Its Mayor

Its: _____

ATTEST:

By: _____

Kurt Ulrich, Its City Administrator

CERTIFICATE OF OWNER’S ATTORNEY

I, the undersigned, Joseph J. Langel, the duly authorized and acting legal representative of the City of Ramsey, do hereby certify that I have reviewed the attached contract dated _____, 2017, between the City of Ramsey as Owner, and _____ as Contractor. In addition, I have examined the attached Performance Bond of said Contractor as Principal, and _____ as Surety, dated _____, 2017, and which is the Surety’s Bond _____. In addition, I have examined the attached Payment Bond of said Contractor as Principal, and _____ as Surety, dated _____, 2017, and which is the Surety’s Bond _____. Based upon said review, I approve these documents to be Legal Form.

Dated: _____, 2017

Ramsey City Attorney

NOTICE TO BIDDERS

Minnesota Statutes that require prompt payment to subcontractors:

16A.1245 Prompt payment to subcontractors.

Each state agency contract must require the prime contractor to pay any subcontractor within ten days of the prime contractor's receipt of payment from the state for undisputed services provided by the subcontractor. The contract must require the prime contractor to pay interest of 1-1/2 percent per month or any part of a month to the subcontractor on any undisputed amount not paid on time to the subcontractor. The minimum monthly interest penalty payment for an unpaid balance of \$100 or more is \$10. For an unpaid balance of less than \$100, the prime contractor shall pay the actual penalty due to the subcontractor. A subcontractor who prevails in a civil action to collect interest penalties from a prime contractor must be awarded its costs and disbursements, including attorney's fees, incurred in bringing the action.

HIST: 1990 c 541 s 1

337.10 Building and construction contracts; prohibited provisions.

Subd. 3. Prompt payment to subcontractors. A building and construction contract shall be deemed to require the prime contractor and all subcontractors to promptly pay any subcontractor or material supplier contract within ten days of receipt by the party responsible for payment of payment for undisputed services provided by the party requesting payment. The contract shall be deemed to require the party responsible for payment to pay interest of 1-1/2 percent per month to the party requesting payment on any undisputed amount not paid on time. The minimum monthly interest penalty payment for an unpaid balance of \$100 or more is \$10. For an unpaid balance of less than \$100, the party responsible for payment shall pay the actual penalty due to the party requesting payment. A party requesting payment who prevails in a civil action to collect interest penalties from a party responsible for payment must be awarded its costs and disbursements, including attorney fees incurred in bringing the action. This subdivision does not apply to construction of or improvements to residential real estate as defined in section 326.83, subdivision 17, or to construction of or improvements to attached single-family dwellings, if those dwellings are used for residential purposes and have fewer than 13 units per structure.

HIST: 1997 c 127 s 1; 1998 c 289 s 1,2; 1999 c 116 s 2

CITY OF RAMSEY

BUNKER LAKE BOULEVARD UTILITIES EXTENSION

CITY IMPROVEMENT PROJECT NO. 17-09

GOVERNING SPECIFICATIONS

THE 2016 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

ALL FEDERAL, STATE AND LOCAL LAWS, REGULATIONS AND ORDINANCES SHALL BE COMPLIED WITH IN THE CONSTRUCTION OF THIS PROJECT.

ALL TRAFFIC CONTROL DEVICES AND SIGNING SHALL CONFORM TO THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, INCLUDING THE FIELD MANUAL FOR TEMPORARY TRAFFIC CONTROL ZONE LAYOUTS.

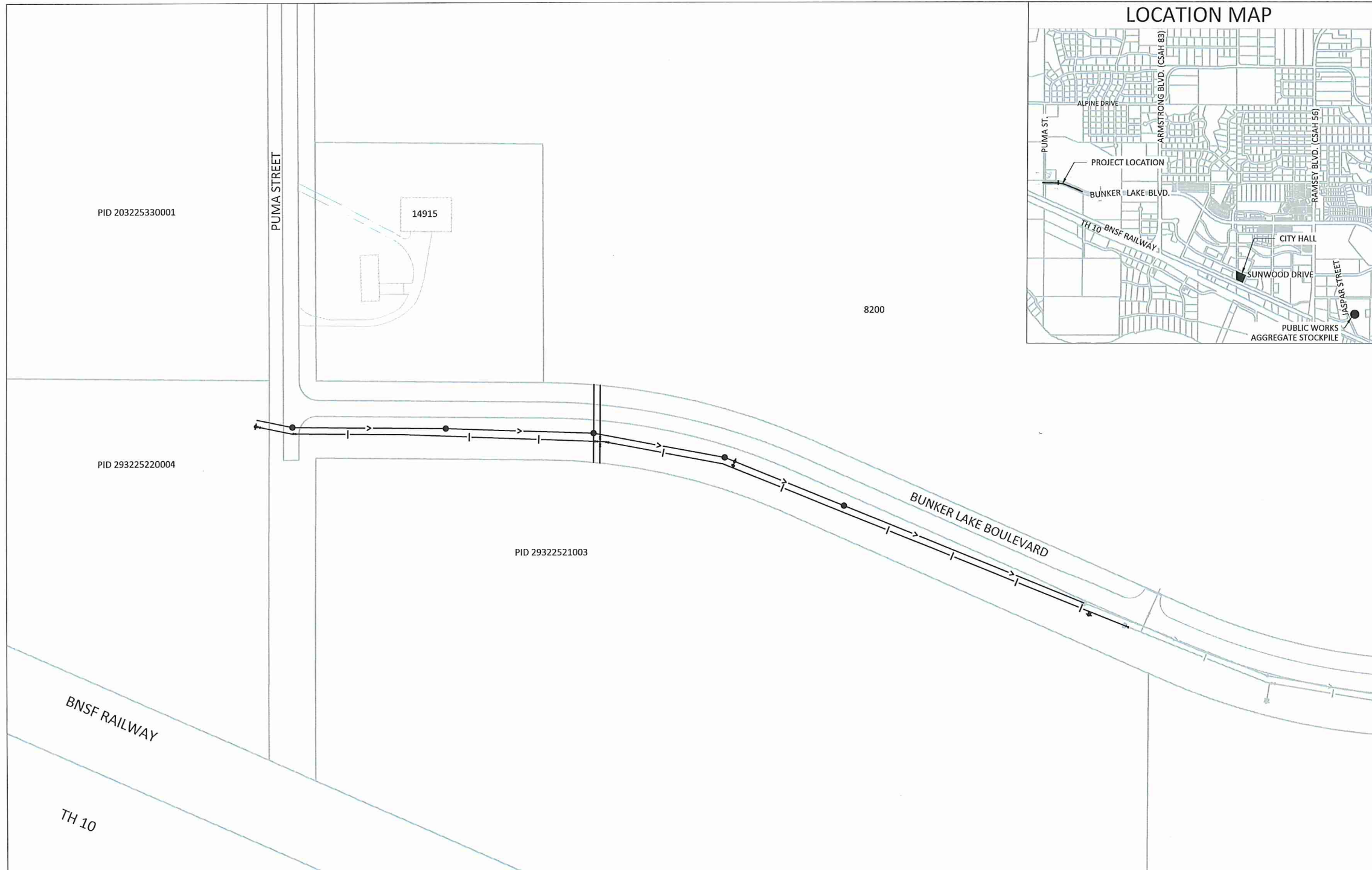
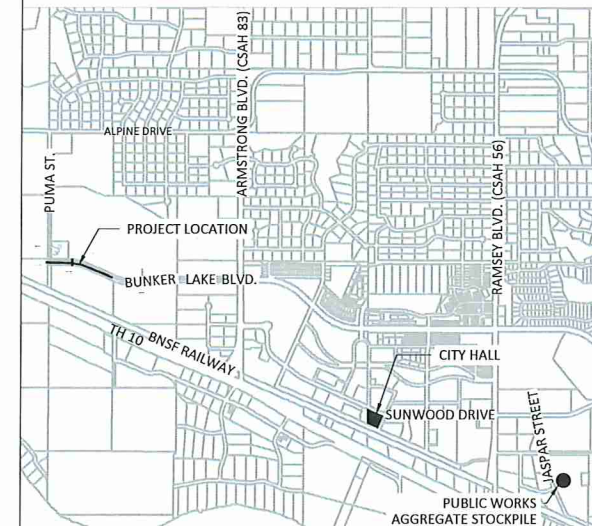
SHEET INDEX

THIS PLAN CONTAINS 11 SHEETS

SHEET No. DESCRIPTION

1	TITLE SHEET
2	STATEMENT OF ESTIMATED QUANTITIES
3	DETAILS
4	EXISTING CONDITIONS AND REMOVALS
5	EROSION CONTROL PLAN AND RESTORATION PLAN
6	SANITARY SEWER & WATERMAIN CONSTRUCTION
7	GRADING PLAN
8-11	CROSS SECTIONS

LOCATION MAP



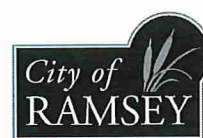
LEGEND

	LIGHT POLE		EASEMENT
	TREE		RIGHT OF WAY
	SHRUB		ELECTRIC
	SIGN		OVERHEAD ELECTRIC
	VALVE		GAS
	UTILITY PEDESTAL		TELECOMMUNICATIONS
	HAND HOLE		STORM SEWER
	REMOVE TREE		SANITARY SEWER
	3'x2' CATCH BASIN		WATERMAIN
	MANHOLE		SAWCUT PAVEMENT
	INLET PROTECTION		TREE LINE
	HYDRANT		SPLIT RAIL FENCE
	VALVE		LANDSCAPING
			RETAINING WALL
			5' CONTOUR LINE
			1' CONTOUR LINE
			SILT FENCE
			CONCRETE CURB & GUTTER
			REMOVE BITUMINOUS PAVEMENT
			EROSION CONTROL BLANKET
			CONCRETE PAVEMENT
			BITUMINOUS PAVEMENT
			GRAVEL SURFACE

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

Bruce Westby 40116 DATE *5/26/17*
 BRUCE R WESTBY, P.E. LIC. NO.
 RAMSEY CITY ENGINEER

DATE	REVISION



CITY OF RAMSEY
 7550 SUNWOOD DRIVE
 RAMSEY, MN 55303
 (763) 427-1410 FAX (763) 433-9898

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA."

NOTE: EXISTING UTILITY INFORMATION SHOWN ON THIS PLAN HAS BEEN PROVIDED BY THE UTILITY OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY GOPHER STATE ONE CALL 1-800-252-1166 OR 651-454-0002



Call before you dig
 811
 651 454-0002 Metro
 800 252-1166 Outstate
www.gopherstateonecall.org

17-09 BUNKER LAKE BOULEVARD UTILITIES EXTENTSION - ESTIMATED QUANTITIES

PAGE NO.	NOTE	ITEM NO.	ITEM	UNIT	ESTIMATED QUANTITY
		2021.501	MOBILIZATION	LS	1
4		2101.501	CLEARING AND GRUBBING	ACRE	0.04
4	2	2104.501	REMOVE WATERMAIN	LF	10
4	2	2104.505	REMOVE BITUMINOUS PAVEMENT	SY	336
4	2	2104.513	SAWING BITUMINOUS PAVEMENT - FULL DEPTH	LF	330
4	7	2104.521	SALVAGE CONCRETE PIPE STORM SEWER	LF	16
4	7	2104.523	SALVAGE GATE VALVE & BOX	EA	1
4		2104.523	SALVAGE HYDRANT	EA	1
4	7	2104.523	SALVAGE PIPE APRON	EA	1
7	1	2105.501	COMMON EXCAVATION (CV)	CY	350
7	1	2105.521	GRANULAR BORROW (CV)	CY	2250
		2105.601	DEWATERING	LS	1
5	1	2211.503	AGGREGATE BASE CLASS 5 (CV)	CY	70
6		2503.511	8" PVC PIPE SEWER (SDR 26)	LF	120
6		2503.511	18" PVC PIPE SEWER (SDR 26)	LF	1333
6		2503.602	8" PIPE PLUG (SANITARY)	EA	2
6		2503.602	18" PIPE PLUG (SANITARY)	EA	1
6		2503.602	CONNECT TO EXISTING MANHOLE (SANITARY)	EA	1
6		2503.603	CLEAN AND VIDEO TAPE PIPE SEWER (SANITARY)	LF	1453
6		2504.602	6" GATE VALVE & BOX	EA	2
6		2504.602	8" GATE VALVE & BOX	EA	2
6		2504.602	16" GATE VALVE & BOX	EA	4
6		2504.602	FURNISH HYDRANT	EA	2
6		2504.602	INSTALL HYDRANT	EA	3
6		2504.602	CONNECT TO EXISTING WATERMAIN	EA	1
6		2504.603	6" WATERMAIN DUCTILE IRON CL 53	LF	25
6		2504.603	8" WATERMAIN DUCTILE IRON CL 52	LF	121
6		2504.603	16" WATERMAIN DUCTILE IRON CL 52	LF	1412
6		2504.608	DUCTILE IRON FITTINGS	LBS	867
6		2506.516	CASTING ASSEMBLY (SANITARY)	EA	5
6		2506.521	INSTALL CASTING	EA	5
6		2506.601	CONSTRUCT SANITARY STRUCTURE DESIGN 48-4007	LF	91
		2563.601	TRAFFIC CONTROL	LS	1
5		2573.503	SILT FENCE	LF	450
5		2573.530	STORM DRAIN INLET PROTECTION	EA	2
5		2573.533	SEDIMENT CONTROL LOG TYPE STRAW	LF	150
5	4	2574.508	FERTILIZER TYPE 3	LBS	276
5		2575.501	HYDROSEEDING MNDOT MIXTURE 21-111	ACRE	1.41
5	5	2575.502	MNDOT SEED MIXTURE 21-111	LBS	141
5	3	2575.560	HYDRAULIC MATRIX TYPE MULCH	LBS	2820

PAY ITEM NOTES:

- EV TO CV CONVERSION FACTOR = 1.2
- REMOVAL LIMITS WILL BE MARKED IN THE FIELD BY CITY STAFF.
- ESTIMATED QUANTITY BASED ON APPLICATION RATE OF 2000 LB/ACRE.
- ESTIMATED QUANTITY BASED ON APPLICATION RATE OF 200 LB/ACRE.
- ESTIMATED QUANTITY BASED ON APPLICATION RATE OF 100 LB/ACRE.
- CITY TO FURNISH CLASS 5 AGGREGATE MATERIAL FROM STOCKPILE LOCATED AT CITY PUBLIC WORKS YARD. THE CONTRACTOR SHALL FURNISH A LOADER AND OPERATOR. CONTRACTOR SHALL LOAD AND HAUL FROM THE STOCKPILE AND PLACE, SHAPE AND COMPACT ON-SITE.
- PAY ITEM INCLUDES SALVAGE AND RE-INSTALL.

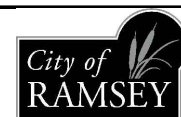
SANITARY SEWER CASTING SCHEDULE						
STRUCTURE	DESIGN	RIM	INVERT	STATION	OFFSET	CASTING
MH - 1	48-4007	883.37	INV. W (16" STUB) 864.25	1+36.69	R - 24.5	1733 SERIES
			INV. E (MH - 2) 864.15			
MH - 2	48-4007	882.37	INV. W (MH - 1) 863.87	3+74.72	R - 24.5	1733 SERIES
			INV. E (MH - 3) 863.77			
MH - 3	48-4007	881.88	INV. W (MH - 2) 863.49	6+06.83	R - 26.8	1733 SERIES
			INV. E (MH - 4) 863.39			
			INV. N (8" STUB) 863.49			
			INV. S (8" STUB) 863.49			
MH - 4	48-4007	880.72	INV. W (MH - 3) 863.14	8+19.84	R - 24.7	1733 SERIES
			INV. E (MH - 5) 863.04			
MH - 5	48-4007	879.69	INV. W (MH - 4) 862.80	10+22.77	R - 24.5	1733 SERIES
			INV. E (EX. MH - 1) 862.70			
EX. MH - 1	48-4007	877.4	INV. W (MH - 5) 862.22 (FIELD VERIFY)	14+25.01	R - 12.4	1733 SERIES
			INV. E (EXISTING) 862.12			

DATE	REVISION

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

Bruce Westby
 BRUCE WESTBY
 Date 5/26/17 Lic. No. 40116

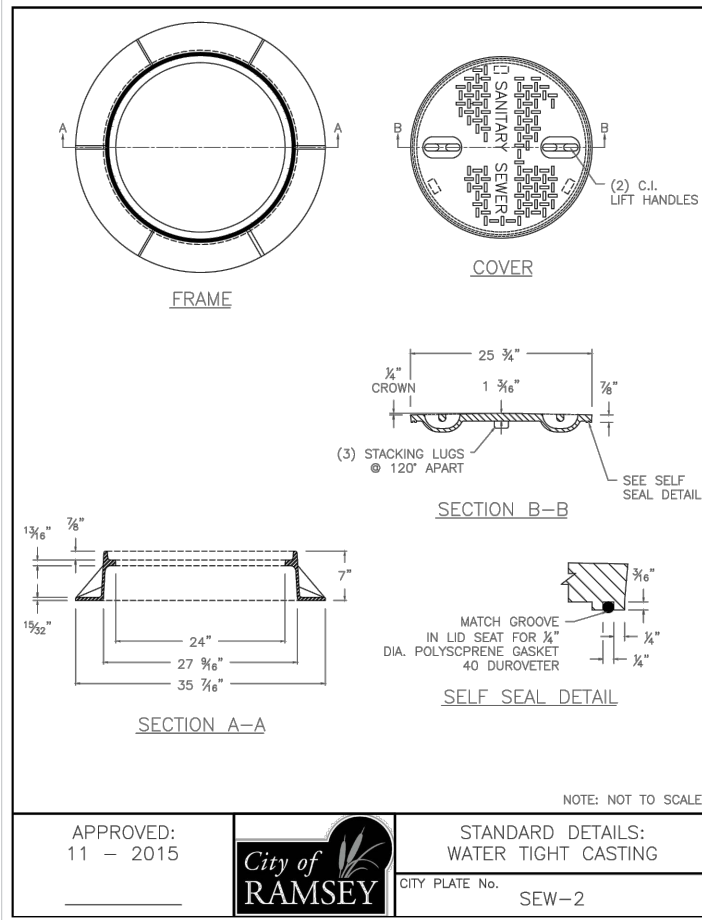
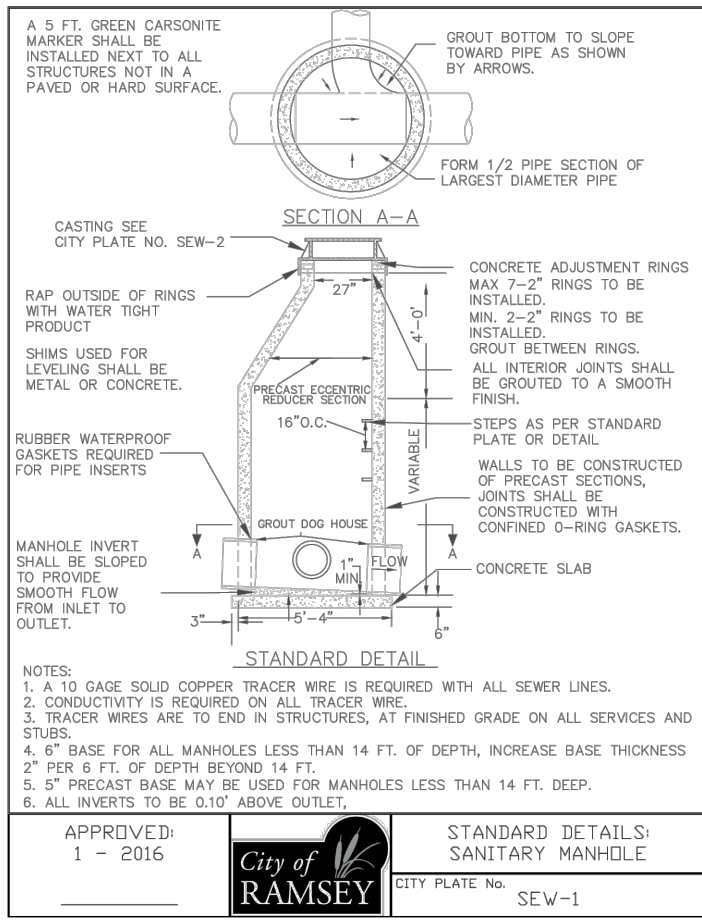
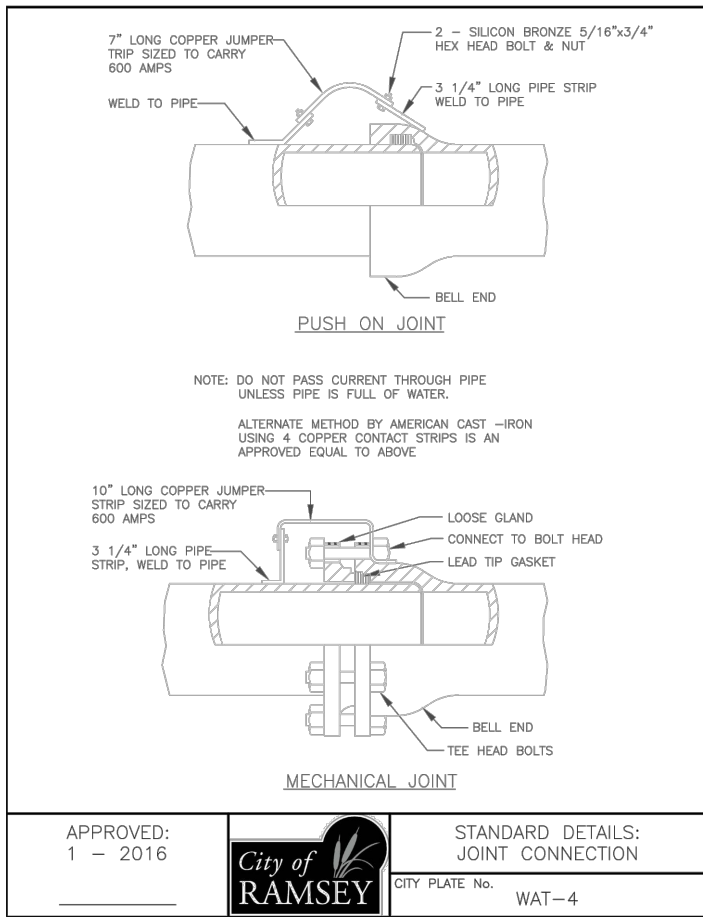
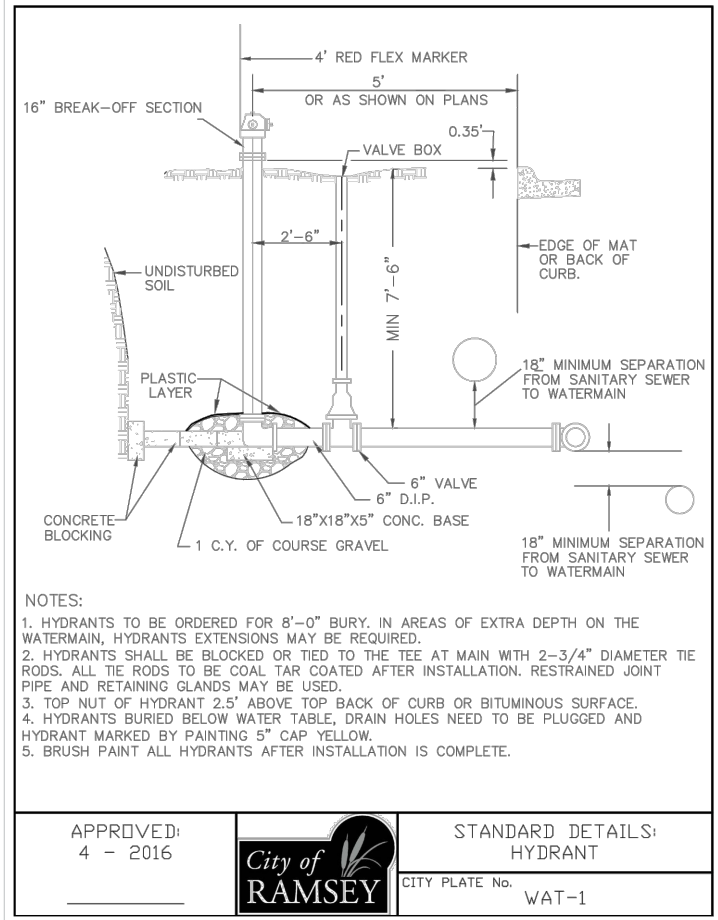
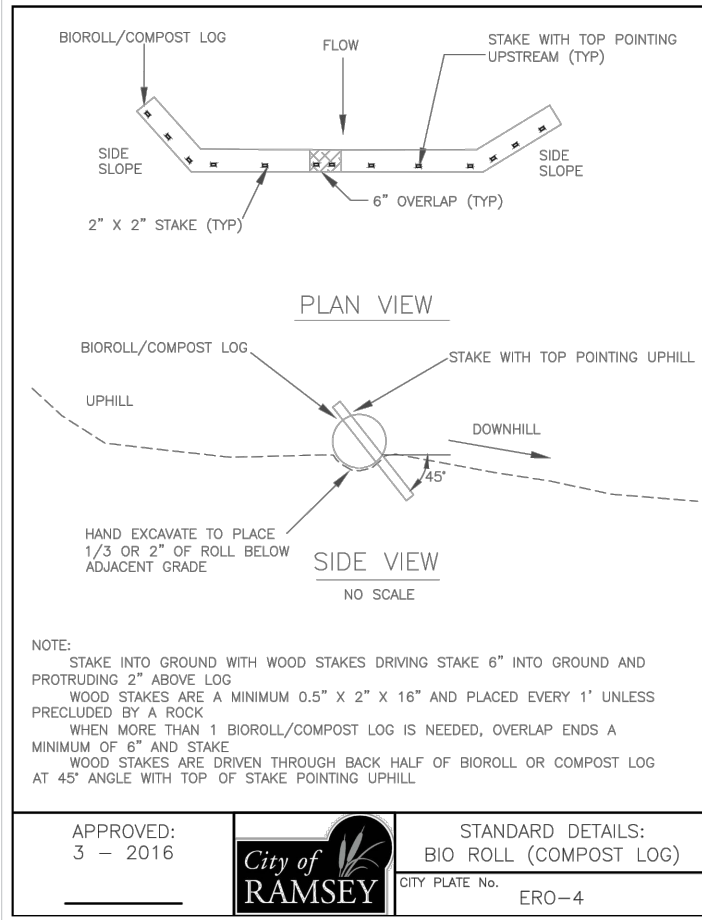
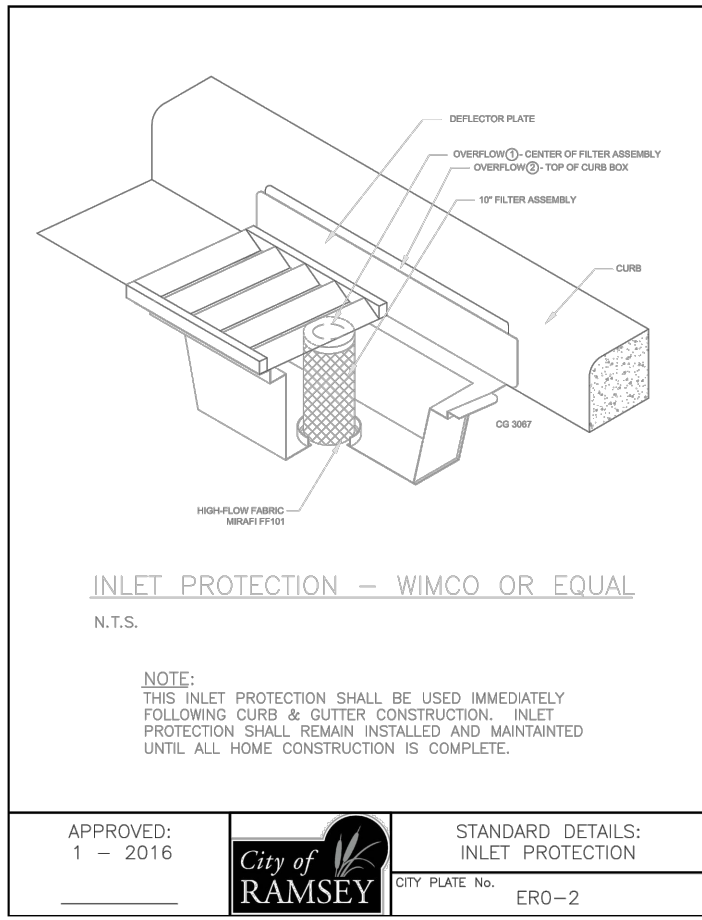
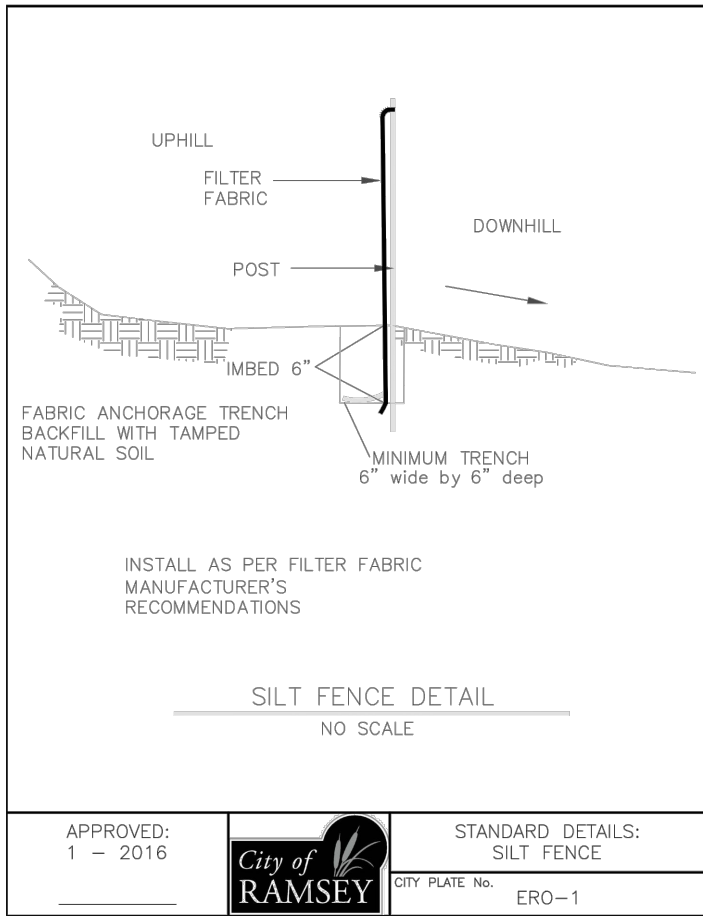
DESIGNED BY: JJF
 DRAWN BY: JJF
 CHECKED BY: BRW
 DATE: 5/26/17
 FILE No. 17-09



CITY OF RAMSEY
 7550 SUNWOOD DRIVE
 RAMSEY, MN 55303
 (763) 427-1410 FAX (763) 433-9898

STATEMENT OF ESTIMATED QUANTITIES

BUNKER LAKE BLVD. UTILITIES EXTENSION
 CITY PROJECT NO. 17-09
 CITY OF RAMSEY, MINNESOTA



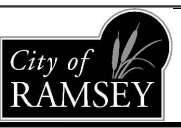
DATE	REVISION
May 30, 2017 - 8:36am	G:\Engineering\AutoCad Dwg\Projects A-M\Bunker Lake Blvd Utilities Extension - 2017\Plan Drawings\Details.dwg

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

Bruce Westby
BRUCE WESTBY
Date 5/26/17 Lic. No. 40116

DESIGNED BY: JJF
DRAWN BY: JJF
CHECKED BY: BRW

DATE: 5/26/17
FILE No. 17-09



CITY OF RAMSEY
7550 SUNWOOD DRIVE
RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

DETAILS

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA



PUMA STREET

14915

8200

REMOVE BITUMINOUS PAVEMENT
SAWCUT - FULL DEPTH

REMOVE BITUMINOUS PAVEMENT
SAWCUT - FULL DEPTH

BUNKER LAKE BOULEVARD

CLEAR AND GRUB TREES
0.04 ACRES

PID 29322521003

REMOVE BITUMINOUS PAVEMENT
SAWCUT - FULL DEPTH

REMOVE WATERMAIN

SALVAGE CONCRETE APRON &
CONCRETE STORM SEWER PIPE

SALVAGE HYDRANT
SALVAGE GATE VALVE & BOX

LEGEND

	REMOVE BITUMINOUS PAVEMENT		
	REMOVE WATERMAIN		
	SAWCUT PAVEMENT	XXX	EXISTING GROUND CONTOUR
	CLEAR AND GRUB TREES	---	EXISTING 1' CONTOUR LINE
	SALVAGE HYDRANT	---	EXISTING 5' CONTOUR LINE
	SALVAGE GATE VALVE & BOX	—□—E—	OVERHEAD ELECTRIC LINE
	SALVAGE CONCRETE PIPE - STORM	—E—	UNDERGROUND ELECTRIC LINE
	SALVAGE CONCRETE APRON	—T—	TELECOMMUNICATIONS LINE

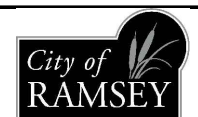
DATE	REVISION

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Bruce Westby
BRUCE WESTBY
Date 5/26/17 Lic. No. 40116

DESIGNED BY: JJF
DRAWN BY: JJF
CHECKED BY: BRW

DATE: 5/26/17
FILE No. 17-09



CITY OF RAMSEY
7550 SUNWOOD DRIVE
RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

EXISTING CONDITIONS AND REMOVALS

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA

SHEET 4 OF 11 SHEETS



PUMA STREET

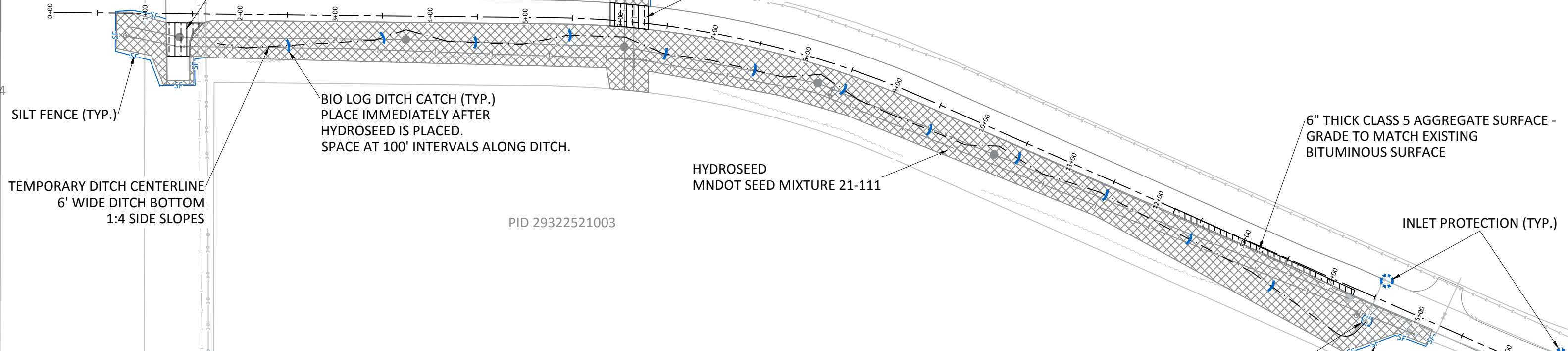
14915

8200

6" THICK CLASS 5 AGGREGATE SURFACE -
GRADE TO MATCH EXISTING
BITUMINOUS SURFACE

6" THICK CLASS 5 AGGREGATE SURFACE -
GRADE TO MATCH EXISTING
BITUMINOUS SURFACE

BUNKER LAKE BOULEVARD



SILT FENCE (TYP.)

TEMPORARY DITCH CENTERLINE
6' WIDE DITCH BOTTOM
1:4 SIDE SLOPES

BIO LOG DITCH CATCH (TYP.)
PLACE IMMEDIATELY AFTER
HYDROSEED IS PLACED.
SPACE AT 100' INTERVALS ALONG DITCH.

HYDROSEED
MNDOT SEED MIXTURE 21-111

6" THICK CLASS 5 AGGREGATE SURFACE -
GRADE TO MATCH EXISTING
BITUMINOUS SURFACE

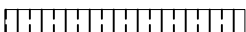

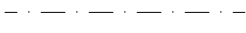



PID 29322521003

INLET PROTECTION (TYP.)

SILT FENCE (TYP.)

SILT FENCE (TYP.)

LEGEND

-  GRAVEL SURFACE
-  HYDROSEED AREA
-  TEMPORARY DITCH CENTERLINE
-  SILT FENCE
-  BIO LOG DITCH CATCH
-  INLET PROTECTION

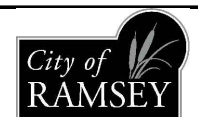
DATE	REVISION

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

Bruce Westby
BRUCE WESTBY
Lic. No. 40116

DESIGNED BY: JJF
DRAWN BY: JJF
CHECKED BY: BRW

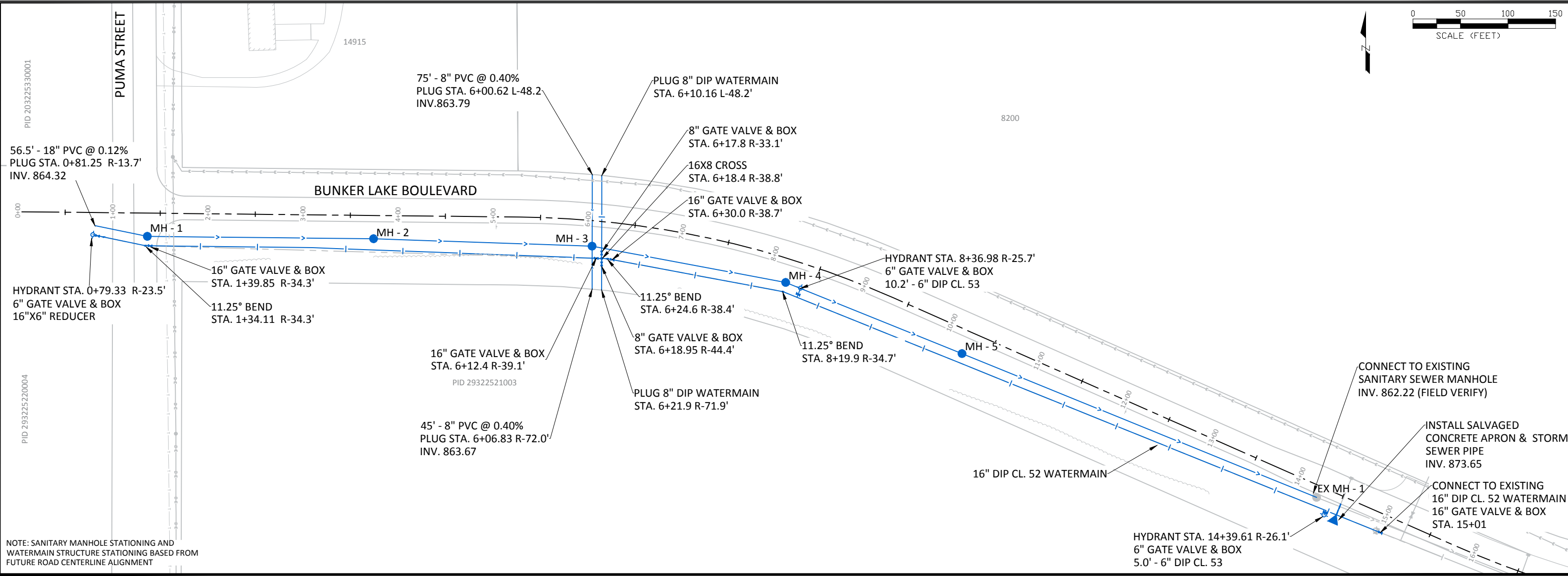
DATE: 5/26/17
FILE No. 17-09



CITY OF RAMSEY
7550 SUNWOOD DRIVE
RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

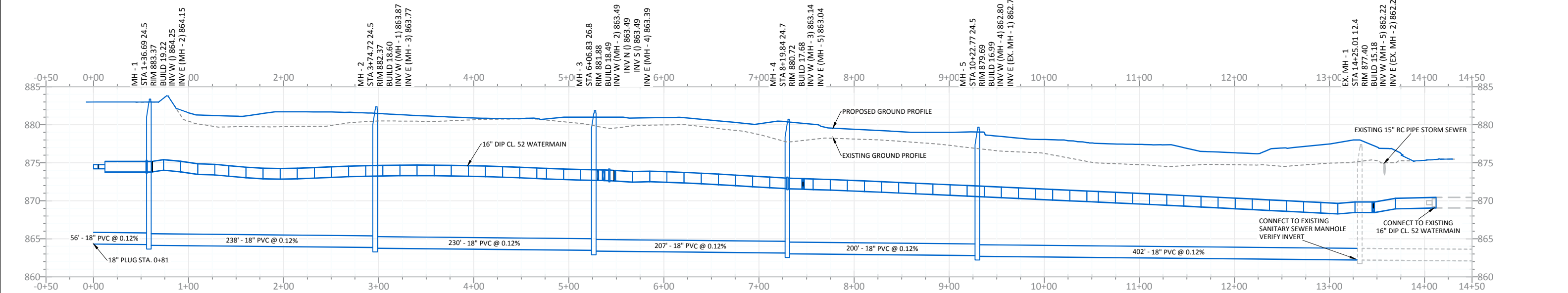
EROSION CONTROL PLAN AND RESTORATION PLAN

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA



NOTE: SANITARY MANHOLE STATIONING AND WATERMAIN STRUCTURE STATIONING BASED FROM FUTURE ROAD CENTERLINE ALIGNMENT

PROPOSED WATERMAIN ALIGNMENT



NOTE: SANITARY SEWER STATIONING FROM FUTURE ROAD CENTERLINE ALIGNMENT

883.0	883.6	881.56	881.22	881.12	881.42	881.70	881.69	881.68	881.60	881.48	881.30	881.15	881.02	880.89	880.81	880.82	880.75	881.00	881.00	880.89	880.94	880.88	880.59	880.30	880.11	880.44	880.14	879.56	879.40	879.25	879.07	879.00	879.00	879.05	878.51	878.21	878.06	877.89	877.60	877.47	877.41	877.35	876.90	876.45	876.31	876.19	876.93	877.16	877.47	878.00	877.07	876.23	875.31	875.5
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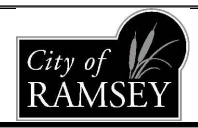
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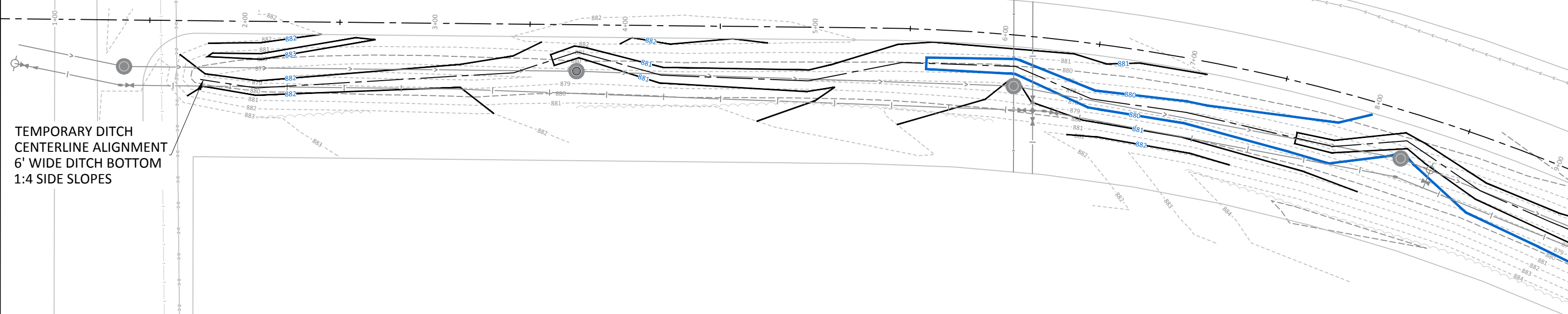
SANITARY SEWER & WATERMAIN CONSTRUCTION

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA

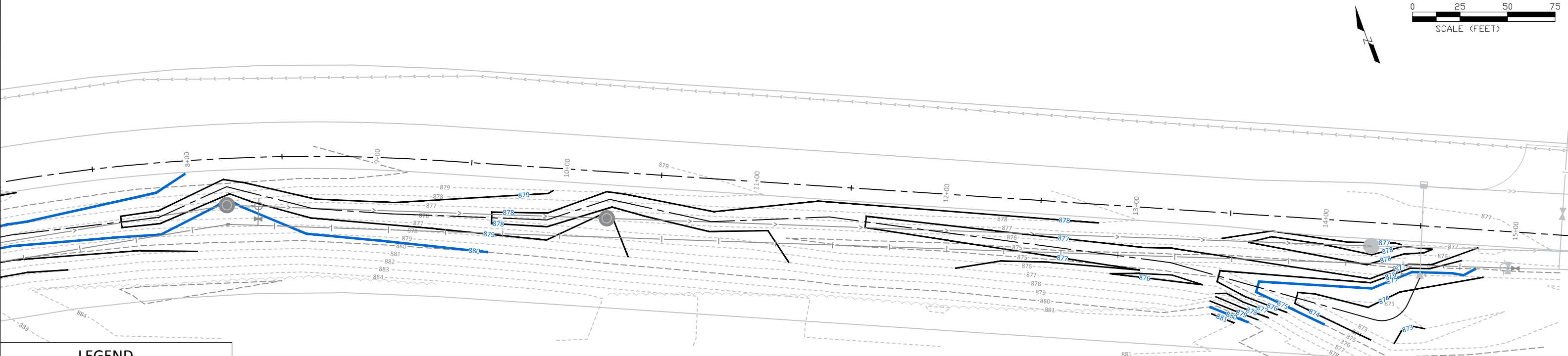
SHEET 6 OF 11 SHEETS



BUNKER LAKE BOULEVARD



TEMPORARY DITCH
CENTERLINE ALIGNMENT
6' WIDE DITCH BOTTOM
1:4 SIDE SLOPES



LEGEND

- XXX PROPOSED ELEVATION
- XXX EXISTING ELEVATION
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- - - EXISTING 1' CONTOUR
- - - EXISTING 5' CONTOUR

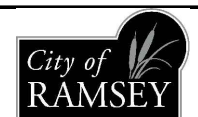
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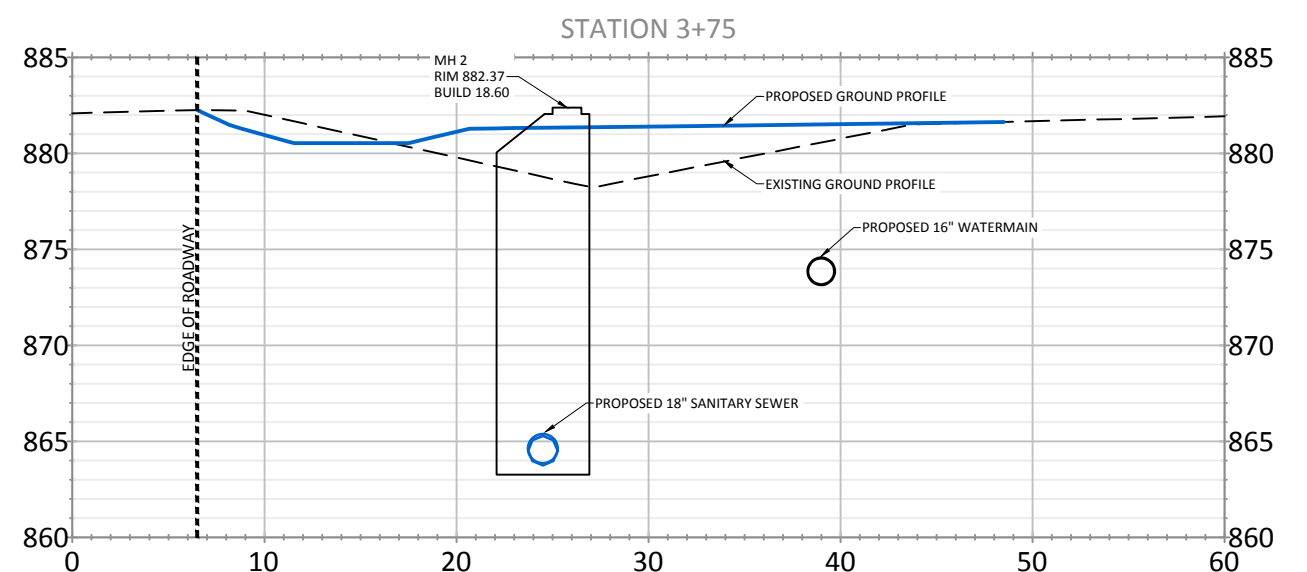
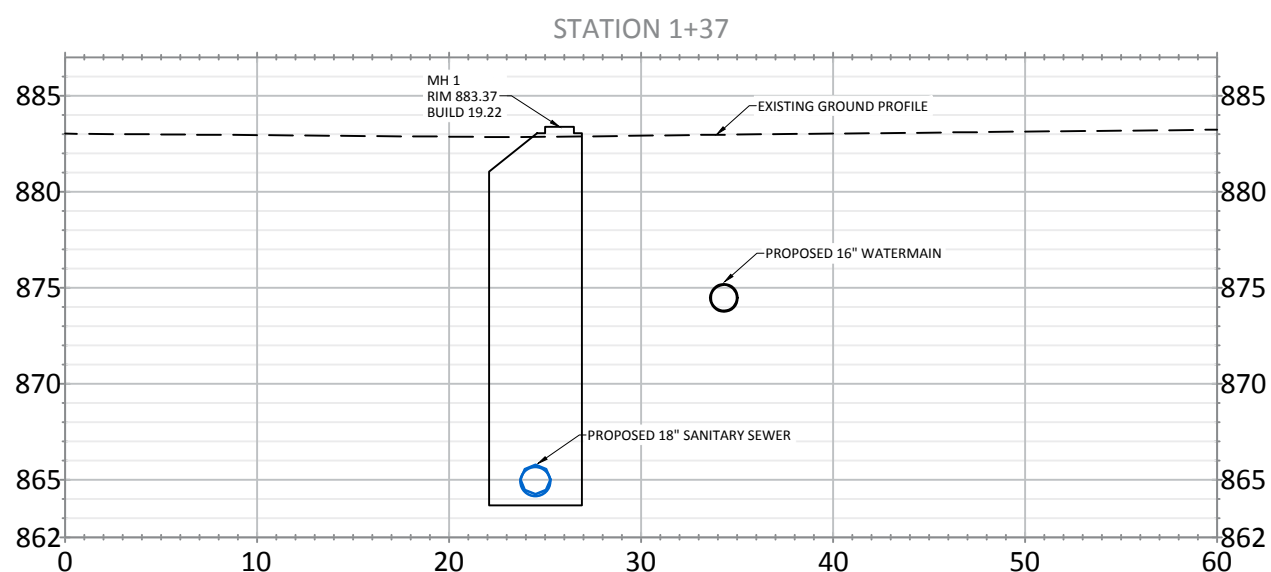
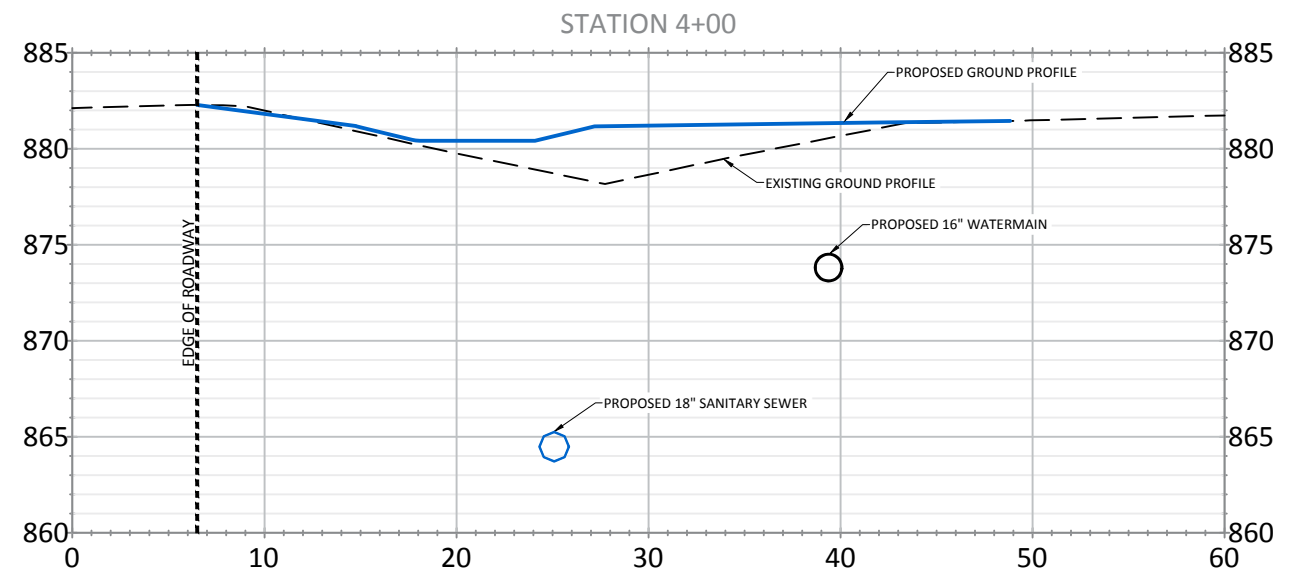
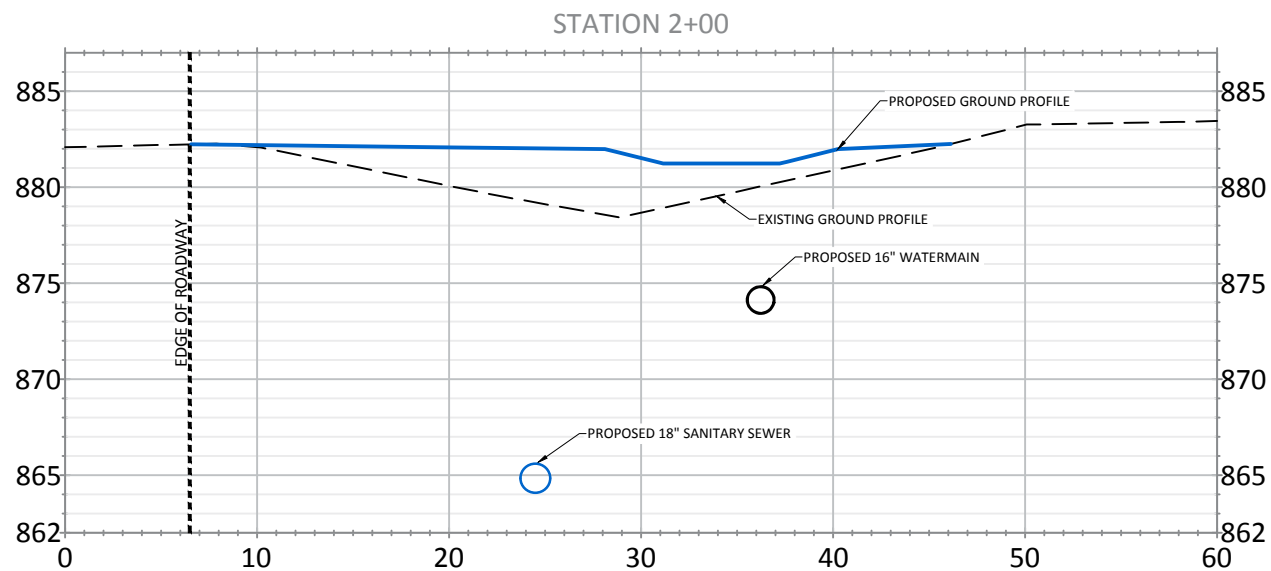
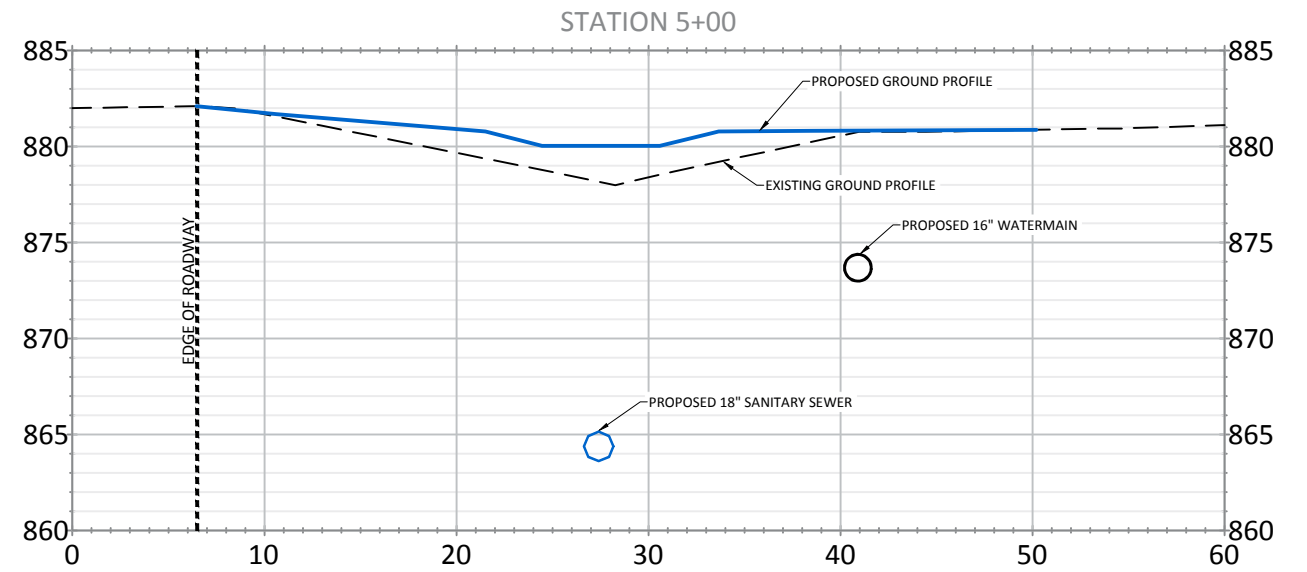
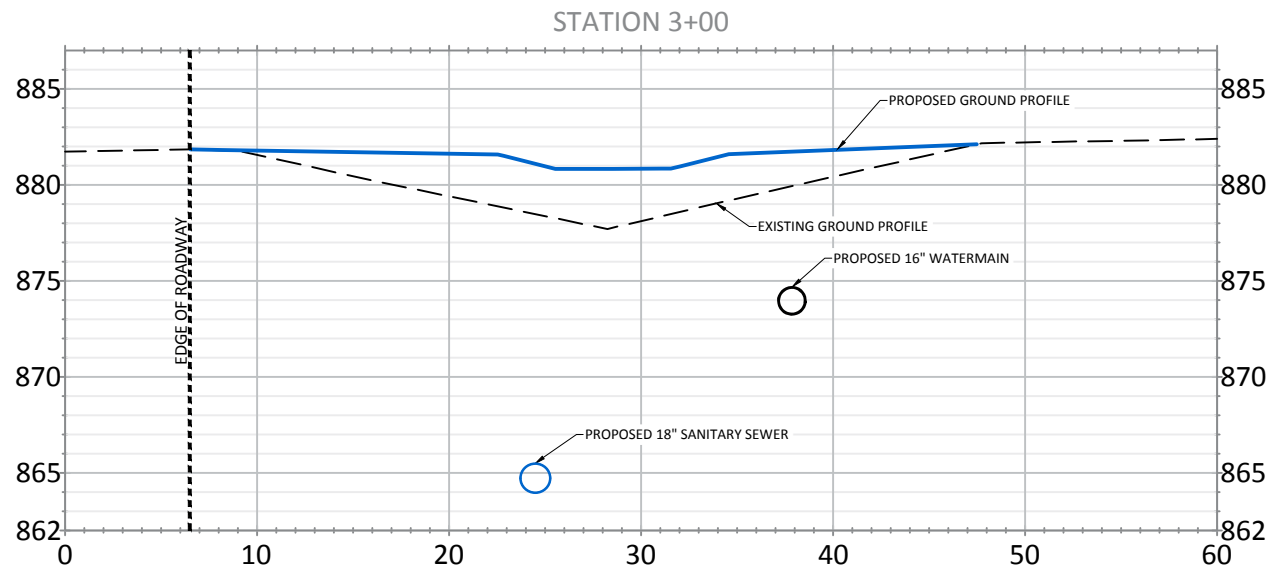
DATE: 5/26/17
FILE No. 17-09



CITY OF RAMSEY
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GRADING PLAN

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA



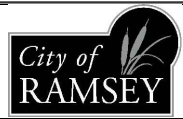
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BRUCE WESTBY
Date 5/26/17 Lic. No. 40116

DESIGNED BY: JJJ
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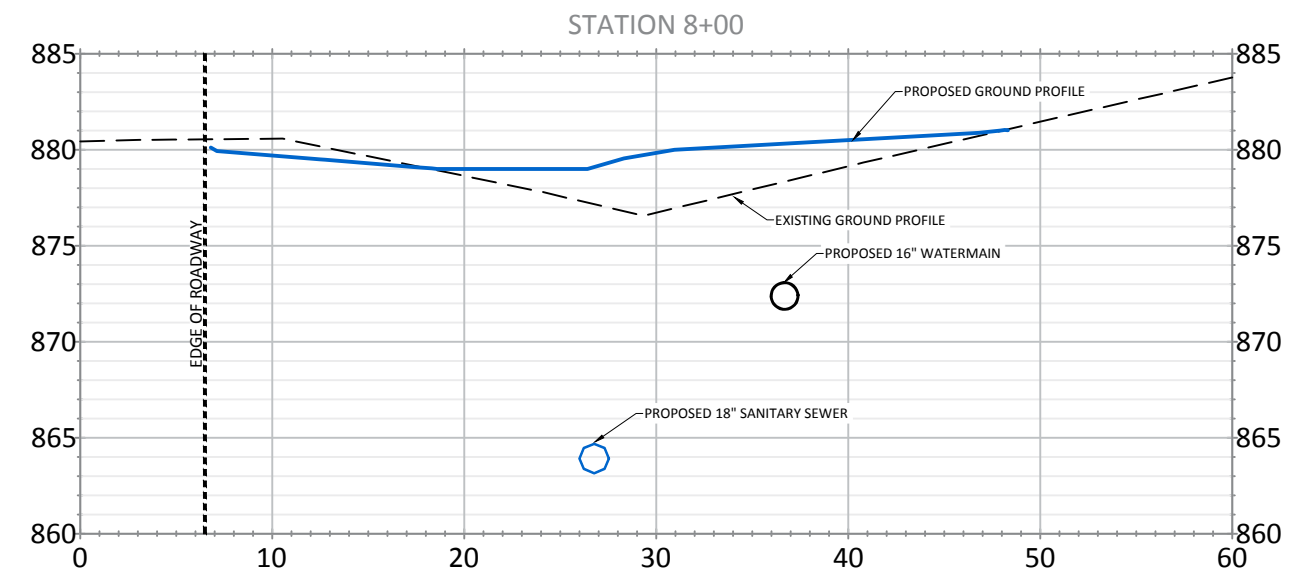
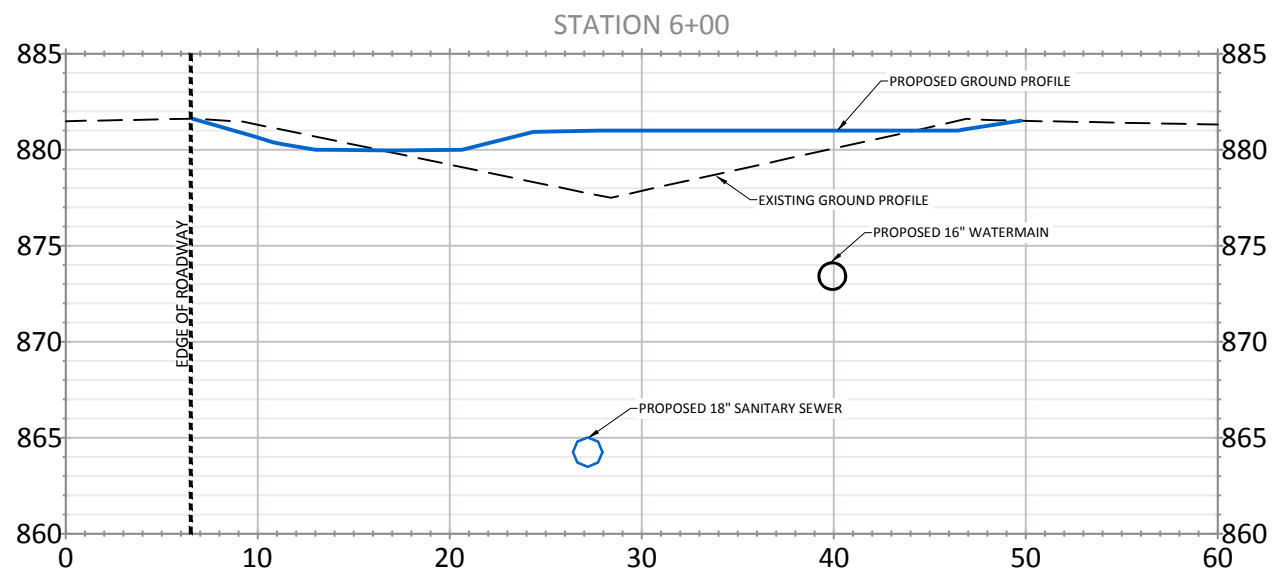
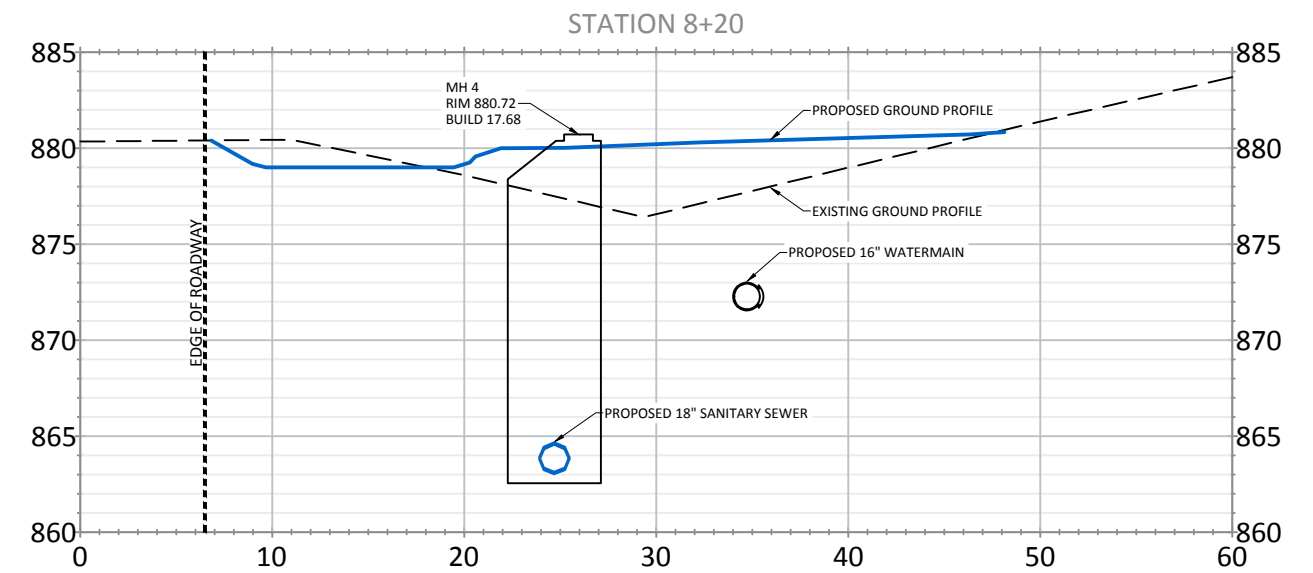
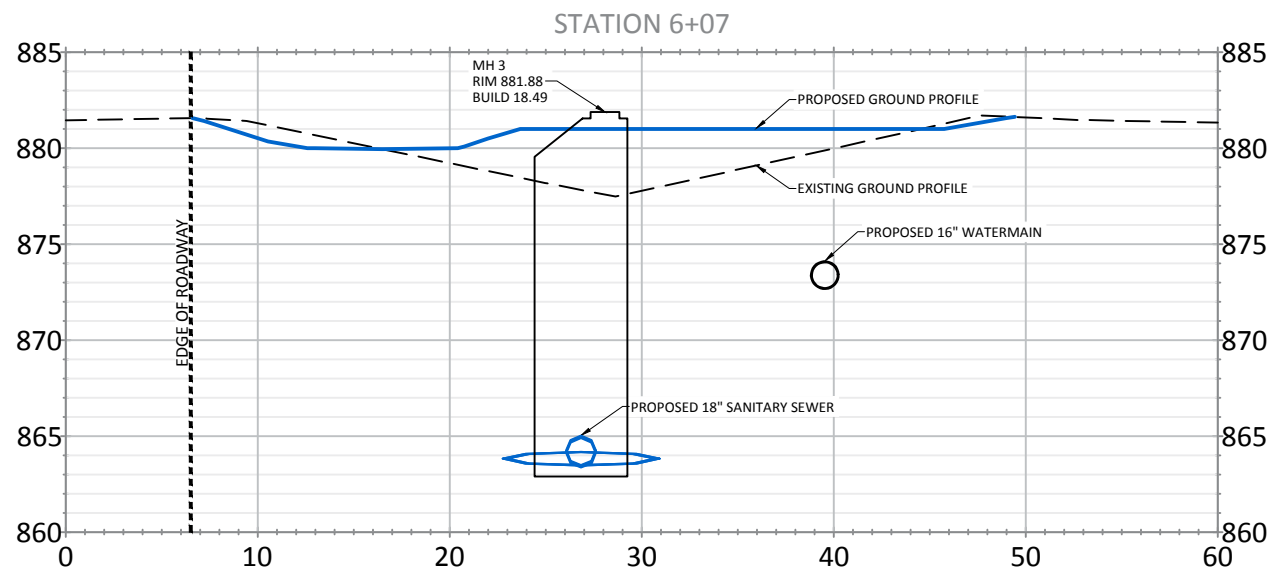
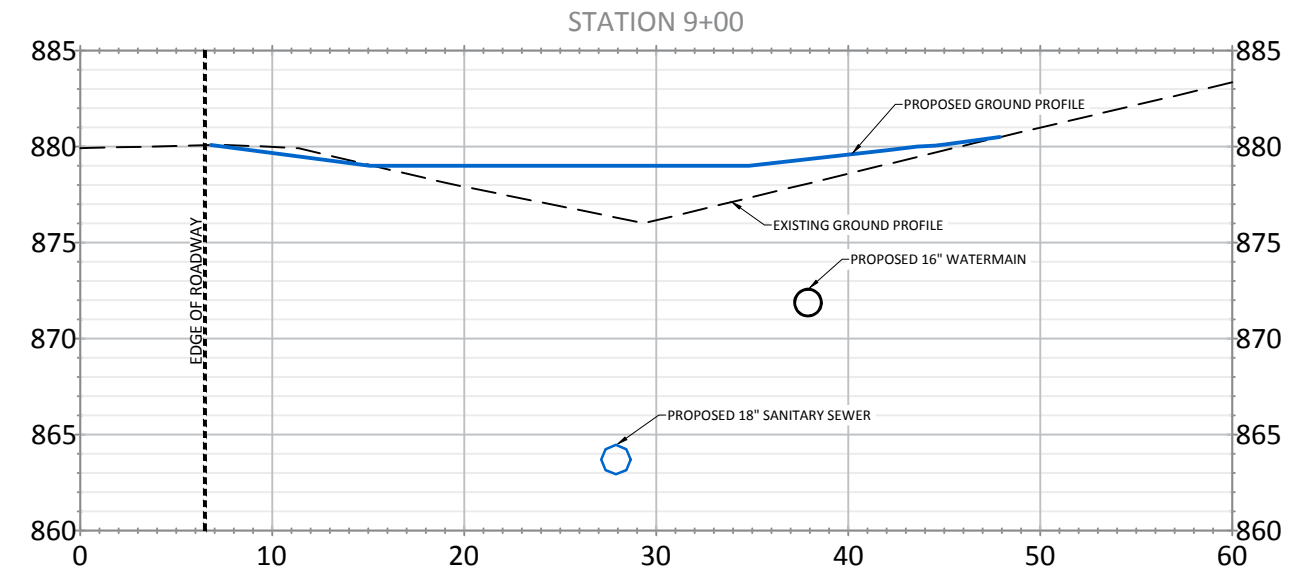
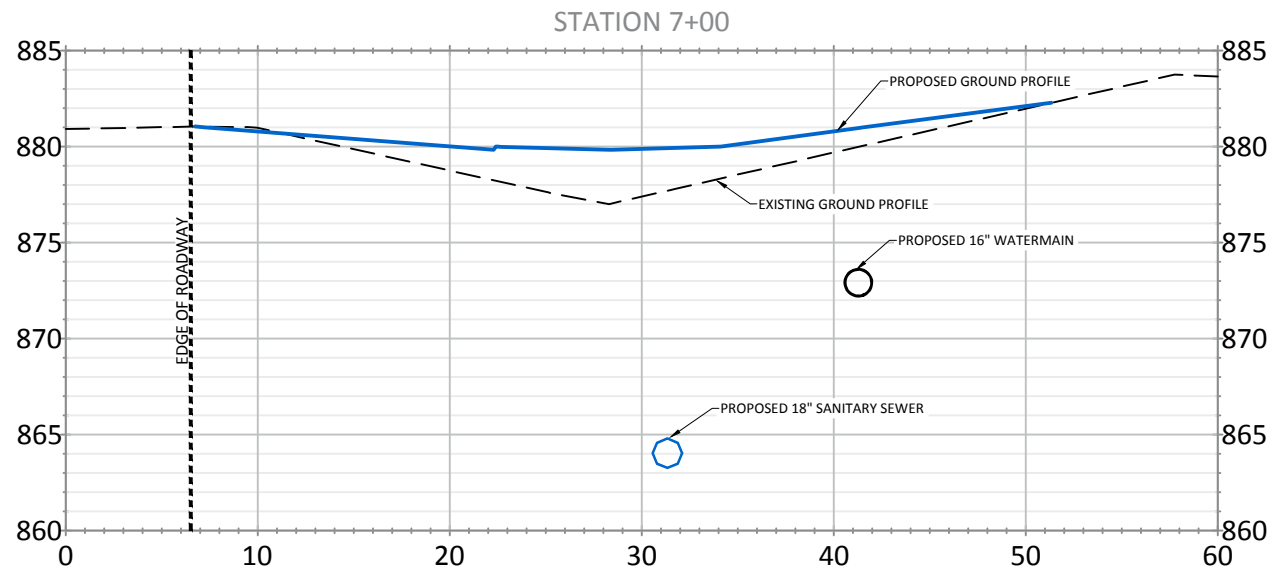
DATE: 5/26/17
FILE No. 17-09



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RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

CROSS SECTION STA. 1+37 TO STA. 5+00

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA



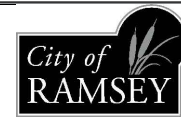
DATE	REVISION
May 30, 2017 - 8:39am	
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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

BRUCE WESTBY
Date 5/26/17 Lic. No. 40116

DESIGNED BY: JJF
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CHECKED BY: BRW

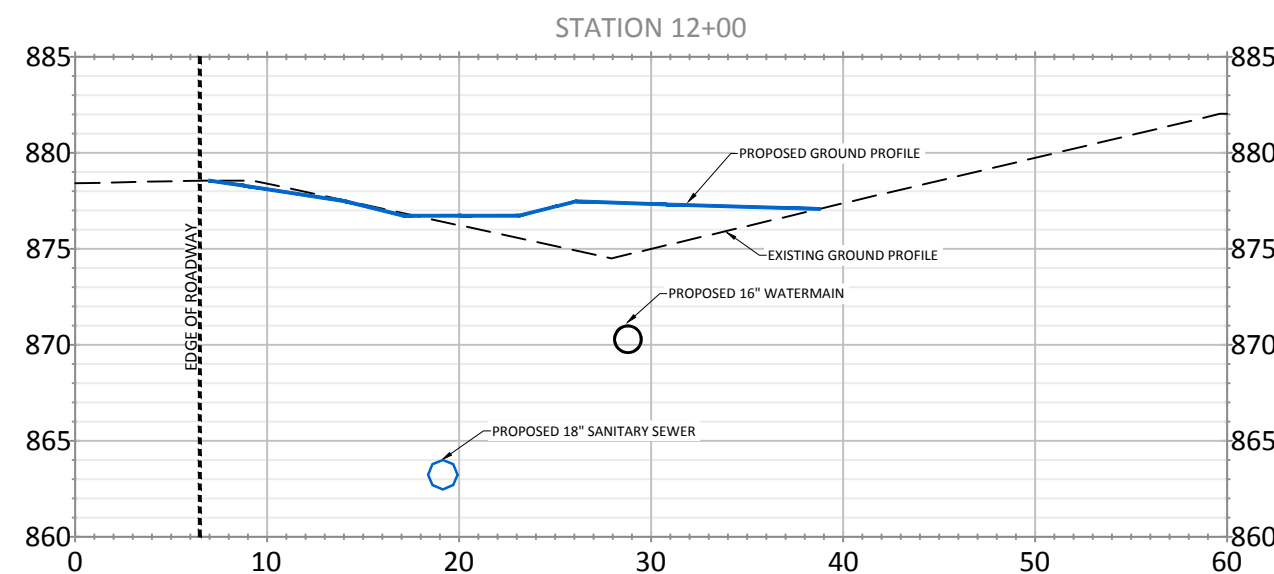
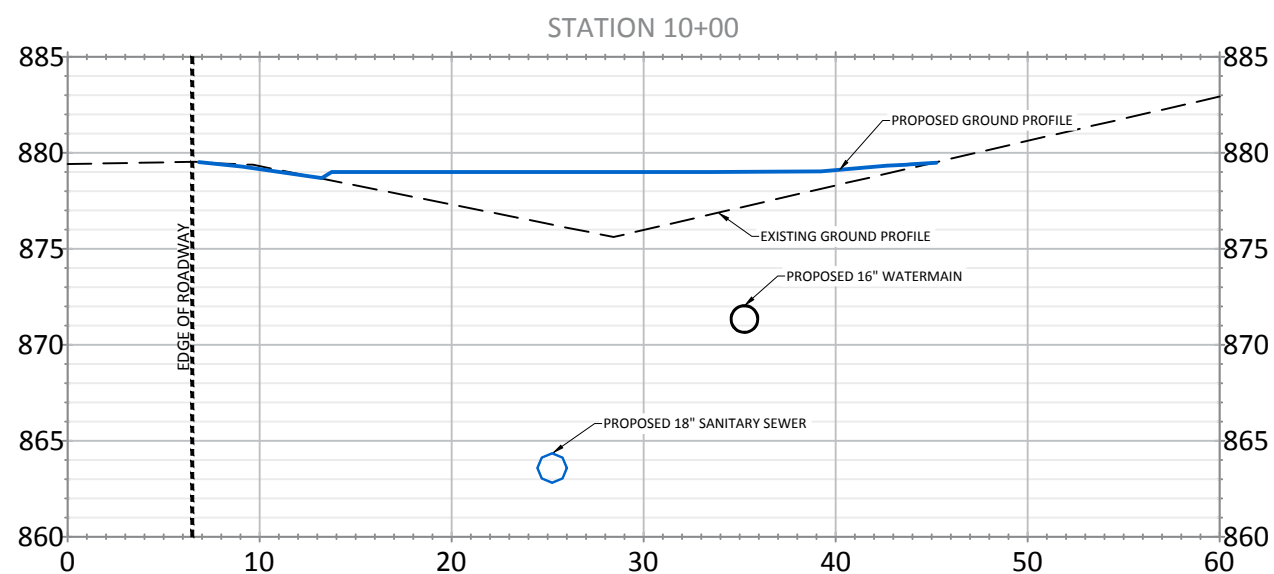
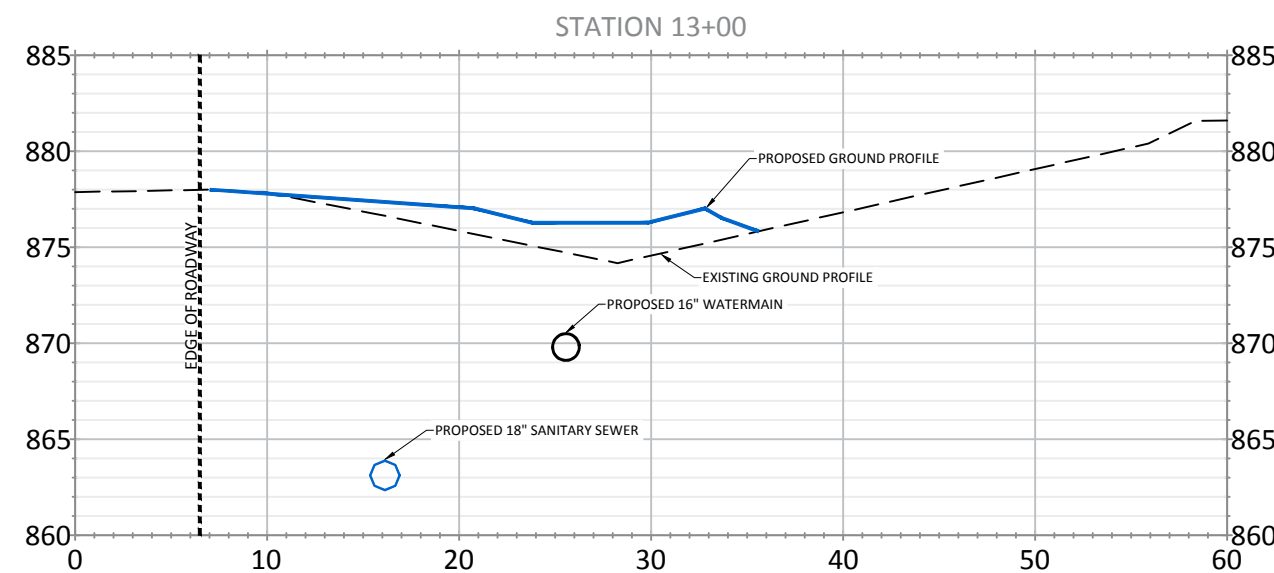
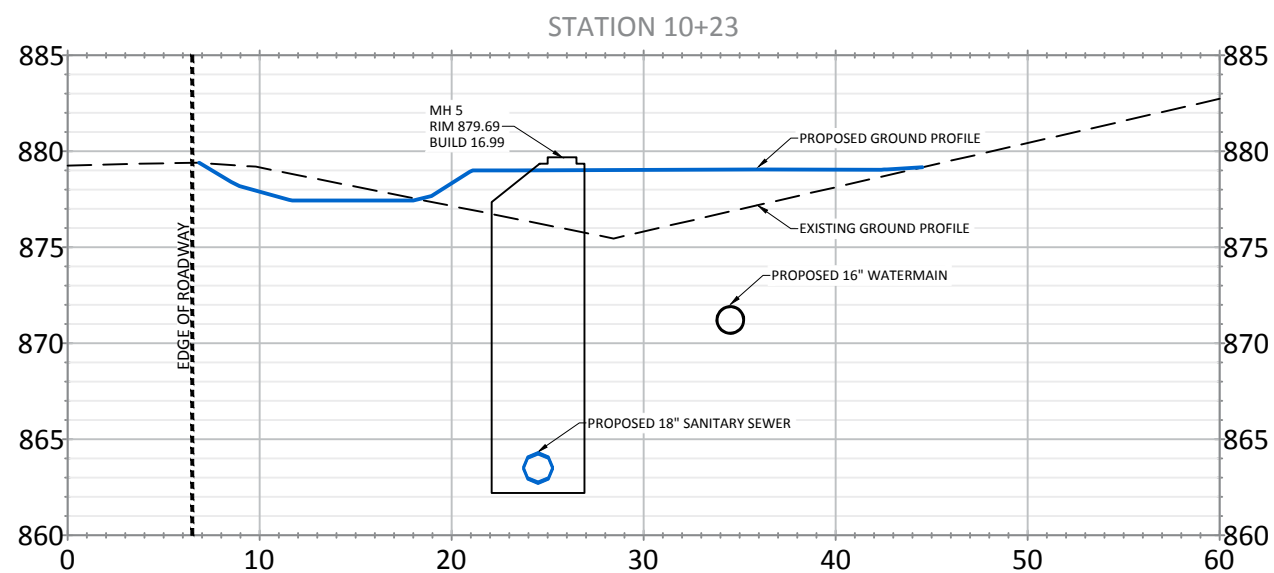
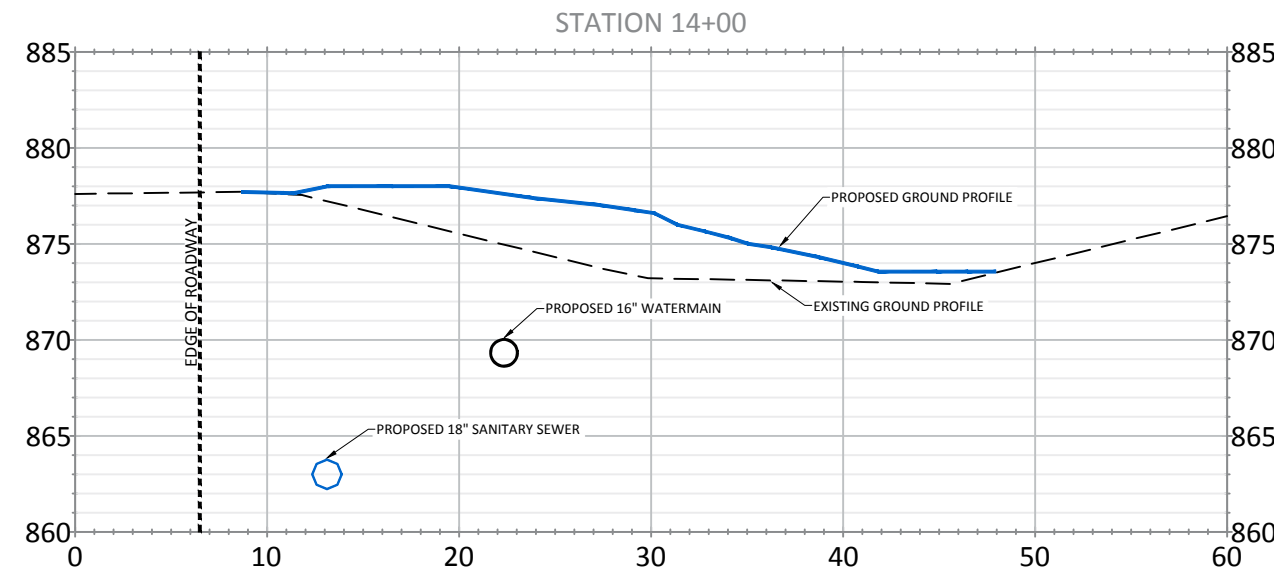
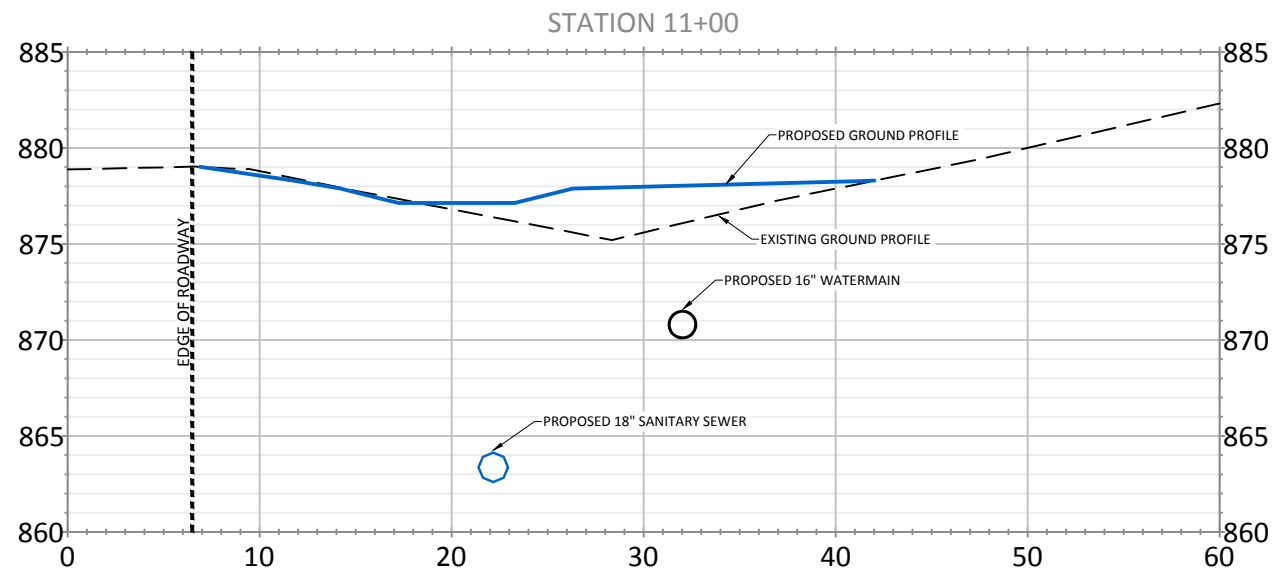
DATE: 5/26/17
FILE No. 17-09



CITY OF RAMSEY
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RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

CROSS SECTIONS STA. 6+00 TO STA. 9+00

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA



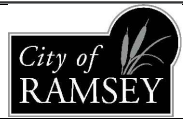
DATE	REVISION

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BRUCE WESTBY
 Date 5/26/17 Lic. No. 40116

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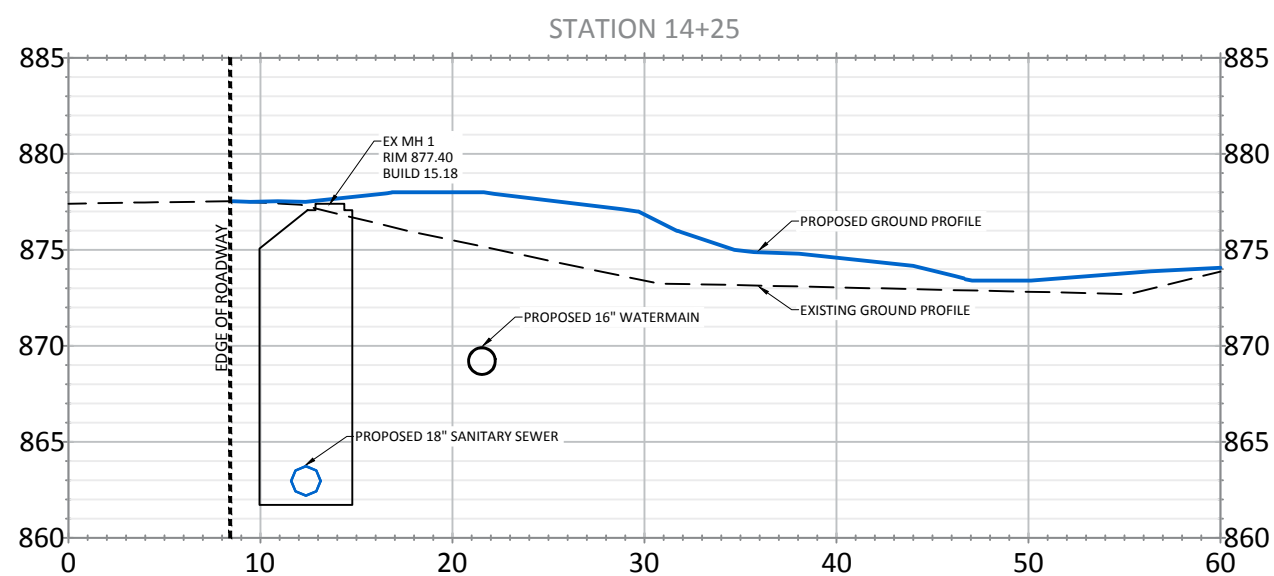
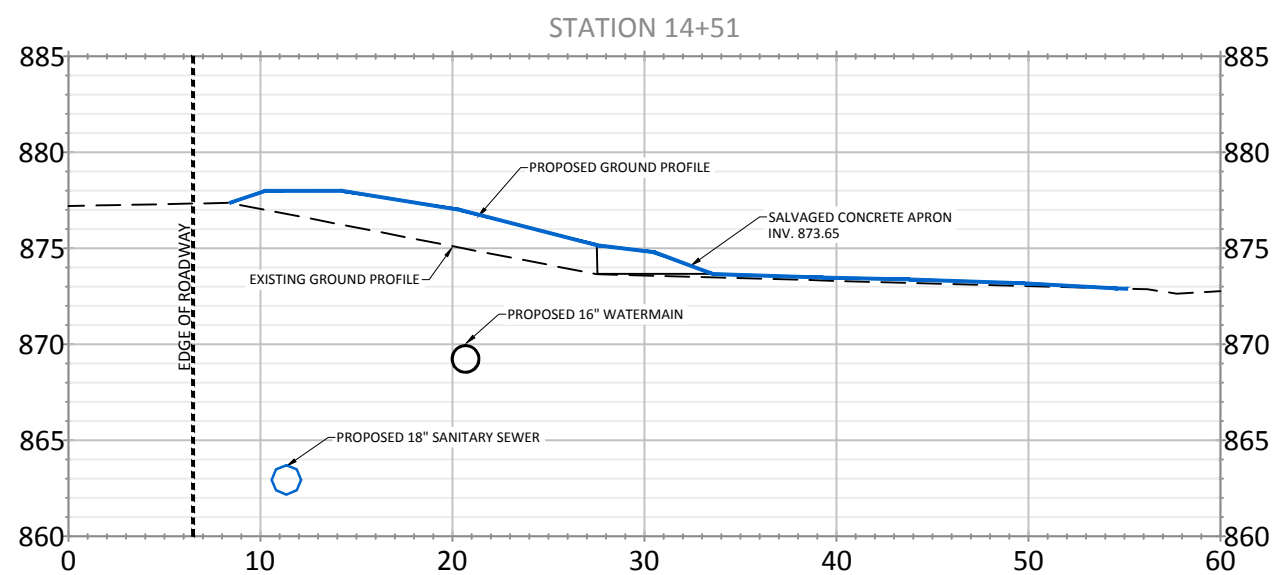
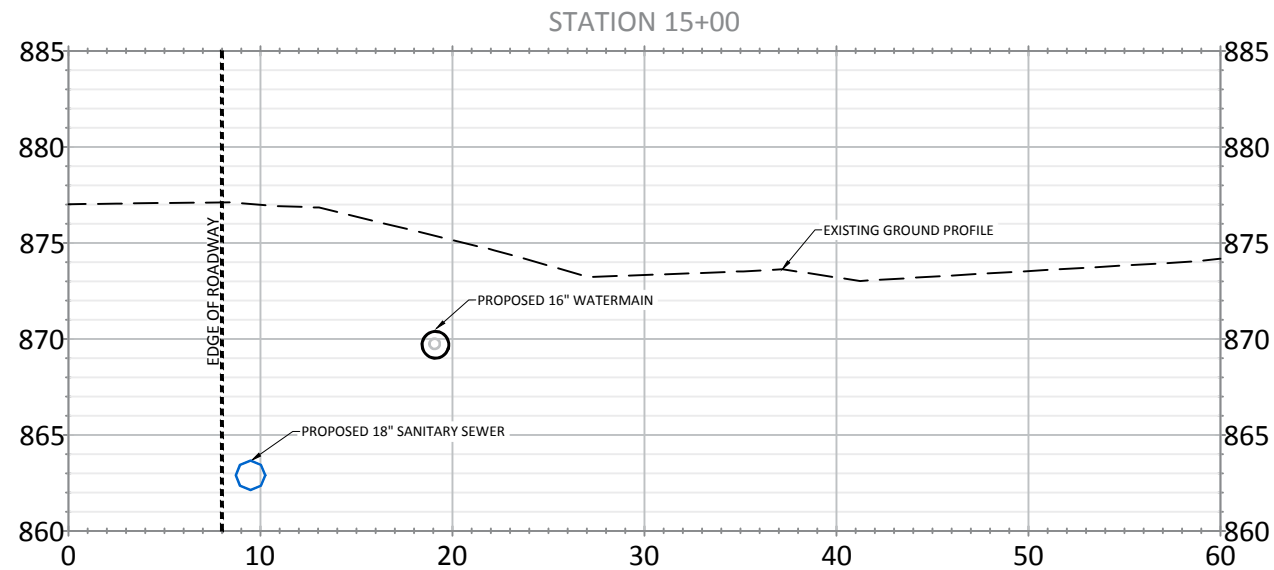
DATE: 5/26/17
 FILE No. 17-09



CITY OF RAMSEY
 7550 SUNWOOD DRIVE
 RAMSEY, MN 55303
 (763) 427-1410 FAX (763) 433-9898

CROSS SECTIONS STA. 10+00 TO STA. 14+00

BUNKER LAKE BLVD. UTILITIES EXTENSION
 CITY PROJECT NO. 17-09
 CITY OF RAMSEY, MINNESOTA



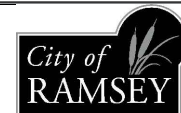
DATE	REVISION
May 30, 2017 - 2:57pm	
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BRUCE WESTBY
Date 5/26/17 Lic. No. 40116

DESIGNED BY:
JJF
DRAWN BY:
JJF
CHECKED BY:
BRW

DATE:
5/26/17
FILE No.
17-09



CITY OF RAMSEY
7550 SUNWOOD DRIVE
RAMSEY, MN 55303
(763) 427-1410 FAX (763) 433-9898

CROSS SECTIONS STA. 14+25 TO STA. 15+00

BUNKER LAKE BLVD. UTILITIES EXTENSION
CITY PROJECT NO. 17-09
CITY OF RAMSEY, MINNESOTA