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**STANDARD SPECIFICATIONS
FOR STREET AND UTILITY
CONSTRUCTION**

GENERAL CONDITIONS

St. Charles, MN

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Section 1001 SCOPE

1001.1 Description

The Contract stipulations that follow are general in scope and may refer to conditions that will not be encountered on the work covered by the City or Developer. Any provision of these general requirements that pertains to a nonexistent condition or is not applicable to the work to be performed here under, or that conflicts with any provision of the Special Provisions or with any special instructions to bidders, shall have no meaning and shall be disregarded.

1001.2 Reference Documentation

Reference Documentation shall be the latest edition, including amendments and published updates, issued prior to the date of advertisement for bids or the date of request for quotations, of the following:

1. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction.
2. City of St. Charles Ordinances.
3. City of St. Charles Standard Detail Plates.

1001.3 General Performance

These conditions shall be followed whether the work performed by the Contractor is directly for the City of St. Charles or a private developer. The City of St. Charles will have final approval on all projects.

Section 1002 DESIGNATION OF PARTIES

1002.1 “City”

“City” shall mean the City of St. Charles, 830 Whitewater Avenue, St. Charles, MN 55972.

1002.2 “Owner”

“Owner” shall mean the City of St. Charles, 830 Whitewater Avenue, St. Charles, MN 55972 or the Developer.

1002.3 “City Engineer”

“City Engineer” shall mean the representative of the City.

1003.4 “Engineer”

“Engineer” shall mean the City Engineer or other authorized representative of the Owner.

1003.5 “Inspector”

“Inspector” shall mean the Engineer's authorized representative assigned to make inspections.

1003.6 “Bidder”

“Bidder” shall mean any individual or entity submitting a Proposal for the advertised work.

1003.7 “Contractor”

“Contractor” shall mean the individual or entity designated to construct the project pursuant to plans and specifications.

1003.8 “Sub-Contractor”

“Sub-Contractor” shall mean the individual or entity acting for or on behalf of the Contractor in performing any part of the project.

1004 DEFINITIONS AND TERMS

1002.1 Abbreviations

Wherever these Specifications, the Plans, or other Contract documents use the following abbreviations, these abbreviations have the following meaning:

Agg.....	Aggregate
APWA.....	American Public Works Association
ASA.....	American Standards Association
CB.....	Catch Basin
C to C.....	Center to Center
C & G.....	Curb and Gutter
CIP.....	Cast Iron Pipe
Const.....	Construct
CL.....	Center Line
DIP.....	Ductile Iron Pipe
DL.....	Deflection Left
DR.....	Deflection Right
F & I.....	Furnish and Install
FL.....	Flow Line
Inpl.....	Inplace
Inst.....	Install
Inv.....	Invert
L.....	Length Curve
LV.....	Loose Volume
MH.....	Manhole
MJ.....	Mechanical Joint
Mn/DOT.....	Minnesota Department of Transportation
NPDES.....	National Pollutant Discharge Elimination System
PE.....	Plain End
PL.....	Property Line
ROW.....	Right-Of-Way
VC.....	Vertical Curve

1004.4 Definition of Terms

1004.4.1 Amount of Contract

For the purpose of awarding the Contract and determining the amount of the Bond, the Contract amount shall be the total amount of the bid.

1004.4.2 Date of Acceptance

Date of Acceptance shall be the day when final inspection reveals that the work has been completed in strict accordance with the provisions of the Plans and other Contract documents, and with previous inspection documents.

C. Date of Final Acceptance

Date of Final Acceptance shall be a day, at least two (2) years after the Date of Acceptance, at which time the City determines that the work continues to be in strict accordance with the provisions of the Plans and other Contract and inspection documents. The Date of Final Acceptance denotes the termination of Contractor's maintenance obligation.

D. Liquidated Damages

Liquidated damages are the amount prescribed in Mn/DOT Section 1807 to be paid to the Owner, or to be deducted from any payments due or to become due to the Contractor, for each day that work remains uncompleted after expiration of the Contract time as determined and extended in accordance with Mn/DOT Section 1806.

E. “Or Approved Equal” Clause

Whenever in any section of the Contract documents, Plans or Specifications, any article, material or equipment is defined by describing a proprietary product, or by using the name of manufacturer or vendor, the term “or approved equal” if not inserted, shall be implied.

The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality required and shall not be construed in such a manner as to exclude manufactured products of comparable quality, design, and efficiency. The Engineer shall determine the acceptability of articles, materials, or equipment proposed “as equal”.

1004.4.3 Standard Documents

Standard Documents are those that are referred to but not included in the Plans, Specifications and Special Provisions. Standard Documents are available to the public and it is the Contractor’s sole responsibility to obtain and understand the requirements of any Standard Documents noted in the Plans, Specifications and Special Provisions. Examples of Standard Documents include but are not limited to:

- (a) Bid documents (Advertisement, Information to Bidders, Proposal and Bid Security)
- (b) Performance and Payment Bond forms
- (c) Project Specifications and Special Provisions
- (d) City of St. Charles, Minnesota, Department of Public Works documents:
 - (1) Standard Specifications for Street and Utility Construction
 - (2) Standard Detail Plates
- (e) Minnesota Department of Transportation documents:
 - (1) Standard Specifications for Construction.
 - (2) Standard Plates Manual.
- (f) ASTM Material Specifications.

1004.4.4 Contract Wording

Whenever in these Contract documents the words “As Ordered”, “As Directed”, “As Required”, “As Permitted”, “As Allowed”, or words or phrases of like import are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Owner and Engineer is intended.

Similarly the words “Approved”, “Reasonable”, “Suitable”, “Acceptable”, “Properly”, “Satisfactory”, or words of like effect and import, unless otherwise particularly specified therein, shall mean approved, reasonable, suitable, acceptable, proper, or satisfactory in the judgment of the Owner and Engineer.

1005 BIDDING REQUIREMENTS AND CONDITIONS

1002.1 Qualifications of Bidders

BIDDERS may be required to submit satisfactory evidence that they have a practical knowledge of the particular work bid upon, and that they have necessary financial and material resources to complete the proposed work. Such data shall be submitted upon request of the Owner. In determining the responsibility of a particular bidder, the following elements will be considered:

Whether the Bidder:

- (a) maintains a permanent place of business;
- (b) has adequate equipment and personnel to do work properly and expeditiously within the Contract time;
- (c) has suitable financial status to meet obligations incident to the work; and
- (d) has appropriate technical experience.

Each Bidder may be required to show that former work performed by Bidder's company has been handled in such a manner that there are no just or proper claims pending against such work. No Bidder will be considered responsible if it is engaged in other work that impairs its ability to finance this Contract or to provide adequate labor and equipment for the proper execution of the work required. Each Bidder shall demonstrate its ability to meet all requirements of the Contract by evidence satisfactory to the City.

1005.4 Proposal

All persons requesting a Proposal will be required to register as a Plan holder and provide the Owner with their name, address, phone number and fax number. Failure to provide the requested information will relieve the City of any responsibility to provide that Plan holder with any Addenda that may be issued.

1005.5 Bid Security

A certified check, cashiers check or bidders bond in an amount equal to at least five percent (5%) of the total bid amount must accompany each bid as a guarantee that the Bidder will execute the Contract and give a Performance Bond as required if awarded the Contract.

The Bid Security shall be made payable to the City of St. Charles, Minnesota.

Upon failure or refusal, on the part of the successful Bidder to enter into the Contract and furnish the necessary Bond within the time specified, the Bid Security shall be forfeited to the City.

1005.6 Written Addenda

Written Addenda is the only method acceptable for changes to the Contract Documents prior to the Bid Date. Verbal comments, statements, or instructions made by any representative of the Owner shall not be considered a part of the Contract Documents. Written Addenda shall be made part of the Contract Documents. The Engineer may either fax or mail the Addenda to all registered Plan holders. The Bidder shall acknowledge receipt of each Addendum on the face of the envelope containing its bid.

1006 AWARD AND EXECUTION OF CONTRACT

1002.1 Payment and Performance Bonds

The successful Bidder, at the time of the execution of the Contract, shall furnish a Payment Bond equal to the Contract amount and a Performance Bond equal to the Contract amount, as required by Minn. Stat. Section 574.26. The bonds shall be issued by sureties satisfactory to the City and authorized to do business in the State of Minnesota.

The Payment Bond and Performance Bond shall guarantee that the Contractor will perform each and every part of the agreement, cover all guarantees called for in these Specifications, including the provisions for maintenance and repair, and insure the prompt payment to all persons furnishing material and labor required in the prosecution of the work. The Performance Bond shall be written in such a manner that it shall remain effective until the Date of Final Acceptance (two (2) years after the Date of Acceptance by the City, provided the work is in accordance with the Specifications and any inspection instructions, and all defects identified during the two (2) year period have been corrected).

In the event the Surety on any Bond furnished by the Contractor is declared bankrupt or becomes insolvent, or its right to do business in Minnesota is terminated, or it otherwise ceases to meet the requirements set forth herein, the Contractor shall, within five days thereafter, substitute another Bond and Surety, both of which shall be subject to Owner's acceptance.

If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it will be the Contractor's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. Contractor shall furnish proof of such adjustment to the Owner.

1007 CONTROL OF WORK

1002.1 Drawing and Specification

The Specifications and Plans are intended to supplement, but not necessarily duplicate each other, and together constitute one complete set of Specifications and Plans so that any work exhibited in the one and not in the other, shall be executed as if it has been set forth in both, in order that the work shall be completed according to the complete design or designs as decided and determined by the Engineer.

Should anything be omitted from the Specifications and Plans that is necessary to a clear understanding of the work, or should it appear various instructions are in conflict, the Contractor shall secure written instructions from the Engineer before proceeding with the construction affected by such omissions or discrepancies. It is understood and agreed that the work shall be performed and completed according to the true spirit, meaning, and intent of the Contract, Plans, and Specifications.

All Drawings, Specifications and copies thereof furnished by the City are its property. They are not to be used on other work and, with the exception of the signed Contract, plan sets are to be returned to the City upon request at the completion of the work.

Contractor shall keep and maintain one complete set of all drawings and specifications, addenda, approved shop drawings, change orders and other modifications at the job site that shall be available to the Engineer at all times.

1007.4 Surveys, Staking and Monument Preservation

The Contractor shall give the Engineer at least 2 working days notice before requiring any stakes to be set or before commencing work on any portion of the Contract, or at any new place, as well as at any place where work has been relinquished or stopped for any reason.

Any work done without being properly located and established by base lines, offset stakes, bench marks, or other basic reference points located, established, or checked by the Engineer, may be ordered removed and replaced at the Contractor's cost and expense.

Contractor shall carefully protect and preserve any permanent monuments or benchmarks that must of necessity be removed or disturbed in the construction of the work, until they can be properly referenced for relocation.

1007.5 Other Contracts and Contractors

The Owner reserves the right to award contracts to other Contractors who do additional work at the site of this Project pursuant to Mn/DOT section 1505.

1007.6 Testing of Completed Work

Before final acceptance, all parts of the work shall be tested and each part shall be in good condition and working order, or shall be placed in such condition and order at the expense of the Contractor. All tests of completed work required under this Contract shall be made under the direction of the Engineer or others so designated and at the expense of the Contractor, who shall repair at its own expense all damage resulting therefrom.

1008 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

1002.1 Permits, Public Utilities and Code Requirements

The Contractor shall make the necessary arrangements for the use or installation of, and shall pay for, any and all utility service that may be necessary in conducting its work. The Contractor must obtain permission from the City of St. Charles Water Department if it is necessary to use City water, and said use of water shall be under the City's direction and supervision. The use of existing private water services adjacent to the work shall be arranged and paid for by the Contractor.

If work is to be performed in State of Minnesota Right-Of-Way, the Contractor shall apply for a "Utilities on Trunk Highway" Permit from the Minnesota Department of Transportation. The Contractor shall not initiate the work prior to receipt of the permit. All regulations and rules contained in this permit shall apply and will be considered a part of the Special Provisions. The Contractor shall furnish a certified check or surety bond in the amount required by and in favor of the State of Minnesota, Commissioner of Transportation.

1008.4 Contractor's Insurance

The Contractor shall not commence work until it has obtained and submitted to the City written evidence of all insurance required under this paragraph and such insurance has been approved by the City, nor shall the Contractor allow any sub-Contractor to commence work on its subcontract until all similar insurance required of the sub-Contractor has been obtained and approved.

Compensation Insurance

Worker's Compensation Insurance shall be as required by the laws of the State of Minnesota.

General Liability and Property Damage Insurance.

The Contractor shall take out and maintain General Liability and Property Damage Insurance as shall protect him and any sub-Contractor from claims while performing work. The certificates of insurance shall indicate that the City and City's Consulting Engineer is an additional insured. The required amounts of such insurance are as follows:

General Liability, Personal injury and Property damage

- | | |
|--|-------------|
| 1. Injury or death of one person..... | \$1,000,000 |
| 2. Injury to more than one person in a single accident or occurrence | \$1,000,000 |
| 3. Property damage..... | \$1,000,000 |
| 4. Products – Comp/Op Aggregate..... | \$1,000,000 |
| 5. General Aggregate..... | \$2,000,000 |

X-C-U Hazards

Same limits as above. Basic exclusions for eXplosions, Collapse, and Underground hazards shall be removed from the policy, and so indicated as covered in the declarations on the certificates of insurance.

Automobile Liability and Property Damage Insurance

The Contractor shall take out and maintain Automobile Liability and Property Damage Insurance on all self-propelled vehicles used whether owned, non-owned, or hired site and the amounts of such insurance shall be as follows:

- | | |
|--|-------------|
| 1. Injury or death of one person..... | \$1,000,000 |
| 2. Injury to more than one person in a single accident or occurrence | \$1,000,000 |
| 3. Property damage..... | \$1,000,000 |

Satisfactory Coverage

In the event that the form of any policy or certificates or the amount of the insurance is not satisfactory to the City, the Contractor shall secure other policies or certificates in a form and amount satisfactory to the City.

The Contractor shall not cause any policies to be canceled or permit them to lapse, and all insurance policies shall include a clause to the effect that the policy shall not be canceled or changed until 30 days after the City has received written notice as evidenced by the return receipt of registered letter.

Proof of Carriage of Insurance

Written evidence of insurance shall contain true transcripts from the policy, authenticated by the proper officer of the, insurer, evidencing in particular those insured, the extent of the insurance, the location and operations to which the insurance applies, the effective date and expiration date and the notice of cancellation clause mentioned herein above.

The Contractor shall comply with all federal, state, and local laws and ordinances applicable to the work to be done under this agreement. The Contractor shall defend, save and hold harmless the City of St. Charles and its officers, agents, employees, and members, from all claims, suits, or actions of whatsoever nature resulting from or arising out of the activities of the Contractor or its subcontractors, agents, or employees.

1008.5 Arbitration

The resolution of any dispute, controversy or claim arising out of or relating to this Contract or the relationship between the parties shall first attempted through a non-binding arbitration process. Such non-binding arbitration shall be conducted in the city of St. Charles, Minnesota or such other location as the parties may mutually agree. The non-binding arbitration shall be conducted by one arbitrator mutually agreed upon between the parties. If the parties are unable to agree upon a single arbitrator within thirty days after one party has delivered written notice to the other party requesting non-binding arbitration of a stated dispute, each party shall select one arbitrator and the selected arbitrators shall select a third arbitrator who alone shall attempt resolution of the dispute. Either party may take action in Winona District Court should non-binding arbitration not result in a resolution of the dispute.

1008.6 Use of Explosives

The Contractor shall obtain a User Permit from the Chief of Police for the City of St. Charles and notify the Public Works Superintendent prior to the transporting, storage or use of explosives, and shall comply with all conditions imposed therein.

1008.7 Noise Control

The Contractor shall comply with the following requirements:

“Noises Prohibited.

Subdivision 1 Unnecessary Noises Generally. No person shall make, continue, or cause to be made or continued any loud, unnecessary or unusual noise which unreasonably annoys, disturbs, injures or endangers the comfort, convenience, safety, health, welfare or repose of persons in the vicinity thereof, unless the making, continuing, or causing to be made or continued of such noise cannot be prevented and is necessary for the protection or preservation of property or of the health, safety, life or limb of some person.

Subdivision 2 Construction or Repair of Buildings, or Construction work.

- a) The erection (including excavation), demolition, alteration or repair of any building requiring a building permit or the performance of any construction work occurring between the hours of 10:00p.m. and 7:00 a.m. on Monday through Saturday, from 10:00 p.m. Saturday through 12:00 p.m. Sunday, and from 10:00 p.m. Sunday through 7:00 a.m. Monday is a violation of this section. For purposes of this section, "construction work" shall mean any and all activity incidental to the erection of buildings, structures, roads, flood control facilities, or appurtenances thereto, including land clearing, grading, excavating, and filling.
- b) Notwithstanding this section, a permit may be obtained to allow construction work to occur during the prohibited hours described in (a) in cases of urgent necessity in the interest of public health and safety. The permit shall be granted for a period not to exceed three days, shall continue only so long as the necessity continues, and may be extended for periods of three days or less so long as the necessity continues.
- c) Notwithstanding this section, a permit may be obtained to allow construction work to occur during the prohibited hours described in (a) if it is determined that the public health and safety is not impaired by the erection, demolition, alteration, or repair of any building, or the performance of construction work occurring during such hours, and further determines that loss or inconvenience would result to any party in interest. Application for a permit may be made at the time the permit for the work is awarded or during the progress of the work.
- d) The permits described in (b) and (c) shall be issued by the building inspector in cases involving a building for which a building permit is required. In all other cases, the permit shall be issued by the city engineer.”

1009 MEASUREMENT & PAYMENT

1002.1 Partial Payment

Unless the terms of the contract provide otherwise, progress payments shall be made monthly as the work progresses. Payments shall be based upon estimates of work completed as approved by the City. A progress payment shall not be considered acceptance or approval of any work or waiver of any defects therein.

The City may reserve as retainage from any progress payment an amount not to exceed five percent of the payment. The City may reduce the amount of the retainage and may eliminate retainage on any monthly contract payment if, in the City's opinion, the work is progressing satisfactorily.

For further details refer to Mn/DOT specification 1906 "Partial Payments".

1002.2 Acceptance and Final Payment

When final inspection reveals that the work has been completed in strict accordance with the provisions of the Plans, other Contract documents, and previous inspection instructions, the Engineer shall, within ninety (90) days thereafter, prepare a final estimate which shall be based on accurate measurements of all work performed, and shall submit such estimate together with recommendations to the City Council of the City of St. Charles for approval. Payment shall then be made for all work performed under the Contract, less any partial payments already made and any legal deductions or forfeitures for the satisfaction of liens or other claims against the Contract.

1009.4 Correction of Work After Final Payment

Neither acceptance and occupancy by the Owner, final payment, nor any other provision in the Contract documents, shall relieve the Contractor of its maintenance obligation as hereinafter set forth and as identified in the Specifications.

1009.5 Maintenance and Repair

The Contractor shall guarantee all work relating to the Specifications for a period of at least two (2) years from the date of written acceptance of the work or project. The Contractor shall make all needed repairs arising out of defective workmanship or materials that, in the judgment of the City, become necessary during such period. Final acceptance and termination of the maintenance obligation shall occur on the date two (2) years after initial acceptance provided that the work is in accordance with the Specifications and any inspection instructions. The maintenance obligation shall otherwise continue until all defects, including defective equipment installed therein, have been corrected.

At any time prior to Final Acceptance (the time during which the maintenance obligation is in effect as provided herein) the City may demand that the Contractor make any noted repairs. If Contractor fails to undertake repairs within ten days after the mailing of a notice of the need to make such repairs, the City may either take action against the performance bond or make the repairs itself and recover the cost from Contractor or the surety under the performance bond.

SEWER SPECIFICATIONS
S100

St. Charles, MN

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Section 1 GENERAL REQUIREMENTS

S100.101 Description

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

The City of St. Charles reserves the right, at any time during the construction of any sewer embraced within the limits of this contract, to issue a permit to a property owner to connect premises to the sewer. In the event such a permit is issued, the Contractor is not relieved of the responsibility to complete their contract according to Plans and Specifications. The issuance of a permit by the City to tap or connect to any part of a sewer embraced within the limits of this contract shall in no sense be construed as acceptance of any part of the work.

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 accepted as an enforceable component of the Contract or Contract Documents.

S100.102 Reference Documentation

Provisions of the General Conditions and Trench Excavation & Backfill/Surface Restoration shall apply to this work. The Contractor shall abide by the applicable provisions of state, federal and local laws and ordinances.

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before 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 A48	Specification for Gray Iron Castings
ASTM C76	Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C270	Specification for Mortar for Unit Masonry
ASTM C361	Specification for Reinforced Concrete Low-Head Pressure Pipe
ASTM C478	Specification for Precast Reinforced Concrete Manhole Sections
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D2241	Standard Practice for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3350	Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings
ASTM F679	Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
ASTM F789	Specification for Type PS-46 and Type PS-115 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
ASTM F794	Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F892	Specification for Polyethylene (PE) Corrugated Pipe With a Smooth Interior and Fittings
ASTM F949	Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings

- ASTM F1803 Specification for Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings
Based on Controlled Inside Diameter
- ANSI A21.4 Standard for Cement - Mortar Lining for Ductile Iron Pipe and Fittings
- ANSI A21.11 Standard for Rubber - Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- ANSI A21.51 Standard for Ductile Iron Pipe Centrifugally Cast
- ANSI A21.53 Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in

Section 2 MATERIALS

S100.201 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 City 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. The Engineer may withhold payment, on appropriate items, pending submittal of the Certificate.

All pipe furnished for main sewer and service line installations shall be of the type, kind, size, and class 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.

S100.202 Alternate Pipe for Sanitary Sewer

Sanitary sewers 8 inch through 15 inch in diameter may be constructed of the following materials unless otherwise specified.

1. Polyvinyl Chloride (PVC) Pipe ASTM D3034
2. Polyvinyl Chloride (PVC) Pipe ASTM F789
3. Polyvinyl Chloride (PVC) Pipe ASTM F949

Whenever the pipe is classified as pressure or watermain quality pipe, the following materials may be used unless otherwise specified.

1. Ductile Iron
2. Polyvinyl Chloride (PVC) Pipe AWWA C900
3. Polyvinyl Chloride (PVC) Pipe ASTM 2241

S100.203 Ductile Iron Pipe and Ductile Iron Fittings

The pipe furnished shall be Ductile Iron pipe and fittings furnished shall be of the Ductile Iron type as specified for each particular use of installation.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water and thickness design shall conform to AWWA C150. In addition, the pipe shall comply with the following supplementary provisions:

1. Fittings shall conform to the requirements of AWWA C110 (Ductile iron 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.

3. Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.

S100.204 Reinforced Concrete Pipe and Fittings

Reinforced concrete pipe, fittings and specials shall conform with the requirements of Mn/DOT Section 3236, ASTM C76 (Reinforced Concrete Pipe) (with rubber O-ring joints for the sanitary pipe), 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. If the connections are fabricated in the field, the hole shall be cut with a tapping machine and an approved saddle installed.
2. When flexible watertight joints are specified, joints shall meet the requirements of ASTM C-361, with dimensions shown on Mn/DOT Standard Plate No. 3006G.
3. Lift holes will not be permitted in pipe smaller than 54" in diameter. The lift hole in pipe larger than 54" in diameter shall be filled with a commercially manufactured plug and a non-shrinking concrete grout.

S100.205 Corrugated Steel Pipe and Fittings

Corrugated steel pipe and fittings shall conform to the requirements of Mn/DOT Specification 3226 (Corrugated Steel Pipe) for the type, size and sheet thickness specified. The coupling bands shall cover at least two full corrugations on each side of the joint. When specifically provided for in the Plans Specifications and Special Provisions the galvanized steel pipe and fittings shall be furnished with special aramid fiber bonded, bituminous, or plastic coating or concrete lining as required.

S100.206 Polyvinyl Chloride Pipe and Fittings

Smooth walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034, ASTM 2241, AWWA C900, and ASTM F679 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. Unless otherwise specified, all pipe and fittings shall be a minimum SDR 26 and connections shall be push-on with elastomeric gasketed joints which are bonded to the inner wall of the gasket recess of the bell socket.

Corrugated polyvinyl chloride pipe and fittings with smooth interior shall conform with 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 3212.

Polyvinyl Chloride (PVC) pipe shall be installed in conformance with the requirements of ASTM D-2321. Only class B embedment materials shall be used for PVC applications.

S100.207 Dual Wall Corrugated Polyethylene Pipe

Dual-Wall Corrugated Polyethylene Pipe shall conform to the requirements AASHTO M294 and Design 18 of the AASHTO Standard Specifications for Highway Bridges. The allowable storm sewer pipe sizes are 12-inch through 36-inch and must be located outside the roadway section. Joints shall be watertight unless the engineer approves a soil-tight joint. Pipe manufacture, watertight joint testing, and installation shall conform to current Mn/DOT requirements and/or as indicated in the Plans, Specifications, and Special Provisions.

S100.208 Metal Sewer Castings

Metal castings for sewer structures such as manhole frames and covers, catch basin frame grates and curb boxes, shall conform to the requirements of ASTM A48 (Gray Iron Casting) subject to the following supplementary provisions:

1. Casting assemblies or dimensions, details, weights, and class shall be as indicated in 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 bearing around the entire circumference.
3. Casting weight shall be not less than 95 percent of theoretical weight for a unit cast to exact dimensions, based on 442 pounds per cubic foot.
4. A Certificate of Compliance shall be furnished with each shipment of castings stating the materials furnished have been tested and are in compliance with the specification requirements.
5. Unless otherwise specified, sanitary sewer manholes in areas subject to flooding by surface water shall have self-sealing, bolt-down, lids and recessed pick holes.

S100.209 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, Mn/DOT 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 joints provided on sanitary sewer manholes. Sanitary sewer inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.
3. Air-entrained concrete shall be used in the production of all units. Air content shall be maintained within the range of 5 to 7 percent.
4. 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.
5. Lift holes will not be permitted in manhole sections smaller than 60" in diameter. On manholes 60" and larger diameter, the lift holes shall be filled with a commercially manufactured lift hole plug and non-shrink concrete grout. The concrete grout shall have an approved bonding agent added.

S100.210 Concrete

Concrete for cast-in-place masonry construction shall be produced and furnished accordance with the requirements of Mn/DOT Specification 2461 for the mix designation indicated in the Plans. 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.

S100.211 Mortar

Mortar for use in masonry construction shall be an air-entrained mixture of one part Masonry cement, Type S, and 2.5 parts mortar sand, with sufficient water to produce proper consistency, and with sufficient air-entraining agent added to maintain an air content within the range of 7 to 10 percent. Mortar shall meet the requirements of ASTM C-270.

S100.212 Trash Guard

Trash guards, where shown on the plan shall have 5/8" (16mm) vertical galvanized steel rods placed 6" (150mm) center to center unless otherwise specified. The guard shall be securely attached to the end section.

S100.213 Riprap

Riprap, where shown on the plans, shall be constructed in accordance with Mn/DOT Section 2511.

Section 3 CONSTRUCTION REQUIREMENTS

S100.301 Notification by Contractor

A. Sanitary Sewer Construction

The discharge of surface water runoff or ground water into the city's sanitary sewer system is prohibited. To protect the sanitary sewers, authorized users, and the treatment works from the accidental discharge of surface water runoff or ground water into the active sanitary sewer the following procedure shall be followed:

1. Two weeks before connecting any new sewer piping to the existing sewer system, the contractor shall notify the St. Charles Sewer Division of the Department of Public Works as to the schedule of sewer construction activities.
2. The St. Charles Sewer Division will install a sewer plug in the outlet of the most downstream manhole through which no sewage is presently passing and that the new sewer will be connected. A plug will be install into each connection to the city's sewer system. In the event that the manhole into which the plug must be installed is a manhole constructed with this project, the Contractor shall notify the St. Charles Sewer Division within 24 hours of the installation.
3. After the St. Charles Sewer Division has installed the plug, the Contractor may proceed with the Installation of the sewer extension. Upon completion of the work including the cleaning of the sewer lines, air testing the sewer, and conducting the mandrel test, the Contractor shall notify the St. Charles Sewer Division. Once all the sewer extension passes all specified tests, the St. Charles Sewer Division will remove the sewer plugs.
4. The sewer plugs will be installed by the St. Charles Sewer Division and shall be removed by the Sewer Division. The Contractor shall not disturb the plugs.

S100.302 Installation of Pipe and Fittings

A. Inspection and Handling

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall 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 City 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.

B. 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 by approved means during and after laying. 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.

At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water or when the trench or bedding conditions are otherwise unsuitable or improper.

When placement or handling precautions in the Engineer's opinion prove inadequate, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for the connection of an adjoining unit.

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, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above the top with hand operated mechanical tamping devices or by hand. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is effected. Backfill in the bell area shall be left loose

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 City. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment deflections at joints shall not exceed that which will assure tight joints and comply with any limitation recommended by the pipe manufacturer.

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.

C. 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, as the minimum requirement, and shall be watertight in all sanitary sewer lines. Where specified, the joints in certain assemblies shall be made structurally integral by being completely encased in concrete to form a rigid watertight unit as indicated in the standard drawings.

All joints shall be sealed as follows, subject to such other approved method as the City may authorize as being acceptable alternative:

1. Concrete pipe and fitting joints – compression type rubber gasket seals conforming to the requirements of ASTM C443, ASTM C-361 or AASHTO M-198 for circular pipe, or as otherwise approved by the Engineer in the case of non-circular pipe sections.
2. PVC pipe and fittings – assembled gasket seal joints.
3. Corrugated smooth wall PVC and corrugated double wall HDPE pipe and fittings – assembled

push-on gasketed joints shall pass performance tests as listed in ASTM D-3212.

4. Corrugated steel pipe and fittings – sealed with Mn/DOT Standard Detail Plate M3221C.
5. Connections to storm sewer mains at other locations than manholes and catch basins shall be made with precast tees, wyes or junction boxes. Field cut openings may be permitted for mains, which are at least 2 times the size of the branch and no further than 100-ft from a structure. The materials, work and method of connection for other than precast connections shall be subject to the City's approval.

D. Bulk heading Open Pipe Ends

All pipe and fitting ends left open for future connection shall be bulk headed by approved methods prior to backfilling. Unless otherwise specified or approved, all openings of 24 inches diameter or less shall be closed off with prefabricated plugs or caps and all storm sewer openings larger than 24 inches 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 concrete brick, or solid block to a wall thickness of 8 inches.

S100.303 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 to be raised or lowered shall follow Mn/DOT Specification 2506.3 with the following modification: the structure construction (excluding casting) above the cone shall not exceed 1 foot.

When the plans call for reconstruction of structures, all debris shall be removed from the bottom of the old structure without additional compensation.

Sewer aprons shall be subject to all applicable requirements for installation of pipe. All aprons and outfall end sections shall be tied as per Mn/DOT Standard Plate 3145.

S100.304 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 City. 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 in the City of St. Charles standard specification for the construction of service connections.

S100.305 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.

For gravity flow sewers, the sewer shall be subjected to exfiltration testing, by the ASTM F1417 (low pressure air) test method regardless of pipe material.

For sewers designated as pressure pipe sewers, the sewer shall be subjected to exfiltration testing, by the Minnesota Plumbing Code 4715.2820.

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 as required.

A. Air Test Method-Gravity Sewer

The Table below contains selected text from ASTM F1417 (Gravity Sewer Lines).

4.1 The section of the line to be tested is plugged. Air, at low pressure, is introduced into the plugged line. The line passes the test if 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 Table 1 or Table 2, or calculated by use of the formulas in 9.2.

TABLE 2 1 Minimum Specified Time Required for a 0.5 psig Pressure Drop for Size and Length of Pipe Indicated for Q = 0.0015

NOTE-Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

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

9.2 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, s,

K = 0.000419 DL but not less than 1.0,

Q = leak rate in cubic feet/minute/square feet of internal surface = 0.0015 CFM/SF,

D = measured average inside diameter of sewer pipe (see Method D 2122 and Practice D 3567), in., and

L = length of test section, ft.

Table 1 contains the specified minimum times 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 ft³/min/ft² of internal surface.

B. Air Test Method-Pressure Pipe

The air test shall be made by attaching the air compressor or testing apparatus to any suitable opening and closing all other inlets and outlets to the system by means of proper testing plugs. Air shall be forced into the system until there is a uniform pressure of five (5) psi on the portion of the system being tested. The pressure shall remain constant for 15 minutes without the addition of air.

C. 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.

S100.306 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 for a minimum of 30 days.

The deflection test shall be performed by pulling a rigid ball or pointed mandrel through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 92.5 % of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed 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 City.

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

A. 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 City. The replaced section shall be re-tested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and re-testing shall be at the Contractor's expense.

Section 4 METHOD OF MEASUREMENT

S100.401 Description

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. 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.

S100.402 Sewer Pipe

Sewer pipe of each design designation will be measured by length 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.

Measurements for trench excavation will be determined separately, when included in the Pay Items for the Plans, and according to the Trench Excavation Specification.

S100.403 Manholes and Catch Basins

Manholes and catch basins of each design will be measured by number of each constructed complete-in-place, including the base and castings as required, for the depth increments as stated in the proposal.

The depth of manholes and catch basins shall be considered as being the distance from the top of the ring, cover, or grate to the invert elevation at the center of the structure.

S100.404 Reconstruct Manholes and Catch Basins

Reconstructed manholes and catch basins will be measured by height from the bottom of the reconstructed portion to the bottom of the ring or frame casting with no regard to type.

Connection of new catch basins to the existing storm sewer piping, including up to 1.5m (5 feet) of new pipe per location, and interconnection of multiple catch basins shall be considered an incidental expense.

S100.405 Adjust Frame and Ring Casting

Adjust frame and ring casting will be measured by the number of castings adjusted, all the castings in any one structure being considered as one assembly.

S100.406 Outside Drop Connection

Outside drop connections of each design will be measured by number of each constructed complete-in-place, including granular encasement, fittings, and any special piping as required, including two holes into existing manhole for the drop connection.

S100.407 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.

S100.408 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.

Section 5 BASIS OF PAYMENT

S100.501 General

Payment for sewer pipe items at the Contract prices of each design shall be compensation in full for all costs of providing a complete-in-place pipeline, including excavation, foundation preparation, bedding, backfilling, leakage testing, plugging, restoration of surface improvements, disposal of surplus or waste materials, final cleanup, and such other work as may be specified, but excluding the construction 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.

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 (risers, 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.

S100.502 Items List

Payment for construction of Sewer Main will be made on the basis of the following schedule:

ITEM NO	ITEM	UNIT
S100.513	Furnish & Install ___" Non-Reinforced Concrete Pipe, Class__	Linear Foot
S100.514	Furnish & Install ___" Reinforced Concrete Pipe, Class__	Linear Foot
S100.518	Furnish & Install ___" Corrugated Metal Pipe, ___ gauge (Specify Coating when Required)	Linear Foot
S100.519	Furnish & Install ___" Alternate Pipe Sewer	Linear Foot
S100.520	Furnish & Install ___" Alternate Pressure Pipe Sewer	Linear Foot
S100.522	Furnish & Install ___" Perforated _____ Pipe (Specify Type of Pipe)	Linear Foot
S100.524	Furnish & Install ___" Ductile Iron Pipe	Linear Foot
S100.530	Furnish & Install ___" x ___" Branch _____ (Specify Tee or Wye & Material)	Each
S100.532	Furnish & Install ___" Riser ___' to ___' High (Specify Height Range & Material)	Riser
S100.534	Furnish & Install ___" Bend ___ Degree Bend (Specify Degree & Material)	Bend
S100.536	Connect to Storm Sewer Main	Each
S100.540	Construct Manhole Type __, ___' to ___' Deep	Structure
S100.548	Construct Junction Box ___' to ___' Deep	Structure
S100.550	Construct Catch Basin Type __, ___' to ___' Deep	Structure
S100.552	Construct Double Catch Basin Type __, ___' to ___' Deep	Structure
S100.560	Remove _____	Each
S100.562	Remove _____	Linear Foot
S100.563	Remove & Salvage _____	Each
S100.564	Remove & Salvage _____	Linear Foot
S100.565	Remove and Reinstall _____	Linear Foot
S100.566	Reconstruct _____	Each
S100.568	Reconstruct _____	Linear Foot
S100.570	Connect into Existing	Each
S100.572	Adjust	Structure
S100.574	Adjust	Assembly
S100.576	Modify	Each
S100.578	Furnish & Install _____	Each

**WATERMAIN SPECIFICATIONS
W200**

St. Charles, MN

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Section 1 GENERAL REQUIREMENTS

W200.101 Description

These specifications shall apply to the construction and repair of watermains 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 contract.

All references to cast iron material shall be construed to include Gray Iron and Ductile Iron products, except where one or the other is specified. All references to "structure" shall include any manmade object that is not otherwise accepted by special terminology or definition.

The City of St. Charles reserves the right, at any time during the construction of any watermain embraced within the limits of a public contract, to issue a permit to a property owner to connect premises to the watermain. In the event such a permit is issued, the Contractor is not relieved of the responsibility to complete the contract according to Plans and Specifications. The issuance of a permit by the City to tap or connect to any part of a watermain embraced within the limits of a public contract shall in no sense be construed as acceptance of any part of the work.

W200.102 Reference Documentation

Provisions of the General Conditions and Trench Excavation & Backfill/Surface Restoration shall apply to this work. The Contractor shall abide by the applicable provisions of state, federal and local laws and ordinances.

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before the date of advertisement for bids. All references to 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 Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- C105 Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
- C111 Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- C150 Standard for Thickness Design of Ductile-Iron Pipe
- C151 Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- C153 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
- C500 Standard for Metal-Seated Gate Valves for Water Supply Service (Includes addendum C500a-95.)
- C502 Standard for Dry-Barrel Fire Hydrants (Includes addendum C502a-95.)
- C509 Standard for Resilient-Seated Gate Valves for Water Supply Service (Includes addendum C509a-95.)
- C600 Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
- C651 Standard for Disinfecting Water Mains

Section 2 MATERIALS

W200.201 General

The Engineer and Engineer's authorized representatives shall have free access to the manufacturing or processing plants for the purpose of making appropriate inspections and tests. The Contractor shall furnish an affidavit from the manufacturer to the effect that all tests have been made and that the pipe, fittings, and specials conform to the Specifications.

All pipe, fittings, and specials shall be subject to further inspection and approval by the Engineer before being used in the work. At the request of the Engineer, the Contractor shall furnish without charge [for test purposes] up to 0.5% of the number of pipe in each size of pipe furnished to be used for test purposes. In no case shall less than one full length of pipe or one complete fitting of each size be furnished.

W200.202 Ductile Iron Pipe (D.I.P.)

Ductile-Iron Pipe shall meet the requirements of ANSI A-21.51 (AWWA C151) for "Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or Other Liquids."

Wall thickness for Ductile-Iron Pipe shall be determined in accordance with the ANSI A-21.50 (AWWA C150) "Thickness Design of Ductile Iron Pipe." In no case shall pipe wall thickness be less than Class 52.

Pipe shall be furnished with a cement-mortar lining produced in accordance with ANSI A-21.4 (AWWA C104) "Cement Mortar Lining for Cast Iron Pipe and Ductile-Iron Pipe and Fittings for Water."

Pipe joints shall meet the requirements of ANSI A-21.11 (AWWA C111) for "Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings."

Pipe joints shall be push-on type unless otherwise specified.

Pipe shall be installed so as to provide electrical conductivity through the use of either a copper strip conductor across each joint or a conductive gasket equal to the American Fastite conductive gasket or approved equal.

Main line pipe shall be 8" diameter or greater and furnished in nominal laying lengths. Cut pipe will be accepted; however, the total length of cut pipe incorporated into the job shall not exceed 10% of the estimated length of ductile iron watermain pipe as shown on the proposal. The nominal laying length of cut pipe shall be within $\pm 1'$ of the nominal laying length of pipe otherwise furnished. Installation of used pipe will not be permitted unless authorized by the Engineer in writing.

Each length of pipe shall be marked with the weight, thickness, class designation, manufacturer's mark and year in which the pipe was cast.

W200.203 Polyethylene Encasement

Polyethylene encasement material shall conform to the requirements of AWWA C105 for tube type installation and 8-mil nominal film thickness.

W200.204 Ductile Iron Fittings and Specials

Ductile iron fittings and specials shall be of the single gasket push-on joint or the Mechanical Joint (M.J.) type conforming to AWWA C153 and ANSI A-21.53 covering ductile iron compact fittings for 350 psi water pressure plus water hammer. The single gasket push-on joint and mechanical joint shall conform to ANSI A-21.11. Cement mortar lining will not be required unless otherwise stated in the Special Provisions.

W200.205 Isolation Valves

Unless otherwise specified in the Plans or Special Provisions, isolation valves shall be resilient seated gate valve type, with non-rising stem, ductile iron body and fusion-bonded epoxy coating on interior and exterior surfaces.

Resilient seated gate valves shall have mechanical joint ends or single gasket joint type ends and be designed to operate under 200 pounds working pressure and shall conform to the requirements of AWWA C-509. Valves are to open counter-clockwise. Valves are to be furnished with stainless steel bonnet bolts and nuts and shall not have test plugs.

W200.206 Tapping Sleeves and Valves

The tapping valve shall meet the same requirements as the previously described resilient seated gate valves except the inlet flange shall meet ANSI B-16.1 for Cast Iron Pipe Flanges, Class 125. The tapping sleeve shall have mechanical joint ends and ANSI Class 125 flange complying with AWWA C500.

W200.207 Cutting in Sleeves

Cutting-in sleeves are not permitted. Only mechanical joint solid sleeves with retainer glands shall be used for pipe cut-ins (one per cut-in).

W200.208 Valve Boxes

Valve boxes shall be the screw type, have a minimum inside shaft diameter of 5 1/4", and have a cap with the word "WATER" plainly marked on top. In all respects the valve box shall be equal to Tyler 6860 Series. The American Flow Control high-density polyethylene trench adaptor will be considered an approved equal.

The valve box assembly shall be furnished in such lengths of sections needed to satisfactorily complete the installation to the desired height without field cutting either the center or top section of the box.

Operator extensions shall be installed in all valve boxes and curb stops.

W200.209 Hydrants

All hydrants shall be of a standard make and shall be designed to safely hold a working pressure of 150 lbs per square-inch, and not cause "water hammer" with extraordinary usage. Hydrants shall be of the Non-Jacket Type and shall further be of such design that if the hydrant is broken off, the valve will remain closed.

Hydrants shall be Waterous (Pacer WB-67) or U.S Pipe & Foundry (Metropolitan Snow Country 250) meeting the following specifications:

1. Ductile iron body
2. All bronze drain
3. 5-1/4" valve opening
4. 6" mechanical joint connection
5. Two 2-1/2" National Standard Thread hose connections
6. One 4" Minnesota Standard Steamer Thread hose connection
7. 1-1/2" National Standard operating nut (Pentagon), counter-clockwise turn to open
8. Twist-in mechanically attached nozzles
9. Traffic break-off, 24" minimum distance from ground to centerline of nozzle
10. Minimum working pressure - 150 psi
11. Hydrostatic test pressure - 300 psi

12. Bronze seat ring insert
13. International Orange Epoxy Coating, 6.0 mil minimum total coating dry film thickness
14. Compliance with AWWA C502

Unless otherwise specifically directed by the Engineer, the hydrant assembly shall be furnished in the length needed to satisfactorily complete the installation to the desired height without the use of "Bonds" or "Offsets." In cases deemed necessary and authorized by the Engineer, "Hydrant Extensions" may be used. No additional compensation will be allowed for furnishing and installing such fittings.

W200.210 Materials for Restraining Joints

A. Tie Rods (use only for restrained joints connecting to existing watermain)

Tie rods and clamping devices used for rodding at fittings shall be of the required size and adequate strength to secure the installation from movement. The rod size and clamping arrangement shall be as indicated on the Plans or Detail Plates for Watermain Tie Rods and Clamping Devices.

Tie rods shall be galvanized, and other clamping devices shall be epoxy-coated.

All such materials shall be approved by the Engineer before being used in the work.

B. Retainer Glands (use for restrained mechanical joints)

Mechanical joint retainer glands shall be Mega lug Retainer Glands as manufactured by EBAA Iron, Inc. or approved equal.

C. Single Gasket Restrained Joints

Single gasket restrained joints shall be American Fastite type with Fast-Grip gaskets, US Pipe Tyton Field Lok or approved equal. Electrical conductivity is to be maintained across all single gasket pipe joints.

W200.211 Miscellaneous Materials

Any other miscellaneous material required in the work not specifically mentioned in these specifications, shall be new, unused, undamaged, and of a quality equal to the materials specified herein and shall be submitted to, and approved by, the Engineer prior to its use.

Section 3 CONSTRUCTION REQUIREMENTS

W200.301 General

A. Designation of Authority

The City Engineer or authorized representative shall be the designated authority for all watermain construction and inspection, except Hydrostatic, bacterial and conductivity testing will be accomplished by the Contractor with City oversight.

B. Handling Pipe and Accessories

Pipe, fittings, valves, hydrants, and other watermain accessories shall be loaded, transported, unloaded, stored, handled, and installed by methods and in a manner that will insure their final installation in a sound and undamaged condition conforming in all respects to specified requirements.

Under no circumstances shall the pipe, fittings, valves, or hydrants be dropped to the ground, onto or against hard or solid objects or materials, or otherwise subjected to possible damage from impact or shock. Such materials shall be loaded and unloaded by lifting with hoists or by skidding. Pipe handled on skidways shall not be skidded or rolled against other pipe.

In distributing pipeline material at the site of the work, each piece shall be unloaded opposite, or as close as possible to, the point of installation in order to avoid unnecessary rehandling.

C. Work Schedule and General Requirements

When street grading is also under contract on the project, the Watermain Contractor shall install the main immediately after the rough grading is completed. Upon completion of the underground work the Watermain Contractor shall restore the roadway to the same condition as it was prior to trenching.

If the Watermain Contractor chooses to make the installation prior to the rough street grading, he shall place not less than 4' of earth fill over the watermain.

All supplies, tools, and equipment necessary to the proper construction and satisfactory completion of the work in accordance with the Specifications are to be furnished by the Contractor. It is understood that the whole work under this contract is to be done at the Contractor's risk, and that he is to assume the responsibility and risk of all damages to the work, or to the property on the line of the work, which may be occasioned by floods, backwater, caving of the street, settling of the foundations of buildings, or from any cause whatsoever. The Contractor shall not dig up or occupy with materials any more of the street than is absolutely necessary for the prosecution of work, and in no case shall the operations extend beyond the limits of the right-of-way or easement lines. Special care shall be taken to cause a minimum of inconvenience to persons residing along the line of improvement. The Contractor shall protect all excavations by barricades, lights, and other warning devices. The Contractor shall also provide for the flow of all watercourses, sewers, gutters, and drains, and provide for the protection of other utilities, both public and private.

W200.302 Placing Watermain and Appurtenances

A. General

Installation of piping and appurtenances shall be in compliance with AWWA C600 and the project Plans, Specifications, and Special Provisions. Piping and appurtenances shall be laid to the required line and grades as outlined below, each section having a firm and uniform bearing throughout its entire length.

B. Grading and Aligning Pipe

The Contractor is solely responsible for the correct transfer of the primary line and grade from the Engineer's stakes to all working points, and for construction of the work to the prescribed lines and grades

C. Installation of Pipe, Fittings, and Polyethylene Encasement

1. Care in Handling

All pipe, fittings, and specials shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable means, in such a manner as to prevent damage to the watermain materials or to the coating thereon. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Before lowering and while suspended, the pipe shall be inspected for defects, and any defective, damaged, or unsound pipe shall be rejected.

Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.

2. Direction of Laying

Unless otherwise directed, pipe shall be laid with bell ends facing in the direction of laying.

3. Cleaning, Swabbing, and Chlorine Treatment

All foreign matter or dirt shall be thoroughly removed from the inside of the pipe before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying.

A mechanical joint or slip-on joint plug shall be inserted into the bell of the last pipe laid when work is suspended overnight and for seasonal suspension of work.

Immediately before each length of pipe and each fitting is installed on the new watermain, the outside of the spigot end of the pipe, the inside of the pipe barrel and bell, and the interior surfaces of the fittings shall be thoroughly swabbed with a calcium hypochlorite solution containing not less than 200 parts per million of chlorine. "H.T.H." or an equivalent bactericidal agent may be used for this solution.

In addition, the "Dry Calcium Hypochlorite Method" of disinfecting the watermain shall to be used (AWWA C651). Dry calcium hypochlorite (containing at least 65% available chlorine) shall be placed in the pipe during placing operations. A minimum of one ounce shall be placed in each length of 4-inch through 10-inch watermain and one and one-half ounces for each length of 12-inch and larger watermain.

4. Joining Single Gasket, Slip-on Pipe

Immediately prior to assembling the joint, the rubber gasket and all surfaces of the bell and spigot shall be cleaned of dirt, rust or other foreign material. If a copper jumper strip is being installed instead of a conductive gasket, line up the jumper strip. Before drawing the pipe together, the spigot end of the gasket shall be coated with a light film of approved lubricant. If a copper jumper strip is being installed instead of a conductive gasket, after drawing the pipe together, connect the copper jumper strip.

5. Joining Mechanical Joint Pipe

Immediately prior to assembling the mechanical joint, the rubber gasket and all surfaces of the bell, spigot, and gland which will come in contact with the gasket shall be thoroughly cleaned of any dirt, rust or other foreign material. . If a copper jumper strip is being installed instead of a conductive (armor tipped) gasket, line up the jumper strip. Where necessary, the gasket may be

coated with a light film of an approved lubricant to facilitate slipping over the spigot end and into the bell.

After the gland has been shoved into place against the gasket, the bolts shall be inserted, and the nuts shall be tightened with the fingers until snug. Tightening of bolts shall be done carefully and evenly, alternately tightening opposite bolts in order to maintain approximately the same distance between the gland and the pipe flange at all points around the circumference of the joint.

Final tightening of the bolts shall be done with a ratchet torque wrench unless otherwise permitted by the Engineer. Torque requirements shall be in accordance with the following table:

Size of Bolt	Torque Foot-Pounds	*Length of Wrench
5/8"	40 – 60	8"
3/4"	60 – 90	10"
1"	70 – 100	12"
1 1/4"	90 – 120	14"

* (The wrench lengths stipulated in this column are required lengths of non-torque wrenches to be used in the event that their use is permitted by the Engineer.)

After tightening the bolts, connect the copper jumper strip.

6. Cutting Pipe

Cutting of pipe for closure pieces, for installation of valves, hydrants, and fittings, or for any other reason shall be done in a neat and workmanlike manner without damage to the pipe or cement lining therein and so to leave a smooth cut end at right angles to the axis of the pipe. Unless otherwise approved by the Engineer, all cutting of pipe shall be done by means of mechanical pipe cutters of an approved type, except that the cutting of pipe already in place where the use of mechanical cutters would be difficult or impracticable, may be done with diamond point chisels or other hand tools which will cut the pipe without damaging impact or shock.

7. Polyethylene Encasement

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 and City Standard Detail Plate 6-06. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, offsets, 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 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 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 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.

8. Setting Valves, Fittings and Valve Boxes

Gate valves and pipefittings shall be set and jointed to the pipe in the manner heretofore specified for cleaning, laying and jointing pipe. Valve boxes shall be firmly supported and maintained, centered, and plumbed over the wrench nut of the gate valve, with the box cover at such elevation as directed by the Engineer.

All valves and fittings shall be installed with restrained joints conforming to the requirements of W200.210.

9. Setting Hydrants

Hydrants shall be placed as shown on the Plans or as directed by the Engineer. Each hydrant shall be connected to the main with a 6" ductile iron branch controlled by an independent 6" gate valve. Hydrants shall be installed on concrete support blocks as shown on the Standard Detail Plates, and shall be braced so as to remain plumb during backfill operations. Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

The Contractor shall furnish and install the required number of hydrant protective posts at such special hydrant locations as may be designated by the Engineer. See standard detail for hydrant installation. Protective posts shall be placed as an incidental expense.

Hydrants shall be installed with restrained joints conforming to the requirements of W200.210.

10. Hydrant Drainage Pits

A drainage pit 2' in diameter and 18" deep shall be excavated below each hydrant and filled compactly with coarsely graded gravel or crushed rock under and around the bowl of the hydrant and to a level 6" above the hydrant drainage opening. The stone fill shall be completely covered with an impermeable barrier to prevent backfill from filtering into the drainage pit.

The gravel or crushed rock used for this purpose shall conform to the requirements of City Standard T100.206 "Aggregate for Hydrant Drainage Pit".

11. Plugs

Mechanical joint or slip-on joint plugs shall be inserted into the bells of all dead ends of pipe, tees, and crosses. In all cases, and regardless of the type of plug used or specified, a 3/4" corporation stop shall be tapped into the plug. This Corporation Stop that complies with service standard specs shall serve to release any accumulated pressure prior to the future removal of the

plug.

12. Blocking and Anchoring

Watermain, valves, fittings, plugs and hydrants shall be restrained as shown on the City Standard Detail Plates or as stated in the Special Provisions. As noted in Plate 6-05 (Restrained Joint Detail) tie-rods are only to be used for connections to existing watermains. Joint restraints for new watermains are to be provided by retainer glands, American Fast-Grip or US Pipe Tyton Field Lok gaskets (or approved equal restraining gaskets), or the restrained joint type specifically stated in the Special Provisions. Electrical conductivity is to be maintained across restrained pipe joints.

13. Watermain Within Steel Casings

Watermain installed within a steel casing shall be single gasket, restrained joint type. Electrical conductivity is to be maintained across restrained pipe joints. The watermain shall be mounted on plastic skids, two per length of pipe secured in place to support the pipe along the barrel rather than at the joints. The space between the pipe and casing shall be backfilled and dried sand blown into the space and the ends of the casing shall be sealed with concrete bulkheads at least one foot thick. A 2-inch PVC or copper drain shall extend through the bulkhead at the lower end of the casing.

W200.303 Loading and Disinfection of Watermain

Watermain disinfection shall be done in accordance with AWWA C651. The "Dry Calcium Hypochlorite" method shall be used.

Watermain loading and flushing will be done by the City, and bacterial sampling/testing will be done by the Contractor. The Contractor is not to operate water distribution system valves or hydrants.

W200.304 Pressure, Leakage and Electrical Conductivity Testing

A. Testing Equipment and Facilities

The Contractor shall provide, at its own expense, all necessary piping and piping connections between the pipe line to be tested, at the point of test thereof, and the nearest available source of supply of acceptable water, together with test pumping equipment, water loss measuring container, pressure gauge, and other equipment, materials and facilities required for and in connection with the specified tests.

Test pressures shall be applied by means of a pump of such design and capacity that the required pressure can be applied and maintained without interruption for the duration of each test. The pressure gauge used shall be tested, accurately calibrated, and approved by the City Engineer. The container used to measure the volume of water replaced in the water main during the leakage test shall be sized to permit accurate measurement of the pumped replacement water volume (typically less than five gallons).

The City will provide the necessary supervision, and the Contractor shall conduct the test at its own expense.

B. Hydrostatic Pressure Test

All pipelines constructed hereunder shall be tested for defective materials and workmanship by being subjected to a hydrostatic test pressure of 150 pounds per square-inch gauge (psig.). Such test pressure shall be assumed to be applied at the lowest point in the line of pipe being tested and the pressure applied at the point of gauge attachment shall be the specified test pressure corrected as necessary to compensate for any difference in elevation of the gauge above such lowest point in the said line of pipe.

The test pressure shall be applied to watermains only. In the event that any service lines are connected to any watermain that is to be subjected to the test pressure, the curb cocks or other shut-off valves in all such services shall be closed in order that no plumbing be subjected to the specified test pressure. In each case where water service is interrupted for the duration of the hydrostatic tests, the water customer affected thereby shall be notified of the proposed interruption at least one hour before shutting off the water supply.

After the section of the line to be tested has been filled with water, the specified or otherwise authorized test pressure shall be applied and maintained for a period of not less than two hours and for whatever longer period as may be necessary for the City to complete the inspection of the line under test and for the Contractor to locate any and all defective joints and pipe line materials.

In the event that repairs are needed, such repairs shall be made, the line refilled as specified, and the test pressure applied as before. This operation shall be repeated until the line and all parts thereof withstand the test pressure in a satisfactory manner.

In special situations, the City may approve modifying the hydrostatic test pressure to match the pressure in existing adjacent City Watermains, but in all other respects the test shall be carried out as specified above.

C. Leakage Test

At the discretion and option of the City, the leakage test will be taken in cases where deemed necessary or advisable, or it may be waived where the prior observations and testing so indicate. When the leakage test is taken, it shall be conducted in the following manner:

After the specified pressure test has been completed and any and all pipeline repairs have been made and tested to the satisfaction of the City, the line or lines being tested shall be subjected to a leakage test under a hydrostatic pressure of 150 pounds per square-inch gauge (psig) as defined in paragraph B above. The pressure shall be maintained constant (within a 5% maximum variation, plus or minus) during the entire time that line leakage measurements are being made, in order that the allowable leakage rate may be determined accurately from the leakage rate formula hereinafter specified (or the included allowable leakage table).

Leakage measurements shall not be started until a constant test pressure has been established. Compression of air trapped in unvented pipes or fittings will give false leakage readings under changing Pressure conditions. After the test pressure has been established and stabilized, the line leakage shall be determined by measuring the volume of water pumped from the measuring container to replace the volume of water leaked from the line being tested.

No pipeline, or tested section thereof, will be accepted unless it has a leakage rate less than or equal to the rate determined by the following formula:

$$L = (S \times D \times P^{1/2}) / 133,200$$

In which,

L = Maximum permissible leakage rate, in gallons per hour.

S = Length of pipe tested, in feet

D = Nominal diameter of the pipe, in inches

P = Average pressure (in psig) during the leakage test (not necessarily the test pressure). This pressure

shall be determined by subtracting the average elevation of all tested pipe joints from the elevation of the pressure plane represented by the specified or authorized leakage test pressure, and then converting this difference, in feet or head, to pounds per square-inch hydrostatic pressure. The average pressure may be assumed to be equal to the test pressure where the maximum difference in elevations of the pipe joints being tested does not exceed 20 feet.

In the event that the line or section being tested contains pipe of more than one size, the allowable leakage from all joints of each size shall be calculated separately and then added to obtain the total allowable leakage from the entire line or lines.

D. Electrical Conductivity Testing

The Contractor shall perform conductivity testing on newly installed watermain in the presence of the City personnel within one week after completion of pressure and leakage testing to document electrical conductivity of the watermain.

All watermain, valves, fittings, and hydrants shall be tested for electrical conductivity and current capacity. The test shall be conducted while the watermain is at normal operating pressure. Backfilling shall have been completed. The watermain may be tested in sections of convenient length as approved by the City.

Direct current of 350 amperes \pm 10%, shall be passed through the watermain for five minutes. Current flow through the watermain will be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

Insufficient current or intermittent current or arcing, indicated by large fluctuations of the ammeter needle, will be evidence of defective conductivity in the watermain. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested.

Direct current arc welders will typically be the source of direct current for this testing. Conductivity testing equipment shall be furnished by the Contractor, subject to the approval of the City.

Cables from the current source to the section of watermain under test shall be of sufficient size to carry the test current without overheating or excessive voltage drop.

Conductivity testing connections for the test shall be made at fire hydrants. Hydrants used for a test shall be in the open position with the caps on during the test. The cable shall be clamped to the hydrant standpipe and flange bolt.) The hydrant-operating nut shall not be used as a terminal during the test.

When conducting a conductivity test, the current control should be set a minimum before starting. After starting the test, gradually increase the current until the current indicated on the ammeter is at the desired test value. Caution: the voltage drop across a defective watermain joint may be in the order of 50-100 volts.

The table below summarizes the maximum allowable main leakage (taken from Table 6A, AWWA C600):

Allowable Leakage per 1000 ft of Pipeline, gal/hr*							
Avg Test	Nominal Pipe Diameter, In.						
Pressure, (psi)	4	6	8	12	16	20	24
100	0.30	0.45	0.60	0.90	1.20	1.50	1.80
125	0.34	0.5	0.67	1.01	1.34	1.68	2.01
150	0.37	0.55	0.74	1.10	1.47	1.84	2.21
175	0.40	0.59	0.80	1.19	1.59	1.98	2.38
200	0.43	0.64	0.85	1.28	1.70	2.12	2.55
Normal test pressure is 150 psi.	*Allowable leakage for typical watermain installation.						

Based on 11.65 gpd/mi/in. nominal diameter at a pressure of 150 psi. (AWWA C600)

Where a second pressure test is made following line repairs, the leakage during such test may be measured as a part of the leakage test, provided that where the remainder of the leakage test is made at a reduced pressure as provided herein, the leakage during the application of each of the two pressures shall be measured separately.

It is the intent of this Specification based thereon that (a) all joints in piping shall be watertight and free from visible leaks during the prescribed leakage test, and (b) each and every leak that is discovered at any time prior to the expiration of two (2) years from and after the date of final acceptance of the work by the City shall be located and repaired by and at the expense of the Contractor, regardless of any amount that the total line leakage rate during the specified leakage test may be below the specified maximum rate.

If the specified leakage test is made after the pipe line has been backfilled and the joints covered, and such test shows a leakage rate in excess of the permissible maximum, the Contractor shall make all necessary surveys in connection with the location and repair of leaking joints to the extent required to reduce the total leakage to an acceptable amount. Where evidence of leaking joints does not appear on the ground surface above or near the leaks, the Contractor shall prospect the line by sinking a hole, with an auger or otherwise, at the location of each joint and determine any undue saturation of the soil that would indicate a leak at such joint. This prospecting shall be done after pressure has been maintained in the line for a sufficient time to provide adequate soil saturation for locating leaks by this method.

Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket and rebolting. Under no circumstances shall gland bolts be tightened beyond the specified and allowable torque limits in an attempt to reduce or stop leakage from a defective joint or for any other purpose.

W200.305 Placing Watermain In-Service or Suspension of Service

All water system valve operations are to be done by City personnel.

When it becomes necessary to close off any section of watermain in place or in service for the purpose of making connections to the section in place or for any other purpose, the Contractor shall notify all consumers connected to, and receiving water service from that section of watermain at least one hour in advance of the shutting off of service. Contractor’s work, during the suspension of service, shall be so arranged and conducted so as to reduce to a minimum the time necessary for any suspension of existing service. In no case shall existing water service be suspended overnight.

Section 4 METHOD OF MEASUREMENT

W200.401 Watermain

A. General

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 or Special Provisions. Linear measurements 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.

B. Water Pipe

Mainline pipe of each kind and size will be measured separately to the nearest foot, 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.

C. Polyethylene Encasement

Polyethylene encasement will be measured separately to the nearest foot by overall length along the axis of the pipeline, from beginning to end of each installation.

W200.402 Special Structures and Appurtenances

Measurement of special structures and appurtenances, specialty construction items such as insulating concrete, sleeves, etc., and certain removal items shall be as stated in the Special Provisions.

W200.403 Valves, Hydrants and Fittings

A. Valves

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

B. Hydrants

Hydrants will be measured by the number of complete units installed.

C. Ductile Iron Fittings

Tees, crosses, plugs, reducers, bends, or other fittings will be measured by the weight of ductile iron fittings. The weight of each fitting will be those listed in AWWA Standard Specification C153, 3-inch through 24-inch and 54" through 64" for water service, and all MJ ends, regardless of the actual weight of fittings installed in the work. Joint materials (glands, gaskets, bolts, nuts, washers, ties rods and other jointing materials) will not be included in fitting weights.

DUCTILE IRON COMPACT MECHANICAL JOINT FITTING TOTAL & OVERSIZE REIMBURSEMENT WEIGHTS (IN POUNDS)														
SIZE	ITEM		11 1/4 BEND		22 1/2 BEND		45 BEND		90 BEND		SLEEVE (LONG)		PLUG*	
	TL	OS	TL	OS	TL	OS	TL	OS	TL	OS	TL	OS	TL	OS
4"	16		18		23		27		20		10			
6"	30		32		32		39		36		18			
8"	42		46		46		57		46		26			
10"	58	16	64	18	70	24	89	32	62	16	36	10		
12"	74	32	84	38	86	40	108	51	76	30	46	20		
14"	130	88	148	102	164	118	210	153	140	94	79	53		
16"	158	116	178	132	202	156	264	207	172	126	100	74		
20"	245	203	310	264	305	259	400	343	255	209	153	127		
24"	315	273	412	366	405	359	565	508	335	289	202	176		

SIZE	ITEM					
	TEE		REDUCER		CROSS*	
	TL	OS	TL	OS	TL	OS
4"x4"	32				42	
6"x4"	46		24		62	
6"x6"	56				80	
8"x4"	60		32		84	
8"x6"	72		36		105	
8"x8"	86				111	
10"x4"	78	18	46	14	98	14
10"x6"	90	18	47	11	110	5
10"x8"	105	19	50	50	138	27
10"x10"	120	34			155	44
12"x4"	94	34	58	26	115	31
12"x6"	110	38	60	24	129	24
12"x8"	125	39	60	60	158	47
12"x10"	140	54	64	64	180	69
12"x12"	160	74			212	101
14"x4"	172	112	N/A	N/A	N/A	N/A
14"x6"	182	110	100	64	210	105
14"x8"	206	120	100	100	231	120
14"x10"	228	142	100	100	255	144
14"x12"	234	148	100	100	269	158
14"x14"	280	194			299	188
16"x6"	228	156	124	88	250	145
16"x8"	248	162	124	124	264	153
16"x10"	264	178	124	124	286	175
16"x12"	280	194	124	124	310	199
16"x14"	316	230	140	140	363	252
16"x16"	322	236			410	299

SIZE	ITEM			
	TEE		REDUCER	
	TL	OS	TL	OS
20"x6"	315	243	NA	NA
20"x8"	345	259	NA	NA
20"x10"	370	284	220	220
20"x12"	395	309	205	205
20"x14"	440	354	200	200
20"x16"	465	379	200	200
20"x20"	535	449		
24"x6"	415	343	NA	NA
24"x8"	445	359	NA	NA
24"x10"	470	384	NA	NA
24"x12"	500	414	305	305
24"x14"	550	464	310	310
24"x16"	580	494	320	320
24"x20"	660	574	300	300
24"x24"	720	634		

REFERENCES: AWWA C153/A21.53-94
* Pipe Economy by McWane, Inc. (Clow) copyright 2000

Section 5 BASIS OF PAYMENT

W200.501 Description

Payment for furnishing and installing watermain and appurtenances of each kind and size at the unit price bid shall be compensation in full for all labor, service, and other materials such as rubber ring gaskets, materials for providing electrical conductivity, joint restraint materials, gasket lubricant, glands, bolts and nuts necessary for the satisfactory installation in accordance with the requirements specified and reasonably implied by the Contract, Plans and Specifications.

In the absence of special payment provisions:

1. 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.
2. 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.

W200.502 Polyethylene Encasement

Payment for polyethylene encasement at the appropriate contract unit price per linear foot shall be compensation in full for all material, equipment, and services necessary for the satisfactory installation of the encasement.

W200.503 Valves, Hydrants and Fittings

Payment for furnishing and installing valves and hydrants at the appropriate contract unit price per unit and fittings at the contract unit price per pound, shall be compensation in full for all costs of the work except those costs for which the proposal contains specific items, subject to the following additional provisions:

1. The cost of furnishing and installing rubber ring gasket, gasket lubricant, glands, bolts and nuts, etc. will be considered as incidental expense with no additional compensation therefore.
2. In the case of valves, the unit price bid shall include furnishing and installing of both the valve and the box.
3. The unit price bid for furnishing and installing tapping sleeve and valve shall be compensation in full for all material, equipment, and services necessary for the satisfactory installation of the sleeve, valve, and box.
4. The unit price bid for furnishing and installing hydrants shall include the hydrants, hydrant extensions and hydrant protective posts, excavation, backfilling and drainage pit construction.
5. Furnishing and installing $\frac{3}{4}$ -inch corporation stops in conjunction with the installation or removal of plugs will be considered incidental expense with no additional compensation therefore.
6. Furnishing and installing of restrained joints (tie rods, retainer glands and single gasket type) will be considered as incidental expense with no additional compensation therefore.

W200.504 Special Structures and Appurtenances

Payment for special structures and appurtenances, specialty construction items such as insulating concrete, sleeves, etc. and certain removal items shall be made as stated in the Special Provisions.

W200.505 Items List

Payment for watermain construction will be made on the basis of the following schedule:

ITEM NO	ITEM	UNIT
W200.511	Furnish & Install ___" Polyethylene Encasement for ___" D.I.P.	Linear Foot
W200.514	Furnish & Install ___" DIP Watermain Class ___	Linear Foot
W200.515	Furnish & Install ___" Gate Valve and Box	Linear Foot
W200.516	Furnish & Install ___" Butterfly Valve & Box	Assembly
W200.517	Furnish & Install ___" Valve and Box	Assembly
W200.518	Furnish & Install ___" Pressure Reducing Valve	Each
W200.520	Furnish & Install ___" x ___" Tapping Sleeve & Valve	Assembly
W200.525	Furnish & Install ___" Hydrant	Hydrant
W200.526	Furnish & Install Hydrant Extension	Linear Foot
W200.528	Furnish & Install Water Main Fittings	Pound
W200.530	Furnish & Install ___" Corporation Stop	Each
W200.535	Furnish & Install ___" Type ___ Copper Water Pipe	Linear Foot
W200.545	Construct Manhole Type _____	Structure
W200.550	Remove ___" Plug	Plug
W200.551	Install ___" Plug	Plug
W200.552	Install ___" x ___" Reducer	Each
W200.553	Remove ___" Hydrant	Hydrant
W200.554	Install ___" Hydrant	Hydrant
W200.556	Remove ___" Gate Valve and Box	Assembly
W200.557	Install ___" Gate Valve and Box	Assembly
W200.558	Remove Fittings	Each
W200.559	Remove ___" Watermain	Linear Foot
W200.560	Install ___" Watermain	Linear Foot
W200.561	Install Watermain Fittings	Each
W200.571	Adjust Gate Valve Box	Each
W200.572	Reconstruct Gate Valve Box	Each
W200.581	Remove & Salvage ___" Watermain	Linear Foot
W200.582	Remove & Salvage "_____"	Each
W200.590	Turn Off Existing Corporation Stop	Each
W200.591	Lower ___" Watermain	Linear Foot
W200.599	Street Restoration	Square Yard

**SERVICE CONNECTION
SPECIFICATIONS
C150**

St. Charles, MN

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Section 1 GENERAL REQUIREMENTS

C150.101 Description

These specifications shall apply to the construction and repair of water service, sanitary sewer service, storm sewer service and sub-drain service connections between public and private utility mains and buildings located outside the right of way.

C150.102 Reference Documentation

Provisions of the General Conditions of the Specifications for Public Improvements and Standard Specifications for Trench Excavation & Surface Restoration shall apply to this work. The Contractor shall abide by the applicable provisions of state, federal and local laws and ordinances.

Reference Documentation shall be the latest edition, including amendments and published updates, issued prior to the date of advertisement for bids or the date of request for quotations.

1. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction.
2. City of St. Charles, Standard Specifications for Street and Utility Construction.
3. Standard Utility Specifications for Water Main and Service Line Installation and Sanitary Sewer and Storm Sewer Installation, City Department of Public Works Association of Minnesota.

Permits and Licenses

1. Contractors doing service connection work which is not a part of a City Contract shall obtain permits in accordance with the following:
 - (a) Obtain a Street Opening Permit from City Department of Public Works.
 - (b) Obtain a Permit for Water Tap Service Connection from City Department of Public Works.
 - (c) Obtain a Permit for Sanitary Sewer Connection Service from City Department of Public Works.
 - (d) Obtain a Permit for Storm Sewer and Drain Connection Service from City Department of Public Works.
 - (e) In addition to the City permits, Work in State right of way requires a Permit for Installation of Utilities from Minnesota Department of Transportation.
 - (f) In addition to the City permits, Work in County right of way requires Permit for Work in Right of Way from Olmsted or Winona County Engineer.

C150.103 Easements

Easement shall be required and shall be recorded for any service connection that:

1. Service connection crosses another private property, or
2. Service connection is a common or shared use connection.

Section 2 MATERIALS

C150.201 General

Upon the City Engineer's request, representatives of the City shall not be denied access to the manufacturing or processing plants for the purpose of making appropriate inspections and tests.

At the City Engineer's request, the Contractor shall furnish manufacturer's certificate that the pipe, fittings, and other specified material meet the specified standards.

C150.202 Water Service Material

Water pipe and fittings for services larger than 2 inches inside diameter shall be designed and installed in accordance with the City of St. Charles Standard Specifications for Watermain Construction.

Water service pipe shall be 1 inch, 1 and 1/2 inch or 2 inch inside diameters only and shall conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper. Water service pipe of 3/4 inch and 1 1/4 inch diameter shall conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper and may only be used for repairs to copper services of 3/4 inch and 1 1/4 inch diameter.

A. Curb Stop and Box

1. Curb stop valves shall be of the flare type fitting or compression type fitting and shall be one of the following and specifically for the use with copper inlet and outlet service pipe. All curb stop valves shall be threaded and conform to the Minneapolis Pattern.
 - (a) Mueller H-15154, Mueller H-15155, Mueller B-25154, or Mueller B-25155.
 - (b) McDonald 6104 or McDonald 6104-22.
 - (c) Ford B22-444 (1"), Ford B22-666 (1 1/2"), Ford B22-777 (2") or Ford B44-444 (1"), Ford B44-666 (1 1/2"), Ford B44-777 (2").
 - (d) Curb box shall be Mueller H-10300, McDonald 5614 or 5615, or equal, which can be extended from 72" to 84" height and shall conform to the Minneapolis Pattern.
2. Where curb boxes are placed in paved areas, a curb box cover per Detail Plate 1-06 shall be installed.
3. Curb Box shall be 6" to 12" above grade until final site gradings and marked with address number.
4. Operator Extensions shall be provided on all curb stops.

B. Corporation Stop

1. Corporation Stops shall be the flare type fitting or compression type fittings and shall be one of the following, or approved equal:
2. Mueller H-15000 or Mueller H-15008 (1"), Mueller H-15013 (1 1/2" & 2").
3. Ford F-600 (1"), FB-600 (1 1/2" & 2") or Ford F-1000 (1"), FB-1000 (1 1/2" & 2").
4. McDonald 4701 or McDonald 4701-22.

C. Service Saddles for 1-1/2 inch & 2 inch Services.

1. Service saddles shall be double strap ductile iron saddles with neoprene ring gaskets. The

saddles shall be Mueller DB2A, Smith Blair 313 or approved equal.

D. Meter Stop Valves

1. One inch Meter Stop Valves shall be Mueller H-14255, Ford KV23 444 or Ford KVT23 444, McDonald 4601 or 4602 or equal, ground key angle Stop without Swivel nut, threaded for use with flared copper inlet water service pipe and 3/4" inside iron pipe thread for outlet.
2. 1-1/2 inch and 2 inch Meter Stop Valves shall be Mueller H-14276, McDonald 4602B, Stockman, or Nibco, 125-psi full flow, gate or ball valves.
3. 3 Piece Brass Couplings
1 inch and 1-1/2 inch coupling shall be flare or compression type fittings. 2-inch couplings shall be compression type fittings. Couplings shall be one of the following or equal:
 - (a) Mueller 15400 or Mueller 15403.
 - (b) Ford C22 Series or Ford C44 Series.
 - (c) McDonald 4758 or McDonald 4758-22.

C150.203 Sanitary Sewer Service Material

1. Plastic Sewer Service Pipe shall conform to the following:
 - (a) Polyvinyl Chloride (PVC) Schedule 40 conforming to ASTM D 1785 (for use at building line only).
 - (b) Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 2241 (not permitted within 1 foot of footing).
 - (c) Polyvinyl Chloride (PVC) SDR 35 or SDR 26 conforming to ASTM D 3034 (not permitted within 1 foot of footing).
 - (d) Cast iron soil pipe and fittings shall be the "Service Weight, Centrifugally Spun" grade and shall conform to ASTM A74-75.
 - (e) Ductile iron pipe shall conform to ANSI 21.51.
2. All joints shall be gasketed and shall be watertight.
3. Connections to mains or risers shall be made using factory made fittings or commercial adapters. Bends shall be one-eighth (45) bends or less.
4. Sanitary sewer service connections shall be plugged and marked by 2 x 4 at the end of the service connection. Plugs shall withstand the air test pressures. DIP plugs shall not be sealed with adhesives. Plugs shall be placed at the property line or at the building site and shall be as follows:
 - (a) For 4 inch DIP or CIP Service, use 4" Moeller Twis-Tite with brass tee or 4" Expandable Dollar Plug
 - (b) For 4 inch PVC Service, use 4" Expandable Dollar Plug or 4" plastic PVC cap
 - (c) For 6 inch DIP or CIP Service, use 6" C.I. Blind Plug with rubber gasket
 - (d) For 6 inch PVC, use 6" PVC cap.
5. Suitable adapters shall be used for joining dissimilar materials or for repair of similar materials and shall be the shear banded coupling type. The adapters shall be manufactured of material generally conforming to the material requirements of ASTM C-425 and the bands shall be stainless steel. Shear bands are not required to connecting dissimilar pipe materials for which shear-banded couplings are not normally manufactured and in these cases the adapter shall be encased in a concrete collar. The adapter inserts and couplings shall be as manufactured by Fernco or Can-Tex or equal.

C150.204 Storm Sewer and Drain Service Material

Storm sewer and drain service pipe located within 10 feet of water service or watermain shall meet the Sanitary Sewer Service material specifications.

C150.205 Backfill Material

Granular backfill shall comply with Mn/DOT section 3149.2D. except that in addition not more than 50% of the material shall pass the No. 40 sieve.

Select Material for Backfill shall be sandy loam, sand, or gravel material approved by the Department of Public Works.

Aggregate for pipe foundation shall comply with Mn/DOT Section 3137 CA-3.

Fine filter aggregate shall comply with Mn/DOT Section 3149.2 J.

Bedding and embedment aggregate Mn/DOT Section 3138, Class 5 containing crushed particles.

Any other miscellaneous material required in the work, but which is not specifically mentioned in these specifications, shall be new, unused, undamaged, and of a quality equal to the materials specified herein and shall be submitted to, and approved by, the City Engineer prior to its use.

Section 3 CONSTRUCTION REQUIREMENTS

C150.301 Public Utilities

The Contractor shall be responsible to protect any existing utility from damage caused by or occurring during their operations. If the work requires excavation, the Contractor shall notify all utility owners by requesting on site utility locations using the state 'Gopher One-call' system. Repair of damaged utilities shall be at the Connection Contractor's expense.

The locations of underground facilities shown on the plans are approximate only, and are shown only for the Contractor's general information. The city does not assume responsibility for showing all utilities on the plans. The Contractor shall use suitable precautions to prevent damage to pipes, conduits, and other underground or overhead structures.

All new utilities shall be installed in common trenches in accordance with City ordinance.

The Construction shall provide for the continued flow of all watercourses, sewers, gutters, and drains, in a manner subject to the approval of the City Engineer, during the service connection work.

C150.302 Limits of Excavation and Restoration

The Contractor shall disturb only that portion of the street and public or private property necessary for the prosecution of the work and consistent with the Street Opening Permit conditions.

The Contractor shall cause a minimum of inconvenience to persons residing near the improvement. The Contractor shall protect all excavations by barricades, lights and other warning devices. All warning devices shall be placed and conform to Minnesota Manual on Uniform Traffic Control Devices.

Within the City's right of way, the Contractor shall not disturb or damage any shade trees or hedges, except by specific written order of the City Engineer. On private property, the Contractor shall not disturb or damage any shade trees or hedges, except with written authorization of the property owner. The setting and marking of stakes shall not be considered such order.

When service connections are installed prior to rough grading, a minimum of 4' of earth fill shall be placed over the pipe. The final earth cover shall be not less than 7 feet for water services and 8 feet for sanitary sewer services.

Upon completion of the service connections, the public and private property shall be restored to the equal or better condition than prior to commencing work.

The maximum length of open trench will be the distance necessary to accommodate the amount of pipe installed in a single day. To the extent practical, trenches shall be fully backfill each day. At any time a trench is unattended, the entire trench shall be protected with a minimum of 4-foot high snow fence.

C150.303 Trench Excavation

Contractor is responsible to comply with current provisions of the Department of Labor and Industry Occupational Safety and Health Rules.

The trench shall be opened along the lines laid out and to a depth necessary for the laying of pipe at the grades shown on the Plans or approved by the City Engineer. The width of trenches shall provide adequate space for workmen to place and joint the pipe properly and to compact the earth below the haunches of the pipe. The width of the trench, measured at the top of the pipe, shall be no wider than 36".

Solid rock shall be defined as ledge rock or other rock or boulders exceeding 1/3 cubic yard in volume which requires blasting or other extraordinary methods for its removal. Whenever solid rock is encountered in the trench, the City Engineer shall be notified immediately so that the contour of the rock

can be determined before its removal. The classification and calculation of the amount of rock excavated shall be determined by the City Engineer and their decision in the matter shall be final. Rock shall be excavated to provide a clearance of at least 6 inches below all parts of the pipe. The rock excavation width for a common water and sanitary sewer service shall be 36 inches.

Whenever the trench is excavated below the designated pipe bedding grade, whether in rock or otherwise, special backfill is required. All depressions below grade shall be backfilled with approved material and thoroughly compacted before the pipe is laid.

The Contractor shall provide suitable means for the removal of ground water and surface water. In no case shall this water be allowed to flow into the sanitary sewer pipe. Storm sewer may be used for ground water and surface water with the permission of the City Engineer. When quicksand or other unsatisfactory foundation soils are encountered, the Contractor shall immediately notify the City Engineer.

Sheeting and bracing shall be provided in all trenches whenever it is necessary for compliance with OSHA requirements, for the safety of the workmen, or for the protection of the work in place, or when specified by the Plans or Special Provisions.

C150.304 Bedding and Encasement

Bedding for service connections shall be full encasement extending not less than 4 inches below the pipe and 12 inches above the pipe. Bedding and encasement material shall be accurately shaped by means of a template to fit the lower part of the pipe exterior for at least 60% of the outside diameter or span of the pipe before placing the pipe.

If the foundation at the established grade for the bottom of the pipe or structure is unstable, the trench shall be subcut to a depth designated by the City Engineer. The side slopes of the trench below invert grade shall be excavated as nearly vertical as practicable. The subcut shall be backfilled to the bottom of the bedding material using Aggregate for Pipe Foundation.

Subcut backfill shall be placed in layers not to exceed 12 inches and thoroughly compacted.

Class "A" bedding shall consist of continuous concrete cradle having a minimum thickness under the pipe of 1/4 the normal inside diameter or span and extending up the sides of the pipe for a height equal to 1/4 the outside diameter or rise. The cradle shall have a width at least equal to the outside diameter or span of the pipe plus 8" and shall be constructed monolithically. Concrete for Class "A" bedding shall be as indicated on the Plans or in the Special Provisions.

For Perforated Pipe the bedding material will conform to the requirements for fine filter aggregate (C150.207D) and shall be placed to 24 inches above the top of the pipe.

Ductile Iron pipe shall be bedded on a soil foundation shaped to fit the lower part of the exterior of the pipe for a width of at least 50 percent of the outside diameter of the pipe.

C150.305 Sanitary Sewer, Storm Sewer and Drain Pipe Installation

A. Grading and Aligning Pipe

1. Service connection pipe shall be laid to line and grade and in the location shown on the Plans or as determined by the City Engineer.
2. Work done without proper location from base lines, offset stakes, bench marks, or other basic reference such as provided by modern line and grade control equipment shall be removed and replaced at the Contractor's expense.
3. Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.

4. Sanitary sewer service pipe shall have a fall of not less than 1/4 inch to the foot for 4" pipe and 1/8 inch per foot for 6-inch pipe, except as specifically approved by the City Engineer.

B. Placing Sewer Pipe

1. Each section of service connection pipe (sanitary sewer, storm sewer, or drain) shall have a firm and uniform bearing throughout its entire length.
2. The ends of sewer service connections shall be sealed with a plug conforming to the requirements of Section C150.200 in this specification. Sub-drains will be plugged with a suitable cap or plug. Pipe shall be laid with the bell or grooved end upgrade.
3. Installing PVC Pipe
 - (a) PVC pipe shall be bedded and encased using specified materials. Pipe placement shall be in accordance with the pipe manufacturer's recommendations.
 - (b) The maximum allowable radial deflection shall be 5% of the diameter of the pipe.
 - (c) PVC sub-drain pipe shall be laid with the perforation down.
4. The sanitary sewer service pipe risers shall be constructed in accordance with the City Standard Detail Plates.
5. Cleanouts shall be placed at a maximum 100-foot intervals.
6. Connections with Mains or Structures
 - (a) Sanitary Sewer Service connections shall be made at the main using tees, wyes, or City installed taps. Manhole connections will be permitted only where approved by the City Engineer.
7. Storm Sewer Connections
 - (a) Connections to storm sewers shall be made with manholes, junction boxes, tees or cut-ins in accordance with the applicable standard detail plates of the City of St. Charles.
 - (b) Near a tee or wye, where compression joint cannot be made with a commercial adapter, the connection shall be made by tapping the main. The existing connection shall be abandoned by plugging within 5 feet of the main.
 - (c) Sewer services to be abandoned in place shall be disconnected and plugged with a pressure plug or the end filled with concrete at the property line. A compression plug shall be used when disconnecting at the wye or tee connection.

C150.306 Water Service Installation/Abandonment

A. Grading and Aligning Pipe

1. Service connection pipe shall be laid to line and grade and in the location shown on the Plans or as determined by the City Engineer.
2. Work done without proper location from base lines, offset stakes, bench marks, or other basic reference such as provided by modern line and grade control equipment shall removed and replaced at the Contractor's expense.
3. Dropping, jolting, striking, or other such methods of manipulating pipe to proper grade and alignment will not be permitted.

B. Copper Water Service

Copper Water Service pipe may be spliced only with a brass union. Copper Water Service pipe shall not be spliced except as follows:

1. When the length of 1-inch water service between the curb stop and the water meter connection exceeds 100 feet. Only one splice will be permitted for each addition 100 feet of service.

2. When the length of 1 ½ inch water service between the curb stop and the water meter connection exceeds 60 feet. Only one splice will be permitted for each addition 60 feet of service.
3. When the length of 2-inch water service between the curb stop and the water meter connection exceeds 40 feet. Only one splice will be permitted for each addition 40 feet of service.
4. When a copper service is repaired, a minimum number of splices will be permitted.
5. During water main replacements, one splice will be permitted on services running to the side of the new water main on which the existing water main lies.

Water service taps on watermains shall be tapped at 45 degrees on the appropriate upper quadrant of the main. A distance of at least 12 inches shall separate taps and no tap shall be made within 12 inches of a pipe joint. Corporation threads shall be wrapped with double wrap of three mills Teflon before installation. 1-1/2inch and 2 inch service pipe shall have a 45 degrees bend connected to the corporation stop to facilitate the downward expansion loop. Corporation stops for 1-1/2 inch and 2-inch services shall be connected to the main with a double strap ductile iron service saddle. Immediately after the water service connection has been placed from the main to the curb stop and the curb stop installed, it shall be flushed with water from the main by having the curb stop valve in the fully opened position.

Small lead, galvanized iron or copper water services to be abandoned shall be disconnected by closing the corporation stop at the main. The pipe shall be cut off one foot from the corporation stop, pinched closed, and the curb box riser section removed. Larger cast iron or ductile iron services shall be abandoned as follows: Tapping sleeves and lead caulked joint tees shall be cut out and replaced with a new section of watermain; for mechanical joint type tees, the service pipe shall be removed and a mechanical joint plug installed.

C. Water Service Appurtenances

1. Curb Box

- (a) Curb boxes shall be set in the extended position 6"-12" above grade in areas where finish grading is yet to be completed. After completion of the finished grading, the upper box section shall be adjusted and the curb box operated to verify proper alignment.
- (b) In areas where the finished grade is established the curb box shall be adjusted to the Extended position and set to finished grade and the curb box operated to verify proper alignment.
- (c) Prior to setting of curb box the metal stops of curb box upper section shall be removed and the split-locking ring in base section shall also be removed.
- (d) A 2"x4" stake, or other approved substantial indicator; extending three feet above grade shall be placed by the curb box to mark the location of the box. The marker shall also identify the address number of the property.

2. Curb Stop

- (a) A concrete brick shall be placed immediately below the curb stop for it to rest on.
- (b) Where the water service is not being extended to the building immediately, the open end of the curb stop shall be protected by installing a 12-inch long piece of copper and smashing the end of the copper. Alternate cap methods require approval of the City Engineer and must prevent soil from entering the copper pipe and minimize the water leak should the curb stop be accidentally opened.

C150.307 Record Location

The Contractor shall keep accurate record of wye; curb box and corporation stop locations. Upon completion of service construction the sheet shall be submitted to the City Engineer.

C150.308 Trench Backfilling

All trenches shall be backfilled as soon as practicable. Compaction by "Compacted Trench Backfill" method, as specified below, will be required on all service connection construction.

When suitable material is not available from project excavations the City Engineer may order the procurement of select material for backfilling or for blending with existing material. The quantity and quality of the imported selected material shall be subject to the approval of the City Engineer.

Placing and compacting of trench backfill including blending of materials, adding moisture or drying of materials, and procuring suitable materials from excavations within the project shall be considered as incidental to trench excavation or to the items for pipe.

C150.309 Compacted Trench Backfill

Bedding and encasement material shall be carefully placed by hand methods and tamped around and over the sewer and water connection to a depth 1-foot above the top of the pipe. The remainder of the backfill shall be placed in layers of uniform depth not exceeding 12 inches per layer and compacted to City Standards.

Backfill material shall be Select Material for Backfill as defined in Backfill Material Section of this specification, except that whenever a 'street cut' is required, Granular Backfill Material shall be used in and within 3 feet of the right of way line.

Backfill material placed within 3 feet of subgrade shall be compacted to a density of not less than 100 percent of maximum density and the relative moisture content shall be not more than 102 percent of optimum moisture content. Subgrade shall be defined for this section as the elevation of the bottom of any aggregate material placed for pavement or sidewalk or the bottom of the topsoil for turf establishment.

Backfill material placed more than 3 feet below the subgrade shall be compacted to a density of not less than 95 percent of maximum density and the relative moisture content shall be not more than 115 percent of optimum moisture content.

Maximum density and optimum moisture shall be determined using the methods described in the current edition of the Mn/DOT Grading and Base Manual.

C150.310 Resurfacing and Restoration of Public and Private Property

A. Street and Alley Resurfacing and Restoration

1. The terms and requirements indicated in the City Street Opening Permit, issued for this project shall govern. The following requirements shall apply except if in direct conflict with the listed permit conditions.
2. Adequate protection shall be afforded to ensure the safe prosecution of the work with minimum of inconvenience to safe public vehicular and pedestrian traffic. Barricades, warning lights, and other traffic control signs and devices shall be placed and maintained in accordance with the Manual of Uniform Traffic Control Devices and as directed by the City Traffic Engineer. At least one lane of traffic shall be maintained at all times unless specific authorization is received from the City Traffic Engineer. Any time traffic is closed to one lane, the Contractor shall provide flaggers the direct the flow of traffic.
3. All streets and alleys shall be restored with aggregate base and pavement section existing before work commenced or as described below, whichever is more substantial.

4. Any off site material needed to backfill the trenches, to re-fill settlements, or to properly restore the original condition of the streets, alleys, public or private property shall be furnished by the Contractor.

5. All restoration work shall be done according to the following schedule:
 - (a) Gravel surfaced areas
 - 1 Shall be restored using a minimum of 6" of crushed rock conforming to Mn/DOT Specification 3138 – Class 2. The crushed rock shall be compacted to 100% of Standard Proctor Density and graded to the shape of the existing surface.

 - (b) Bituminous Surfaced Streets
 - 1 Patches in multi-layer bituminous streets shall be the same number and compacted thickness of the layers found in the original construction with no layer exceeding 2 1/2" in compacted thickness.
 - 2 Unless otherwise directed by the City Engineer, a tack coat shall be applied at a rate directed by the City Engineer but not to exceed 0.05 gallons per square yard between successive layers of the bituminous patch.
 - 3 The City Engineer shall delineate the limits of the area of bituminous surface to be removed. Sawing along the final removal line shall be required.
 - 4 Bituminous surfaced streets shall be restored to their cross section using aggregate base material and bituminous mixtures consistent with the city's Standard Specifications for bituminous pavement. The minimum thickness of the bituminous portion of the restoration shall be 3 inches, but in no case shall the thickness be less than the abutting pavement. The minimum compacted thickness of the aggregate base in the trenched area shall be 6 inches, but in no case less than the existing aggregate base.
 - 5 The finished surface of the patch shall be uniform and smooth, shall conform to the adjacent surface. Bituminous patches shall be left approximately 1/4" above the edges of other fixed surfaces and installations such as catch basin castings, concrete gutter, slabs, etc.

 - (c) Concrete Surfaced Streets
 - 1 The provisions of this section shall apply to repairs of concrete surfaced streets, alleys and driveways and to the repairs of the concrete base under other types of surfacing.
 - 2 A Contractor licensed by the city to conduct concrete work within the public right of way shall complete patching of street openings in concrete paved streets.
 - 3 The limits of concrete surfacing to be removed shall be delineated by the City Engineer and shall generally be full panel replacement. The edges of the replacement panel shall be doweled or tied as directed by the City Engineer.
 - 4 Where the subgrade, sub-base or base is found to be unstable or yielding the unstable material shall be removed and replaced with stable material to a depth of not less than 12 inches. The replacement subgrade material shall be 'granular backfill' material and have a moisture content between 65% and 102% of optimum and shall be compacted to 100% Standard Proctor density.
 - 5 The base shall be restored to their original thickness, but not less than 6 inches, using Aggregate Base, Class 2 material. Immediately prior to placing the concrete, the base material and the exposed edges of the existing concrete shall be moistened.
 - 6 The concrete mixture shall be Mn/DOT Mix No. 3A32 or Mix No. 3A32 with 30% added cement for High Early Strength. Concrete shall contain 5% to 8% entrained air and produced in accordance with Mn/DOT 2461 by a concrete 'Ready Mix' plant.
 - 7 The concrete shall be placed and struck off to proper grade. The concrete shall be finished to match the surrounding concrete.

- 8 Joints shall be constructed and sealed in accordance with Mn/DOT 2301.3K and 2301.3N.
- 9 Curing shall be performed by application of a full coverage of Membrane Curing Compound meeting Mn/DOT Section 3754 with white pigment.

(d) In turfed areas

- 1 The top 6" of backfill shall be topsoil material. Any mowed grass area disturbed by the construction shall be replaced with 'Lawn Sod' meeting Mn/DOT Section 3878. Areas not regularly mowed shall be seeded in accordance with Mn/DOT Section 2575 as follows:
 - 2 Seed Mixture Number 65A applied at 150 pounds per acre.
 - 3 Mulch Material Type 5 Wood cellulose fibers applied at 1500 pounds per acre.
 - 4 Commercial fertilizer 12-12-12 applied at 500 pounds per acre.
 - 5 Nurse Crop Seed Mixture 110A applied at 80 pounds per acre.
6. The Contractor shall protect trees, shrubs, or any private, public, or park property. The Contractor shall, without cost to the City, replace any damaged shrubs and trees, unless they have been designated and marked for removal by the City.
7. The Contractor shall repair, relay, or replace all sidewalks, curbs or other street structures displaced or damaged because of the work done under these Specifications. All work of this nature shall be done in accordance with the Standard Specifications covering the particular work involved.

Section 4 METHOD OF MEASUREMENT

C150.401 Description

Services shall be measured by physical count (each). Services shall include all materials, equipment and labor needed to install the service as shown in the Detail Plates. The length of the service, is dependent upon the right-of-way (R.O.W.) widths on that project. The right-of-way widths are stated in the Proposal.

C150.402 Trench and Rock Excavation

Where an unstable trench bottom is encountered necessitating additional trench excavation in order to prepare the pipe foundation with stabilizing materials, the cost of such additional trench excavation shall be considered as incidental, with no direct compensation therefore. The stabilizing materials placed will be paid for in accordance with the applicable provisions of the Specifications and Proposal covering those items.

All solid rock encountered and removed within the specified limits of the trench shall be measured by volume (cubic yard) in place, and paid for within the following limits:

1. 6" below the bottom of the pipe when laid to grade,
2. 8" on each side of the outside of the pipe, with a minimum trench width of 36", said width extending vertically to the top of rock profile.

Where material is encountered which has physical characteristics (relative to difficulty of removal) lying between those of earth trench excavation and solid rock excavation, the engineer will determine and allow the Contractor payment for a percentage of the actual measured volume of such material at the contract unit price per cubic yard of Solid Rock Excavation. Such percentage will be based on the relative cost of removal of the two materials.

C150.403 Granular Materials

Granular materials furnished and placed as special foundation, bedding, encasement, or backfill construction will be measured by volume (cubic yard) 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.

C150.404 Sheeting

Sheeting shall be measured on a square foot basis. Sheeting ordered left in place will be measured and paid for by the square foot of the overall area of the front face of the sheeting including the cut-off sections, if any.

C150.405 Reconnect Existing Water Service

Reconnect Water Services shall be measured by physical count (each). They shall include all materials, equipment and labor needed to needed to reconnect the water service, as shown in the Plans. Bid item includes but is not limited to: corporation stop, and up to 8 feet of new service regardless of service size, (generally 1" services), for each reconnection. Service sizes if shown on the plans are approximate and no additional compensation will be made if services are of a different size.

C150.406 Reconstruct Existing Water Service Connections

Reconstruct Water Services shall be measured by physical count (each). They shall include all materials, equipment and labor needed to reconstruct the water service through the curb box, unless otherwise shown in the Plans. Bid item includes but is not limited to: corporation stop, copper tubing, curb box and all necessary fittings and adapters.

C150.407 Reconnect Existing Sewer Service Connections

Reconnect Sewer Services shall be measured by physical count (each). They shall include all materials, equipment and labor needed to needed to reconnect the sanitary sewer service, as shown in the Plans. Bid item includes but is not limited to: sleeves, wye, tee, bends and up to 8 feet of new service, regardless of service size, (generally 4" services), for each reconnection. Service sizes if shown on the plans are approximate and no additional compensation will be made if services are of a different size.

C150.408 Reconstruct Sewer Services Connections

Reconstruct Sewer Services shall be measured by physical count (each). They shall include all materials, equipment and labor needed to reconstruct the sanitary sewer service to the boulevard, unless otherwise shown in the Plans. Bid item includes but is not limited to: sleeves, wye, tee, bends, trenching and 4" sewer pipe, for each reconstruction.

Section 5 BASIS OF PAYMENT

C150.501 Description

Payment for construction of (Water, Sanitary, Storm, and Sub-Drain) Service Connections shall include all costs for trenching in earth, furnishing and installing service connections from public mains to boulevard, including corporation stop and tapping for same, curb stop and box, plugs, fittings, and adapters, compacted trench backfill, and replacement of surfacing.

Payment will be made for solid rock at the price per cubic yard contained in the Proposal for all rock excavated to the width and depth required by the Plans and Specifications and shall include the cost of refilling the rock sections with approved material to the proper grade for laying pipe.

Granular materials furnished for foundation, bedding, cover, or backfill placement as specified in connection with service 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 service item without any direct compensation being made.

In the absence of special payment provisions:

1. 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.
2. 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.

C150.502 Items List

Payment for construction of (Water, Sanitary, Storm, and Sub-Drain) Service Connections will be made on the basis of the following schedule:

ITEM NO	ITEM	UNIT
C150.701	__" Sanitary Sewer and __" Water Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.702	__" Sanitary Sewer and __" Water and __" Sub-Drain Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.703	__" Sanitary Sewer Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.704	__" Water Sewer Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.705	__" Sub-Drain Sewer Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.706	__" Storm Sewer Service Connections Stubbed to P.L. (__' R.O.W.)	Each
C150.707	Sheeting Left Inplace	Square Foot
C150.708	Select Material for Backfill	Cubic Yard
C150.709	Granular Material for Backfill	Cubic Yard
C150.710	Aggregate for Pipe Foundation (Gradation __)	Cubic Yard
C150.712	Solid Rock Excavation	Cubic Yard
C150.783	Remove Existing Water Service	Each
C150.784	Remove Existing Sewer Service	Each
C150.786	Reconnect Existing Water Service Connections	Each
C150.786	Reconstruct Existing Water Service Connections	Each
C150.787	Reconnect Existing Sewer Service Connections	Each
C150.787	Reconstruct Existing Sewer Service Connections	Each

**TRENCH EXCAVATION, BACKFILL &
SURFACE RESTORATION
SPECIFICATIONS
T100**

St. Charles, MN

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Section 1 GENERAL REQUIREMENTS

T100.101 Description

This work shall consist of the excavation, backfilling, and restoration of existing surface improvements for the purposes of installing new and/or relocating or adjusting existing underground utilities.

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 accepted as an enforceable component of the Contract or Contract Documents.

T100.102 Reference Documentation

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before 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.

Section 2 MATERIALS

T100.201 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 or as indicated in the Plans, Specifications, or Special Provisions.

T100.202 Granular Backfill

Granular backfill shall comply with Mn/DOT section 3149.2D except that in addition not more than 50% of the material shall pass the No. 40 sieve.

T100.203 Select Material for Backfill

Select Material for Backfill shall be sandy loam, sand, or gravel material approved by the City.

T100.204 Foundation Materials

Aggregate for pipe foundation shall comply with:

1. Gradation A Mn/DOT Section 3137 CA-3.
2. Gradation B Mn/DOT Section 3137 CA-1 as modified

Sieve Size	% Passing
3/4"	50 – 80
3/8"	0 – 15

T100.205 Fine Filter Aggregate

Fine filter aggregate shall comply with Mn/DOT Section 3149.2 J.

T100.206 Aggregate for Hydrant Drainage Pit

Aggregate for hydrant drainage pit shall consist of crushed limestone or gravel and shall meet the following gradation requirements:

Sieve Size	% Passing
2"	100
1 1/2"	85-100
1"	65-95
3/4"	50-80
3/8"	0-15

T100.207 Bedding and Encasement

Bedding and encasement materials shall meet the requirements of Mn/DOT Section 3138 Class 5.

T100.208 Miscellaneous Material

Any other miscellaneous material required in the work, but which is not specifically mentioned in these specifications, shall be new, unused, undamaged, and of a quality equal to the materials specified herein and shall be submitted to, and approved by, the City prior to its use.

T100.209 Granular Material Use Designations

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:

Material Use Designation	Zone Designation
Granular Foundation	Placed below the bottom of pipe grade as replacement for unsuitable or unstable soils, to achieve better foundation support.
Granular Bedding	Placed from a point six-inches below the bottom of pipe to the midpoint, prior to pipe installation, to facilitate proper shaping and to achieve uniform pipe support.
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 above granular encasement 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.

T100.210 Piling

Piling shall be constructed in accordance with the provisions of Mn/DOT Specification 2452 and special plan details relating to piling.

T100.211 Insulation

Insulation shall be constructed in accordance with the provisions of Mn/DOT Specification 3760 and the City of St. Charles Standard Plate.

T100.212 Geotextile Fabric

Geotextile fabric shall meet the requirements of Mn/DOT Specification 3733 and of the type as required by the Plans, Specifications, and Special Provisions.

T100.213 Steel Casing

Steel casing pipe shall meet the requirements of ASTM A53, minimum yield strength of 35,000 psi, and shall have a minimum wall thickness of 0.375-inch or as otherwise specified on the plans.

Section 3 CONSTRUCTION REQUIREMENTS

T100.301 Maintenance of Traffic

Whenever work interferes with the flow of traffic along a roadway, the Contractor shall provide for traffic control and signing and public safety in accordance with the provisions of the field manual of Temporary Control Zone Layouts of the Minnesota Manual of Uniform Traffic Control Devices and Mn/DOT 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 City. Where road closures or detours are permitted by the City, the City 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. The Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

T100.302 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 there from 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. Grade and line stakes will be set along the pipeline; at each change in line or grade; and as needed for pipeline appurtenances and service lines.

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 restaking.

No deviation shall be made from the required line or grade except with the consent of the City.

T100.303 Public Utilities

The Contractor shall be responsible to protect any existing utility from damage caused by or occurring during their operations. If the work requires excavation, the Contractor shall notify all utility owners by requesting on site utility locations using the state 'Gopher One-call' system. No existing public utility lines shall be disturbed by the operations of the Contractor, except those, which are specifically designated in the Special Provisions, without the express permission of the City. In case any of the aforementioned public utilities are broken or damaged in any way by the Contractor's operations, the owner of the utility shall be notified and damage repaired without delay. The cost of such repairs shall be paid by the Contractor or deducted from any estimates due him.

The locations of underground facilities shown on the plans are approximate only, and are shown only for the Contractor's general information. The city does not assume responsibility for showing all utilities on the plans. The Contractor shall use suitable precautions to prevent damage to pipes, conduits, and other underground or overhead structures.

T100.304 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 City. Within the construction limits, as required, the removal of improvements such as paving, curbing, walks, turf, etc., shall be subject to 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 City 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.

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 City and without cost to the Owner.

T100.305 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 Mn/DOT Specification 2104. 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 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 within the project or become property of the City and be relocated as approved by the City.

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 City reserves the right to order discontinuance of drop weight breaking operations at any time.

T100.306 Operational Limitations and Requirements

Excavating operations shall proceed only so far in advance of pipe laying as will satisfy the needs for coordination of work in a single day and permit advance verification of unobstructed line and grade as planned. 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.

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

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

The excavating operations shall be conducted so as to carefully expose all in-place 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 and power or communication cables.

The City 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 City'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 City directs. The hours of blasting operations shall be set by the City. 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.

T100.307 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 structure, 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 ordered by the City to produce an acceptable foundation. Unless otherwise indicated or directed, rock shall be removed to an elevation at least six-inches below the bottom surface of the pipe barrel and below the lowest projection of joint hubs. All excavations below grade shall be to a minimum width equal to the outside pipe diameter plus two feet. Rock shall be removed to such additional horizontal dimensions as will provide a minimum clearance of six-inches 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 of clearance on each side of the joint hubs. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet, subject to the considerations for alternate pipe loading set forth below. 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 level of the top of pipe may be exceeded only by approval of the City, 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 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.

T100.308 Preparation and Maintenance of Foundations

Foundation preparations shall be conducted as necessary to produce a stable, dry 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.

Whenever ground water or surface water is encountered, the Contractor shall provide suitable means for the removal of the same and in no case shall this water be allowed to flow into the sewer pipe (Sanitary Sewer or Storm Sewer) except with the permission of the City.

When quicksand or other unsatisfactory foundation soils are encountered, the Contractor shall immediately notify the City. Upon receiving such notice, and after an inspection has been made, the City may direct the work to proceed in accordance with Mn/DOT section 1403 Extra Work.

T100.309 Sheeting and Bracing Excavations

All excavations shall be sheeted, shored, and braced as will meet all requirements of the applicable safety codes and regulations; comply with any specific requirements of the Contract; and prevent disturbance or settlement of adjacent surfaces, foundations, structures, utilities, and other properties. Any damage to the work or to adjacent structures caused by settlement, water or earth pressures, or other causes due to failure or lack of sheeting, shoring, or bracing or through negligence or fault of the Contractor in any manner, shall be repaired at the Contractor's expense and without delay.

The Contractor shall assume full responsibility for proper and adequate placement of sheeting, shoring, and bracing wherever and to such depths that soil stability may dictate the need for support to prevent displacement. Bracing shall be so arranged as to provide ample working space and so as not to place stress or strain on the in-place structures to any extent that may cause damage.

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 City. 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 or more below the established surface grade as the City may direct.

In the absence of special payment provisions, 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.

T100.310 Jacking/Boring

The terms "auger", "boring", "jack", "jacking", and "tunneling" in the proposal, specifications, and plans refers only to non-open cut construction. The Contractor shall inspect and verify soil conditions, in order to determine the type of construction to employ. During the construction, the Contractor shall be responsible for protecting all existing utilities above the pipe invert.

Voids between carrier and casing pipes shall be filled with sand and the casing pipe sealed at both ends with a suitable material to prevent water or debris from entering the casing pipe.

For watermain installation, the casing pipe diameter shall be as shown on the Plans. For other than watermain installation, the minimum diameter of the casing pipe shall be four (4)-inches greater than the outside diameter of the bell of the carrier pipe. For any installation beneath a railroad, the top of the casing pipe shall not be closer than the specified dimensions indicated in the permit.

The Contractor shall prevent excavated materials from flowing back into the excavation during the non-open cut construction. The machine used shall be capable of controlling line and grade. No jacking/auguring 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 auguring operations.

If any installation is augured, the auger shall lead the casing or carrier pipe by no more than one-inch. All voids caused by jacking or boring shall be filled by pressure grouting. The grout material shall consist of sand-cement slurry of at least two sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.

T100.311 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 Contractor shall submit boring/drilling pit locations to the City before beginning construction.

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 without intermediate pits, a minimum distance of 200 feet. The guidance system shall be capable of installing pipe within 1-1/2-inch of the plan vertical dimensions and 2-inches of the plan horizontal dimensions. The Contractor shall be required to 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. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

T100.312 Placement of Insulation

Rigid insulation board shall be placed within the pipe encasement zone, 6-inches above the pipe. Prior to placement of the insulation, encasement material shall be leveled and compacted 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, then leveled and lightly scarified to a depth of 1/2-inch. Encasement zone material placed below the insulation shall be free of rock or stone fragments measuring 1-1/2-inches or greater.

Insulation boards shall be placed on the scarified material according to the Detail Plate. 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 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 precaution to insure that all joints between boards are tight during placement and backfilling with only extruded ends placed end-to-end or edge-to-edge.

The first layer of material placed over the insulation shall be 6-inches in depth, free of rock or stone fragments measuring 1-1/2 inches or greater. The material shall be placed in such a manner that construction equipment does not operate directly on the insulation and shall be compacted with equipment, which exerts a contact pressure of less than 80 psi.

T100.313 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 on a section-by-section basis. All operations shall be pursued diligently, with proper and adequate equipment, as will 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, without loading and hauling or the employment of unreasonable measures, the required additional materials shall be furnished from outside sources as an Extra Work item in the absence of any Special Provision requirements.

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

Within the pipe bedding and encasement zones described as that portion of the trench which is below an elevation one foot above the top of the pipe, the materials placed shall be limited in particle size to 1 – 1/2-inches maximum in the case of pipe of 12-inches in diameter or less and to 2-inches maximum in the case of larger pipe. Above these zones, the placement of material containing stones, boulders, chunks, etc. greater than 8-inches in any dimension shall not be allowed in the road section.

All flexible pipes shall be bedded in accordance with ASTM Specification D2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". This shall include placement of granular bedding and encasement materials from a point six-inches below the bottom of pipe to a point twelve-inches above the top of the pipe. Placement and compaction of bedding and encasement materials around the pipe shall be considered incidental to the installation of the pipe. Where existing soils do not meet the requirements of bedding and encasement materials the Contractor shall furnish the required granular materials.

All surplus or waste materials remaining after completion of the backfilling operations shall be disposed of in an acceptable manner within 24 hours after completing the backfill work on each particular pipeline section. Disposal at any location within the project limits shall be as specified, or as approved by the City; otherwise, disposal shall be accomplished outside the project limits by the Contractor at the City's discretion. The backfilling and surplus or waste disposal operations shall be a part of the work required under the pipeline installation items, not as work that may be delayed until final cleanup.

T100.314 Compaction of Materials

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 12-inches thick spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline. Backfill may be placed in 12-inch layers above an elevation one-foot above the top of the pipe.

Compaction of backfill within Roadbed areas shall meet the density requirements of Mn/DOT Specification 2105.

Compaction of backfill in all other areas shall be compacted effectively, by approved mechanical or hand methods, until there is no further visual evidence of increased consolidation.

Until expiration of the warranty 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 additional cost to the City.

Any pronounced settlement of road surfaces that are either placed under this Contract or by others under either public or private contract and that are within the guarantee period shall be considered failure of the mechanical compaction. The Contractor shall be required to repair such settlement including all items placed by others.

T100.315 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 City'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 therefore. 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.

T100.316 Turf Restoration

Turf restoration shall be accomplished by sod placement except where seeding is specifically allowed or required.

Topsoil shall be placed to a minimum depth of three-inches under all sod and 6-inches in all areas seeded. The topsoil material used shall be light friable loam containing a liberal amount of humus and shall be free of heavy clay, coarse sand, stones, plants, roots, sticks and other foreign matter. Topsoil meeting these requirements shall be selected from the excavated materials to the extent available and needed.

All turf establishment work shall be done in substantial compliance with the provisions of Mn/DOT Specification 2575 using seed mixtures as specified in the Special Provisions or Proposal.

T100.317 Pavement Restoration

The in-place pavement structure (including base aggregates) shall be restored in kind and depth as previously existed, using base aggregates salvaged from the excavated materials to the extent available and needed, and with new materials being provided for reconstruction of the concrete or bituminous surface courses.

The minimum thickness of the bituminous portion of the restoration shall be 4-inches, but in no case shall the thickness be less than the abutting pavement. The minimum compacted thickness of the aggregate base in the trenched area shall be 6-inches, but in no case less than the existing aggregate base.

Reconstruction of aggregate base courses and concrete or bituminous surface courses shall be in substantial compliance with all applicable Mn/DOT Specifications pertaining to the item being restored. The materials used shall be comparable to those used in the in-place structure, and the workmanship and finished quality shall be equal to that of new construction to the fullest extent obtainable in consideration of operational restrictions.

Existing concrete and bituminous surfaces at the trench wall shall be sawed or cut with a cutting wheel to form a neat edge in a straight line before surfaces are to be restored. Sawing or cutting may be accomplished as a part of the removal or prior to restoration at the option of the Contractor. However, all surface edges will be inspected prior to restoration.

T100.318 Restoration of Miscellaneous Items

Wherever any curbing, curb and gutter sections, pedestrian walks, fencing, driveway surfacing, or other improvements are removed or in any way damaged or undermined, they shall be restored to original condition by repair or replacement as the City considers necessary. Replacement of old materials will be acceptable only to the extent that existing quality can be fully achieved such as in the case of fencing. Otherwise new materials shall be provided and placed as the City directs. Workmanship and finished quality shall be equal to that of new construction, where new materials are used, to the extent obtainable in consideration of operational restrictions. No direct compensation will be made for furnishing and placing this material even though such course was not part of the original construction.

T100.319 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 as being a part of the work covered under the Contract Items involved and only that work which cannot be accomplished at any early time shall be considered as final cleanup work not attributable to a specific Contract Item.

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

Maintenance of sodded and seeded areas shall include adequate watering for plant growth and the replacement of any dead or damaged sod as may be required for acceptance of the work.

T100.320 Maintenance and Repair

The Contractor shall guarantee all work relating to the Specifications for a period of (2) years from the date of acceptance of the work or project. The Contractor shall make all needed repairs arising out of defective workmanship or materials, which in the judgment of the City shall become necessary during such period. If within ten days after the mailing of a notice in writing to the Contractor, the said Contractor shall neglect to undertake, the aforesaid repairs, the City is hereby authorized to make such repairs. The Contractor shall reimburse the City for the costs of such repairs or the City may require reimbursement therefore from the surety of the Contract Bond.

Section 4 METHOD OF MEASUREMENT

T100.401 Description

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.

T100.402 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 (12" from each side). The minimum width of measurement shall be three feet.

T100.403 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.

T100.404 Piling

Piling shall be measured according to the provisions of Mn/DOT Specification 2452.

Pile bents shall be measured as a unit and shall include all materials and labor required, except the pile.

T100.405 Sheeting

Sheeting shall be measured on a square foot basis. Sheeting ordered left in place will be measured and paid for by the square foot of the overall area of the front face of the sheeting including the cut-off sections, if any.

T100.406 Insulation

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

T100.407 Geotextile Fabric

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

Section 5 BASIS OF PAYMENT

T100.501 Description

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.

Granular materials furnished for foundation, bedding, encasement, 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.

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.

T100.502 Items List

Payment for construction of Trenching will be made on the basis of the following schedule:

ITEM NO	ITEM	UNIT
SEWER		
S100.501	Trench Excavation for pipe 24" & under	Linear Foot
S100.502	Trench Excavation for pipe over 24"	Linear Foot
S100.503	Trench Excavation Common Trench	Linear Foot
S100.504	Sheeting Left Inplace	Square Foot
S100.505	Select Material for Backfill	Cubic Yard
S100.506	Granular Material for Backfill	Cubic Yard
S100.507	Aggregate for Pipe Foundation (Graduation _____)	Cubic Yard
S100.508	Filter Material	Cubic Yard
S100.510	Furnish & Install Polystyrene Insulation ___" thick	Square Foot
S100.511	Concrete Cradles (Class "A" Bedding)	Cubic Yard
S100.512	Solid Rock Excavation	Cubic Yard
S100.515	Jack & Auger ___" Pipe (Specify Size & type of Pipe)	Linear Foot
S100.516	Jack & Auger ___" Steel Casing	Linear Foot
WATER		
W200.501	Trench Excavation for pipe 14" & under	Linear Foot
W200.502	Trench Excavation for pipe over 14"	Linear Foot
W200.504	Sheeting Left Inplace	Square Foot
W200.505	Select Material for Backfill	Cubic Yard
W200.506	Granular Material for Backfill	Cubic Yard
W200.507	Aggregate for Pipe Foundation (Graduation _____)	Cubic Yard
W200.509	Furnish & Install Concrete Insulation	Linear Foot
W200.510	Furnish & Install Polystyrene Insulation ___" thick	Square Foot
W200.512	Solid Rock Excavation	Cubic Yard
W200.512	___" Trenchless Watermain (HDPE DR-11)	Cubic Yard
W200.529	Furnish & Install ___" PVC Watermain Directional Bore	Linear Foot
W200.537	Furnish & Install ___" Steel Casing	Linear Foot
W200.538	Jack & Auger ___" Steel Casing	Linear Foot
W200.539	Furnish & Install ___" Concrete Pipe Conduit	Linear Foot

**SIDEWALK SPECIFICATIONS
C700**

**Rochester, MN
2000**

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Section 1 GENERAL REQUIREMENTS

C700.101 Description

These specifications shall apply to the construction and restoration of sidewalks installed for improvement of pedestrian facilities. The work includes the construction of concrete walk and other related items as specified

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 accepted as an enforceable component of the Contract or Contract Documents.

C700.102 Reference Documentation

All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before the date of advertisement for bids. All references to other Specifications of AASHTO, ASTM, ANSI, etc. shall mean the latest published edition available on the date of advertisement for bids.

Section 2 MATERIALS

C700.201 Concrete

Concrete shall meet the requirements of the current Minnesota Department of Transportation Standard Specifications for Highway Construction, subject to the following specific requirements and limitations:

A. Mix Requirements

1. Concrete: Mn/DOT Mix No.3A32
2. Air-entrained with air content of 5% to 8%.
3. Compressive strength of 3900 psi.
4. Fly ash may be substituted for Portland cement up to but not to exceed 15% of the cement content.
5. For High Early strength concrete use Mix No. 3A32 with 30% additional cement.
6. No other admixtures will be permitted without specific approval for the specific project by the City Engineer.
7. Concrete walk constructed using concrete that fails to comply with any of these requirements shall be removed and reconstructed.

A batch ticket signifying the concrete mix design and the presence of any admixtures shall accompany each load of ready-mixed concrete. These tickets shall accompany the ready-mix truck driver. The ticket shall be available on the site to the representative of the Public Works Department. The Public Works representative shall take the ticket of any concrete not in compliance with the concrete specified in C700.2A1 and any non-compliant concrete shall be removed and replaced.

C700.202 Material Tests

Ready-mix concrete supplier shall submit to the City no later than May 1, an approved concrete mix design in accordance with Mn/DOT standard procedures with the following minimum schedule or frequency:

1. At least once annually for each mix.
2. At least once annually for each aggregate material stockpile from each aggregate source.
3. At least once annually for each Portland cement source.
4. Compressive Strength Test Cylinders
 - a) The City may take one three-cylinder test set of any concrete used for public sidewalks.
 - b) One cylinder of each set will be tested at 7 day and a second cylinder will be tested at 28 days. The third cylinder will be tested only if the 28-day test fails to meet specified strength.
 - c) All concrete sampling and testing will be done in accordance with the procedures described in the Minnesota Department of Transportation Concrete Manual. A certified lab will conduct cylinder compressive tests.
 - d) Should the test set fail:
 - (1) The Contractor, at its expense, shall have the right to challenge the test results by having the in place concrete tested by an independent, certified lab using a testing method approved by the City Engineer.
 - (2) Concrete sidewalk for which the tests fail shall be removed and replaced at the Contractor's expense.
 - (3) The frequency of city testing will be increased for that Contractor.

- (4) Repeated failures will be grounds for suspension or revocation of the Contractor's license.
- 5. Membrane Curing Compound shall meet the requirements of Mn/DOT Specification Section 3754 with white pigment.

Section 3 CONSTRUCTION REQUIREMENTS

C700.301 Public Utilities

The Contractor shall be responsible to protect any existing utility from damage caused by or occurring during their operations. If the work requires excavation, the Contractor shall notify utility owners by requesting on site utility locations using the state 'Gopher One-call' system.

The locations of underground facilities shown on the plans are approximate only, and are shown only for the Contractor's general information. The engineer does not assume responsibility for showing all utilities on the plans. The Contractor shall notify all public and private utilities of their work schedule, and use suitable precautions to prevent damage to pipes, conduits, and other underground or overhead structures.

C700.302 Notice to Property Owner and Removals

The Contractor shall notify each abutting property owner at least 3 days, but not more than 5 days in advance of starting work at each location. A copy of the notice form to the Property Owner is available at the Public Works Department.

After the notice time has expired, the Contractor shall begin the work by removing any old concrete, brick, flagstone, bushes, and other items within the sidewalk area including one foot each side of the sidewalk. Should the proposed sidewalk be located closer than one foot from the property line, the limit of the removal shall be the property line. Trees shall not be removed except upon specific request of the owner of said tree. Items removed shall be disposed of by the Contractor off the site in a manner acceptable to the Public Works Department and the owner of the disposal site.

C700.303 Limits of Excavation and Restoration

Excavation depth shall be the thickness of the new sidewalk plus aggregate, tapered at no less than 1 to 1 slope upward and outward. Loose and loosely compacted materials shall be removed. Disturbed areas outside the construction limits shall be replaced in kind at the Contractor's expense.

1. Turf Areas - The Contractor shall limit the removal and excavation width to 12" (inches) on each side of the sidewalk. After completion of the sidewalk, excavated areas adjacent to the sidewalk shall be regrading to match existing lawn and/or paved areas and backfilled with topsoil to an elevation that will leave the top of the sod placed approximately 1" (inch) below the top of the sidewalk.
2. Aggregate Driveways - The Contractor shall limit the removal and excavation width to 12" (inches) on each side of the sidewalk. After completion of the sidewalk, excavated areas adjacent to the sidewalk shall be backfilled with substantially the same type of aggregate materials as those in the existing driveway.
3. Bituminous Driveways - The Contractor shall limit the excavation to a distance of 2' (feet) from the sidewalk. The existing bituminous shall be saw cut or Colter cut in a straight line parallel with the edge the sidewalk and at a distance of not less than 2' (feet) from the sidewalk. After completion of the sidewalk, excavated areas adjacent to the sidewalk shall be replaced with not less than 6" (inches) Class 2 Aggregate Base. Aggregate Base shall be uniformly graded to allow the placement of bituminous material at a thickness equal to the existing bituminous but not less than 3" (inches).
4. Concrete Driveways - The Contractor shall limit the removal and excavation only to the edge of the sidewalk segments being replaced. Excavation depth shall be to the base of the existing concrete driveway, then tapered at 1 to 1 slope to a depth of 12" (inches). Loose and loosely compacted materials shall be removed. Undermining of existing concrete driveway shall be repaired before placing aggregate base for the sidewalk. Concrete driveway undermining shall be

repaired using premixed concrete (Sackrete or equal) and water. Packing sand or gravel into the void shall not be permitted. The mixture shall be packed into the void and shaped with a vertical face. Mixture shall not extend under the new sidewalk. After the undermine repair has been completed, the aggregate base under the sidewalk may be placed. If abutting driveway concrete is damaged during the sidewalk removal, excavation, or any other portion of the work, the Contractor shall remove and replace the entire damaged concrete driveway panel. Partial panel removal shall not be permitted. If the damaged driveway does not have clear jointing pattern, the Contractor shall saw cut the driveway in a line parallel to the new sidewalk at a distance from the new sidewalk that will fully remove the first "crack" that approximately parallels the sidewalk. The driveway between the sidewalk and the saw cut shall be removed and replaced at the same thickness as the existing concrete driveway but not less than the thickness of the new sidewalk.

Should the proposed sidewalk be located closer than one foot from the property line, the limit of the removal shall be the property line.

At any time the work requires removal of any portion of an existing driveway or sidewalk located on private property, the property owner shall be fully informed before the removal begins. The property owner shall be advised as to the nature of any damage caused to their property and as to the extent and type of repairs planned. If the repairs are the direct or indirect result of the Contractor's work, the repairs will be completed at the Contractor's expense.

C700.304 Tree Roots

In areas where tree roots are encountered within the zone described in the Limits of Excavation and Restoration, the roots shall be cleanly cut with a saw at the edge or bottom of the excavation and removed. No construction method, which disturbs the roots outside of this zone, shall be permitted.

Tree root removal and disposal shall be incidental to other work items.

C700.305 Width and Thickness

Concrete walks in R -1 & R -2 residential areas shall be a minimum thickness of 4" (inches). Walks shall be 4' (feet) wide along residential streets with a total right of way width of 56' (feet) or less. Streets with a total right of way width of more than 56' (feet) shall be 5' (feet) wide, unless otherwise designated by the City Engineer or shown on the Plans.

Walks in the Central Business District, commercial, industrial, and multiple dwelling zones of R-3 & R-4 or walks in areas of commercial, industrial, and R-3 and R-4 use shall have a minimum thickness of 5" (inches). Walks in areas of commercial, industrial, and R-3 and R-4 shall be a minimum 5' (feet) wide, unless otherwise designated by the City Engineer or shown on the Plans.

Walks across vehicular entrances (existing or future) shall conform to the following minimum thickness requirements:

1. 6" (inches) for single dwelling entrances in R -1 & R -2;
2. 7" (inches) for the Central Business District, commercial, industrial, multiple dwelling entrances and alleys.

The driveway apron between the sidewalk and the street pavement or concrete curb shall be constructed in accordance with the Standard Plates.

C700.306 Preparation of Foundation Base

The soil under the proposed walk shall be excavated or filled to bring it to "foundation level". Foundation level shall be 1" below the bottom of the concrete walk, and 4" below in driveway entrances.

Sod, vegetable material, topsoil and frozen soil shall be removed from the area below the proposed walk. Wherever wet, spongy, soft, or unstable material is encountered below the foundation level, such material shall be excavated to a depth directed by the City Engineer. These over-excavations shall be backfilled with uniform select material and compacted to 100% Standard Proctor Density

Backfill shall be made of a uniform select material provided by the Contractor, placed in layers not exceeding 4" (inches) thick and compacted to 100% Standard Proctor Density. Backfill may be clay or granular materials. Clay material shall have a moisture content within 2% of optimum. Granular materials shall have a moisture content of at least 80% of optimum.

Embankment and soil fill, other than those soils used to replace unsuitable material, shall include the area from 12" (inches) either side of the proposed walk and sloping downward and outward at a 1 to 1 slope. Fill shall be made of a uniform select material provided by the Contractor, placed in layers not exceeding 6" (inches) thick and compacted to 100% Standard Proctor Density. Fill may be clay or granular materials. Clay material shall have a moisture content within 2% of optimum. Granular materials shall have a moisture content of at least 80% of optimum.

The surface shall be graded to within 3/8" (inch) of the specified elevation.

C700.307 Forms and Grades

Forms shall be not smaller than commercial 2x4 lumber for 4" (inch) walks, 2x6 for 5" (inch) and 6" (inch) walks, and 2x8 for 7" (inch) walks and shall be sufficiently rigid to withstand the operations of placing and finishing the concrete.

Good quality commercial 2" (inch) lumber or rigid steel forms shall be used except that flexible strips properly staked may be used on curves. Sections of straight forms 10' (feet) long or shorter may be used for curves having a radius of 300' (feet) or more. Lumber face against which the concrete is placed shall be free of knot holes, large chips or similar imperfections.

The top of the form shall be set true to line and grade. Unless otherwise noted in the Plans, Detail Plates, or Special Provisions, or directed by the City Engineer, the forms shall be set so that the completed walk will slope 1/4" (inch) per foot toward the street. Forms shall be securely staked and braced to hold their alignment during construction of the walk to within 1/8" (inch) of the specified line and grade.

All forms must be clean before using and shall be oiled with a light, clear, commercial paraffin form oil before concrete is placed.

Forms shall remain in place for a period of not less than 24 hours after placement of the concrete. Special care shall be taken when removing forms to avoid damage to the edges and the surface of the new concrete. The practice of using temporary forms or headers that are removed while the concrete is plastic shall be permitted, however the outside forms shall remain in place for not less that 24 hours.

C700.308 Joints

Walks shall be divided into panels by expansion and contraction joints. Joints shall be spaced at approximately 5' (foot) intervals. Wherever practicable, joints shall align with like joints in adjoining work. No panel shall have an area exceeding 40 square feet.

Joints shall be parallel with or perpendicular to the centerline of the walk. Jointing layout shall avoid angles of less than 75 degrees. Panel widths of less than 3 feet or more than 7 feet shall not be permitted. The length to width ratio for panels shall not exceed 1 to 1.5.

Contraction joints shall be saw cut not more than 3/16" (inch) in width and shall be cut to a depth of at least 1/3 the thickness of the walk.

Expansion joints shall be 1/2" (inch) wide unless otherwise specified, shall be the full thickness of the walk, and shall be of pre-formed expansion joint material. Expansion material secured in a manner that will prevent movement or displacement during the placement of the concrete.

Expansion joints shall be placed in the following locations:

1. Along any abutting masonry.
2. Along the foundation of any building.
3. Along concrete curb.
4. All around the intersection of two public walks.
5. Around any concrete base or structure
6. Along both sides of abutting concrete driveways.
7. At intervals not exceeding 100' (feet) and at all property lines known or indicated on the Plans.
8. As directed by the City Engineer.

Sawing of joints shall be conducted as soon as the condition of the concrete permits and before any random cracking occurs.

C700.309 Posts and Utility Boxes

Posts for parking meters, street signs, or other installations shall be surrounded with a 1/4" (inch) or thicker sleeve. Future post locations shall also be provided with sleeves. Sleeves shall be the full thickness of the sidewalk concrete shall be prevented from going under, through or to the inside of the sleeve.

Curb stops located in the sidewalk shall be set in the sidewalk in accordance with City Standard Plates.

All curb stops, valve boxes, frames, or covers within the limits of a concrete walk shall be raised or lowered as required, and be adjusted flush with the finished surface of the walk.

C700.310 Placing Concrete

Concrete shall be placed in accordance with the requirements of Mn/DOT Section 2521, subject to the following specific requirements:

1. At least 3 working hours notice shall be given the Engineer to provide for the inspection and of the base and forms before any concrete is placed. The Contractor before placing concrete as the Engineer prescribes shall complete corrections and adjustments to the base, forms, and other installations.
2. Immediately before the concrete is placed the base shall be moistened.
3. Concrete shall not be placed on a frozen material. Concrete shall not be placed when the air temperature is less than 35 degrees Fahrenheit nor shall it be placed when the air temperature is less than 40 degrees Fahrenheit and falling. Concrete placed whenever the predicted low temperature is less than 45 degrees Fahrenheit, cold weather protection shall be placed in accordance with Mn/DOT specifications. Cold weather protection shall continue for not less than 7 days.

4. The concrete placed shall be vibrated to remove voids and struck off to the required grade then floated smooth.

C700.311 Finishing

The surface of the sidewalk shall be trowel led to a dense and closed, but not glossy, finish. The edges of the walk shall be tooled with an approved edging tool in a manner that leaves a neat and smooth border.

Except for pedestrian ramps and other exposed aggregate areas, the surface shall be finished with a light brush finish using only tools approved by the City Engineer. Brushing shall be uniform and transverse at right angles to the centerline of the walk and shall be sufficient to eliminate any marks left by prior operations.

The surface shall not vary more than 1/8" (inch) from the elevation or the alignment specified. Joints shall not vary more than 1/4" (inch) from the prescribed alignment.

C700.312 Pedestrian Ramps

Pedestrian ramps shall be constructed in accordance with the City's Standard Plate. Grades shall not exceed the maximum grades shown on the Standard Plate.

C700.313 Central Business District and Boulevard Walk

Within the Central Business District, walks shall be placed abutting the street curb. Walk may not be installed abutting the curb in any other area, except with specific authorization by the City Engineer.

Walks within the Central Business District and walks placed abutting the street curb shall have special decorative pattern in accordance with City Standard Plate or as specifically approved by the City Engineer.

C700.314 Marking of Work

Contractors shall mark the new sidewalk using a suitable stamp. Stamp shall include the Contractor's name and the year in which the work was completed

One stamp marking shall be required in each of the following locations:

1. At each property line.
2. At a maximum of 100' (foot) intervals along the entire length of walk constructed.
3. On each separate area or section for lengths less than listed above, such as repair work, crosswalks, and partial frontage construction.
4. As directed by the City Engineer.

C700.315 Curing

Concrete shall be cured in accordance with the requirements of Mn/DOT Section 2521 as modified herein. Membrane Curing Compound meeting the requirements of Mn/DOT Specification Section 3754 with white pigment shall be applied. Application rate shall be adequately dense to visual cover the gray concrete with white pigment.

Plastic sheets shall only be used as protection from rain or as a portion of cold weather protection.

Cold weather protection shall continue for not less than least 7 days after casting. Straw, hay and similar loose materials shall not be used as cold weather protection.

C700.316 Backfill and Clean-up

After removal of the forms, all debris, excess material, tools and equipment shall be removed from the site within 48 hours.

In turf areas, approved topsoil material shall be placed against the sides of the walk to a minimum depth of 6" (inches) or the full excavation depth, which ever is less. The area shall be fine graded and all rocks of 1/2" (inch) diameter or larger shall be removed. The surface of the topsoil shall be firm, smooth, and uniformly graded. Topsoil shall be graded so that the surface of the sod is approximately 1" (inch) below the abutting sidewalk and the adjacent paved areas to allow for swelling of the sod grass root zone.

Turf areas outside the areas defined in the Limits of Excavation and Restoration shall be sodded at the Contractor's expense.

Turf areas within the areas defined in the Limits of Excavation and Restoration shall be sodded by the Contractor, unless otherwise specified in the special conditions for the Work.

Adjacent concrete walks and driveways, bituminous driveways, gutter lines and street areas shall be swept and left clean and free of debris.

The cost of backfilling and cleanup shall be incidental to the Work.

Section 4 METHOD OF MEASUREMENT

C700.401 Concrete Walk

Concrete Walk shall be measured by area computation – Each uniform thickness will be measured separately by top surface area.

C700.402 Pedestrian Curb Ramp

Pedestrian Curb Ramp shall be measured by physical count (each). They shall include all materials, equipment and labor needed construct the pedestrian ramp, as shown in the Plans.

Section 5 BASIS OF PAYMENT

C700.501 Description

Payment for pedestrian facility items at the Contract prices of each design shall be compensation in full for all costs of providing a complete-in-place pathway, including excavation, foundation preparation, backfilling, finishing, restoration of surface improvements, disposal of surplus or waste materials, final cleanup, and such other work as may be specified, but excluding the construction or materials, specifically designated for payment under other Contract Items.

C700.502 Items List

Concrete walk construction will be paid for on the basis of the following schedule:

ITEM NO	ITEM	UNIT
2521.501	___" Concrete Walk	Square Foot
2531.602	Pedestrian Curb Ramp	Each

**ENGINEERING
STANDARDS**

**For Public Works in Conjunction with the
Development of Subdivisions, Commercial &
Industrial Property**

**City of St. Charles
Public Works Department**

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Section 1001 SCOPE

1001.1 Description

In order to standardize engineering requirements for Developers and Engineers performing work within the City of St. Charles, it is important that certain guidelines be followed.

These guidelines outline certain requirements, materials, and standards that shall be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, storm water treatment ponds, watermains, service connections, pedestrian facilities, street construction, and associated erosion control within the St. Charles Urban Service Area, unless otherwise authorized by the City Engineer.

Compliance with these guidelines will help provide quality projects and assure uniform performance standards for the citizens of St. Charles.

1001.2 Engineering Requirement

As set forth in various sections of City ordinances, developers of property within the City are required to submit certain professionally prepared and signed plans and specifications for review and approval by the City. These include such items as grading plans, drainage reports, topographic surveys and plats, street and utility plans and specifications.

All plans and specifications for construction of public works shall be prepared by or under the direction of a Professional Engineer (herein after "Engineer") licensed under the laws of the State of Minnesota.

The Engineer shall be responsible for the accuracy and completeness of the plans and specifications and the thoroughness and quality of the field inspections. The Engineer shall be familiar with the St. Charles Code of Ordinances (as they relate to public works), the City of St. Charles Standard Specifications and the Minnesota Department of Transportation Standard Specifications for Construction.

The City Engineer will review the plans for general compliance with department practice. Approval of the plans and specifications by the City does not relieve the Engineer of full responsibility for the adequacy of design or accuracy of computations and details.

Engineering services include; preparation of plans and specifications, field staking and resident inspection in order to assure the City that the completed project is in conformance with the approved plans and specifications, and submission of record drawings.

1001.3 Definition of Terms

A. Public Works

Public Works as used herein are defined as those facilities for transportation, conveyance of sanitary and storm flows and potable water that are constructed within the public right-of-way or on public easements for the use of the general public. The Public Works Department is that department of the City of St. Charles responsible for the management and oversight of Public Works facilities.

B. Engineer

Engineer as used herein is defined as Professional Engineer licensed under the laws of the State of Minnesota.

C. City Engineer

City Engineer as used herein is defined as the St. Charles City Engineer or his / her designee, the Manager of Engineering.

D. Developer

Developer as used herein is defined as a person, company, corporation, or limited partnership that develops property within the City of St. Charles that is served by Public Works facilities.

1001.4 Reference Documentation

The following reference documentation shall be the latest edition, including amendments and published updates.

- 1.** Minnesota Department of Transportation (Mn/DOT)
 - (a) Standard Specifications for Construction
 - (b) Standard Detail Plates
- 2.** Great Lakes-Upper Mississippi River Board of State and Provincial Health and Environmental Managers
 - (a) Recommended Standards for Wastewater Facilities
 - (b) Recommended Standards for Water Works
- 3.** Minnesota Pollution Control Agency
 - (a) General Storm Water Control during Construction
- 4.** Minnesota Department of Health;
 - (a) Chapter 4715 Plumbing Code
 - (b) Chapter 4720 Public Water Supplies
 - (c) Chapter 4715 Wells & Borings
 - (d) Chapter 4715 Explores & Exploratory Borings
- 5.** City of St. Charles
 - (a) Standard Specifications for Street and Utility Construction
 - (b) Standard Detail Plates
 - (c) Grading Plan Checklist
 - (d) Building and Fire Prevention Code
 - (e) Ordinances
- 6.** Gopher One Rules

Section 1002 ROADWAY DESIGN

1002.1 Right-of-Way & Street Widths

The City of St. Charles Standard Detail Plates contains street widths for typical ROW.

On cul-de-sacs the minimum radius to back of curb shall be 50 feet with minimum ROW radius of 60'.

1002.2 Typical Cross-Section

Cross-slope – maximum 3% on driving lanes, 2% to 5% on parking lanes, 3% to 5% on boulevards.

A 2' clear zone area shall be provided from the face of curb to the face of any obstruction.

Sidewalk location – 1' from property line for streets with a right of way width of more than 56', 0.5' from property line for streets with a right of way width of 56' or less.

1002.3 Curbing

All streets shall be constructed with concrete curb and gutter on both sides of the street.

Curb and gutter shall be design B-624 in all commercial/industrial streets, all multi-family residential (more than 2 families per dwelling unit), all streets centerline grade of 8% or steeper, all intersection radii, at drainage structures, cul-de-sacs and on residential streets that are platted as 'Controlled Access' (or similar restriction).

Minimum longitudinal slope on curbing is 0.4%. Minimum longitudinal slope on curbing for streets leading to a cul-de-sac is 0.5%. The minimum longitudinal slope on curbing for the radial portion of a cul-de-sac is 1%.

4" drive over concrete curb and gutter will be permitted at one and two family residential areas where driveway locations have not been established and street grades are less than 8%.

Pedestrian ramps shall be placed at all intersection corners.

Where sidewalk abuts curb, the curb shall be modified to include a sill on the back on which the walk will rest.

Expansion joints shall be placed at the ends of all curved sections, at the ends of the curved portions of street returns, at drainage structures and where abutting other concrete. The spacing of joints shall not exceed 300 feet.

1002.4 Vertical and Longitudinal Controls

2% maximum longitudinal grade through intersections.

4% maximum grade through cul-de-sacs.

1002.5 Pavement Design

Unless otherwise directed by the City Engineer, the following pavement design shall be used:

The minimum structural sections for flexible pavements are as follows:

1. Local Streets – 7 Ton design, 4" bituminous surfacing with a total G.E. of 13 inches
2. Collector Streets – 9 Ton design, 4" bituminous surfacing with a total G.E. of 18 inches
3. Arterial Streets – 10 Ton design, 6" bituminous surfacing with a total G.E. of 24 inches

Rigid pavement (concrete) shall be considered on 10-ton design streets. All rigid and flexible pavements shall be designed in accordance with the procedures set forth in the Pavement Manual of the Minnesota Department of Transportation.

The pavement design shall be based on a soils investigation and analysis, which shall consider the supporting strength of the subgrade (R-value) to be used in design. Recommended measures shall be provided for special conditions such as excess moisture or highly expansive soils. If you chose to use a higher R-value than 10, or are constructing a 10-ton street, a soils report shall be prepared including; soil boring log, R-value test results, and pavement design.

1002.6 Future Side Streets

Where accesses to future subdivision of adjacent land are shown on the plans, right-of-ways and all roadway improvements including, pavement, curb and gutter, and utilities on the side street, shall be constructed and extended to the end of the side lot or the boundary of the development whichever is greater. Projected profiles and alignments of the future street shall be shown on the plans.

1002.7 Temporary Dead-End Streets

All temporary dead-end streets shall be closed with temporary barricades (MnDOT 8002F) and are to be fully reflectorized and properly maintained until the street is extended. Temporary cul-de-sacs are required unless waived by the City Engineer. Proper erosion control measures shall be taken to prevent soil erosion at the dead-end.

1002.8 Drive Approaches

See standard detail plates for requirements.

1002.9 Utility Lines

All utility lines shall be common trench as possible. The Developer shall coordinate utilities for joint use trench and be responsible for trenching and bedding as specified by the City Electrical Utility. No electrical wire or equipment will be installed prior to final grading.

1002.10 Location of Utilities

The general criteria for placement of utilities within the right-of-way is as follows:

Material	Horizontal Alignment	Vertical Depth
*Sanitary Sewer	Center of Street or, maximum 5.5' from center on curvilinear streets	6 ft over top
*Watermain	10' Clear and Parallel, north and east, to Sanitary sewers	7ft over top
*Storm Sewer	5' - 10' Clear and Parallel, south and west, to Sanitary Sewer.	2ft over top
Subdrain	In sanitary sewer trench or behind curbs.	6ft over top
**Electric Telephone Cable TV	Easement or in boulevard between curb & walk.	3 ft
**Gas	In boulevard between curb & walk.	3 ft

* Sanitary Sewer, watermains, and storm sewer are generally to be kept within the paved street area. In no case shall the sewer or watermain be placed within 3 feet of the lip of gutter. Public sewer and watermains outside the public right-of-way are to be located in dedicated public easements. Landscaping features should be kept outside utility easement areas in order to facilitate future utility maintenance activity.

** All utility crossings shall be common trench.

Water service lines are not to be connected to the looping portion of watermains located outside public right-of-way.

1002.11 Utility Conduit Crossings

Utility ducts shall be provided by the Developer and constructed according to the Detail Plates and placed across streets at locations provided by Electric, Telephone, Gas, and Cable TV companies. The Engineer shall include the ducts on the plans and special provisions. The utility shall make arrangements, if any, with the developer to cover the costs of the ductwork.

1002.12 Utility Easements

Where public sanitary sewer, watermain, storm sewer, or subdrain is outside of platted ROW, the horizontal distance from the pipe to the edge of the easement shall be at least 10' or at least equal to the depth of the pipe, whichever is greater. The minimum easement width shall be 20'.

1002.13 Pedestrian Facilities

A. Sidewalks

All streets are to have a sidewalk berm on both sides. Pedestrian curb ramps shall be constructed at all quadrants of intersections. All driveways are constructed with a sidewalk section. Where sidewalks do not allow for sufficient boulevard width to maintain vegetation, boulevards shall be paved with materials approved by the City Engineer.

Widths:

1. 5' wide on all commercial/industrial streets and all residential streets with a right of way width of more than 56'.
2. 4' wide on residential streets with a right of way width of 56' or less and on cul-de-sacs of 20 dwelling unit or less.

B. Bikeways

Bikeways shall conform to the AASHTO "Guide for the Development of Bicycle Facilities".

Bikeways shall conform to Minnesota Department of Transportation State Aid Standards.

Bikeways are to be 10' wide with 2' recovery area on both sides, and sloped to drain toward the drainage way or gutter.

Walking Trail / Bike Path – Every new phase of a development to be approved needs a bike path or sidewalk linked to a city path/park, or street in that area. It also needs to be approved by Park Board, City Council, and needs to be built according to City Engineering Specifications.

Section 1003 Sanitary Sewer Design

1003.1 Sizing Sanitary Sewers

Sizing of sanitary sewers shall be 8" minimum.

All sewers shall be designed to have sufficient slope to provide mean velocities of not less than 2 fps based on Manning's formula using an N factor of 0.013. Sizing to be reviewed by the City Engineer prior to final plans preparation.

The City shall reimburse the Owner/Developer for the incremental cost of the materials to increase the size of the sanitary sewer above an 8" diameter pipe if requested by the City Engineer. The City shall also reimburse the required incremental cost of the increase in the width of the manhole size if it is solely required for the oversize sanitary trunk sewer pipe.

1003.2 Pipe Material

Watermain quality pipe shall be used in all common trench installations.

Sanitary sewers passing over or under watermains shall be constructed of materials equal to watermain standards of construction for a distance of nine feet on either side of the watermain.

Sanitary sewers crossing watermains or storm sewers shall be constructed with adequate structural support to prevent excessive deflection of joints, or settling on the watermains or storm sewer.

1003.3 Spacing and Alignment

Sanitary sewers shall be placed on tangent alignment with manholes at changes in pipe size, horizontal alignment and/or vertical alignment. Spacing of manholes shall not exceed 400 feet for pipelines 8-15" diameter and 500' for pipelines 18-30" diameter.

Outside drop manholes shall be constructed at locations where the difference in inlet and outlet elevations exceeds 1' (one foot). At other locations the difference in inlet and outlet elevations

shall not exceed 6 inches.

Changes in flow direction at manholes shall not exceed 90 degrees.

4" and 6" Service connections to the sewer main shall only be considered at locations in-between 2 manholes. 8" or larger services should be connected at a manhole. Lamp holes shall not be installed at the end of sanitary sewers.

1. Extensions: Where future R.O.W.'s are plated sanitary sewers shall be extended to the property lines by the Developer.

Section 1004 Watermain Design

1004.1 Sizing Watermains

Standard watermain size for water distribution system design is eight (8) inch diameter.

Looping of watermains is required in all cul-de-sacs and dead end streets unless topographic conditions make it impractical. Watermains are to be extended to the end limits of new subdivisions to facilitate future water system extensions and looping. Six (6) inch diameter watermains may be allowed for short (less than 150 feet long) unavoidable dead-ends or short looped areas if the design will provide minimum required fire flows at minimum allowable pressure.

Twelve (12) inch or larger diameter watermains may be required by the City Engineer based on watermain hydraulic capacity requirements to serve future adjacent portions of the water distribution system. Proposed watermain sizing is to be reviewed with the City prior to final plan and specification preparation.

The City will reimburse the Owner/Developer the incremental cost for constructing over-sized mains, valves and fittings above 8" diameter if requested by the City Engineer.

1004.2 Pipe Material

Watermain shall be ductile-iron pipe complying with (W200) "Watermain Specifications", Standard Specifications for Street and Utility Construction, St. Charles, Minnesota.

Polyethylene encasement shall be incorporated when soil conditions warrant. Procedures are delineated in AWWA C105, Appendix A. Soil samples suitable for resistivity pH, redox potential, and sulfide testing are to be collected at the time project soil borings are completed, the test results are to be included in the project geotechnical report. The report is to include appropriate recommendations for or against polyethylene encasement based on the point-system guidelines provided in Table A.1 of AWWA C105, as well as other more qualitative factors such as soil moisture content, soil description, potential stray direct current and experience with existing installations.

1004.3 Spacing and Alignment

Watermains designed for connection to the St. Charles municipal water system must comply with Minnesota Department of Health (herein after "Health Department") standards. All such watermain plans and specifications are to be reviewed and approved by the Health Department prior to construction. Review and approval of these plans and specifications by the City is also required (before plan submission to the Health Department).

The description of the Minnesota Department of Health watermain, sanitary sewer and storm sewer separation requirements, which follows, is to be considered an aid to watermain designers to explain current requirements. The description is in no way intended to relieve the designer from meeting Health Department separation requirements.

1. Horizontal Alignment: Watermains are generally to be aligned parallel with sanitary sewers with a 10' minimum edge-to-edge separation from any storm or sanitary gravity sewer or force main. As noted in Section 1002 of these Guidelines, a 3' minimum edge-to-edge distance is to be maintained from the front lip of the concrete curb and gutter.

(a) Conditions permitting separation exceptions from gravity sewers: (No exceptions allowed from sanitary force mains)

- 1) Solid rock in trench
- 2) Narrow street pavement with multiple utilities

(b) Exception Procedure: The Engineer must submit to the Minnesota Department of Health supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.

(c) Exception Details:

- 1) Water main quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.
- 2) Water mains are preferred to be located above the sanitary sewer with a minimum vertical edge-to-edge separation of 18". Where this is not possible when passing a manhole structure, one full length of water main pipe shall be located so that both joints will be as far as possible away from the manhole structure. No contact with the manhole is allowed.

2. Vertical Alignment: Generally 7' minimum and 10' maximum bury from finished grade. A 6' bury may be allowed in certain unpaved areas such as stream crossings, narrow ditch crossings, etc. Future finished grade lines in unimproved areas must be determined and shown on the construction plans.

3. Sewer Crossings: Water mains crossing sewers shall be kept to a minimum. The crossings shall be aligned to be as nearly perpendicular as possible. Water mains are preferred to be located over the sanitary sewer with a minimum vertical edge-to-edge separation of 18". One full length of water main pipe shall be located so that both joints will be as far as possible away from the crossing.

(a) Allowed Exceptions From Gravity Sewers: (No Exceptions Allowed From Sanitary Force Mains)

Only where deemed impossible to maintain vertical separation and or full pipe length restriction.

(b) Exception Procedure: The Engineer must submit to the Minnesota Department of Health supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.

(c) Exception Details:

Water main quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.

4. Surface Water Crossings: Surface Water Crossings: Water mains crossing under surface waters greater than 15' in width must be provided with restrained joints from top of bank to top of bank. The restrained joints are to be called out on the plan sheet, and are to be considered an incidental pay item. Valves shall be located at both sides of the crossing within an accessible area above the water table not subject to flooding. No service connections are allowed between the isolation valves. A fire hydrant shall be located between the isolation valves in an accessible area to allow for pressure testing of the crossing to determine leakage.

5. Extensions: Where future R.O.W.'s are platted or loops are required, watermains shall be extended to the property lines by the Developer.

Fire Hydrants: Fire hydrants must be located at all street intersections, at the sides of all cul-de-sacs, at the end of all temporary or permanent dead-ends that include service connections, at the end of all dead-ends that are longer than 150' that do not have service connections and at all dead-ends created between water system pressure zones.

In residential areas with usable frontage, fire hydrants shall be spaced a maximum of 400' apart. Commercial and multi-family areas usually require closer hydrant spacing depending on lot width, lot depth and the location of the buildings to provide adequate fire protection to all sides of the buildings. In non-developed areas fire hydrants shall be placed at major high points to allow for air release and at intervals to allow for proper flushing and testing of the main.

System Valves: Valves must be located at all temporary dead-ends past the last service and a minimum distance of 20' before the temporary hydrant or if the end hydrant is permanent just past the hydrant tee, at all stub-outs, on loops at both ends where the water main exits the paved area.

At the split between pressure zones a valve shall be placed at both sides of the flushing hydrant to allow flushing from both directions.

Generally valves shall be located at intersections in line with the right-of-way lines for safer operation and located to allow a maximum 4-valve shutdown to isolate water main sections. Valves located mid-block shall be near a fire hydrant tee for reference and adequate flushing of the main. In residential areas valves shall be located such that no more than 20 customers would be isolated at a time in a shut down. In commercial areas fewer customers should be isolated depending on the size of the facility. Larger commercial/industrial facilities will require the installation of isolation valves on both sides of the service connection for improved reliability. In non-developed areas valves shall be located at anticipated intersections and or at intervals to allow for proper flushing and testing of the main.

Section 1005 Storm Sewer Design

1005.1 Drainage Plan

A Drainage Plan shall be prepared for each subdivision, or as required by zoning ordinance. The report shall address the impact on existing facilities and provide the basis of design for the storm drainage systems.

Specific items to be addressed in the Engineer's report include: present and future flows from off-site which will impact on the drainage systems, location and inlet capacity of the catchbasins, sizing of the systems, design of ponds, capacity of downstream systems, etc. The Drainage Plan shall be signed by the Engineer.

The Engineer's report shall include depiction of all existing and proposed drainage areas referenced in the report. An on-site plan or map showing drainage areas for each catch basin or other collector shall be prepared at 1" = 100' or larger with finished contours at two (2) foot intervals; the storm sewer system shall be depicted, with pipe sizes labeled and structure numbering corresponding to numbering used in the design calculations. Existing and proposed pond drainage areas shall be depicted. Off-site drainage areas where 2' contours are not available may be shown on USGS maps or other suitable contour maps.

Stormwater Management Pond designs shall be modeled with computer software incorporating SCS Technical Release 20 (TR-20) or US EPA's Surface Water Management Model (SWMM). All printouts shall clearly indicate the respective location, storm event, and existing verses developed. The Engineer's report shall include: derivation of times of concentration and curve numbers, sizing of the pond permanent pool/water quality design, a table of the pond stage-storage-discharge information from the pond bottom up to the top of dam or 100-year high water level (whichever is higher), and derivation of the pond discharge verses stage data.

The report shall include a prepared summary of all computer printouts.

1005.2 Sizing Storm Sewer

Storm sewers shall be designed for the 10-year frequency storm without surcharging of pipes, with a safe overflow provided for the 100-year frequency storm. Sizing shall address future flows from off-site. Rational or SCS methods may be used for run-off with pipe capacity determined by Manning's formula. Sizing of storm sewers shall be 12" minimum.

1005.3 Pipe Material

Storm sewers shall be constructed of reinforced concrete pipe within the paved roadway section and in locations subject to heavy vehicle loading during construction, maintenance, or use. Storm sewers in other areas may be constructed of

- (a) Dual Wall Corrugated Polyethylene,
- (b) Polyvinyl Chloride,
- (c) Corrugated Steel,
- (d) Ductile Iron

in accordance with the City of St. Charles Specifications for storm sewer construction.

Storm sewers crossing watermains or sanitary sewers shall be constructed with adequate structural support to prevent excessive deflection of joints, or settling on the watermains or sanitary sewer.

1005.4 Outlet Structures

Riprap and/or energy dissipaters shall be required for all sizes to prevent erosion.

1005.5 Spacing and Alignment

Storm sewers shall typically be placed on alignments parallel with sanitary sewer, with manholes at changes in horizontal and/or vertical alignment. Manhole spacing shall not exceed 400 feet for 12"-15" pipes, and 500 feet for 18"-30" pipes. Change in flow direction at structures shall not exceed 90 degrees.

Local systems shall provide for containment of street flow from 10-year frequency storms within the parking lanes of the roadway without overtopping the curb. For streets without parking lanes the nearest driving lane to the curb shall be a minimum of 8 feet wide clear of encroachment from the 10 year flows.

Spacing of catch basins shall be as necessary for inlet capacity and as necessary to meet the street flow restrictions above, but in no case shall the spacing exceed 1000 feet on residential streets or 600 feet on collector and arterial streets.

Catch basins shall be located at intersections to prevent water from flowing across intersections (no valley gutters are allowed).

1005.6 Sizing Drainage Way, Open Channels

Open channels shall carry the 25-year frequency storm flow within the graded portion of the channel and the 100-year storm within the channel easement or right of way.

Channels may generally be lined with sod where 10-year frequency storm velocities are below the scouring velocity for the types of soils in the channel and where continuous flows do not exist. Lined low flow channels or storm sewers shall be provided for continuous flows or where the channel velocities exceed the scouring velocity.

Linings through developed or soon to be developed areas shall generally be concrete. Permanent turf reinforcement may be considered where there is both adequate light and continuous flows do not exist.

Concrete lining may be required by the City Engineer in residential areas where the channel slope is less than 2%.

1005.7 Storm Water Treatment Ponds

Design of permanent storm water treatment ponds shall conform to 1) applicable Minnesota Pollution Control Agency (MPCA) permit requirements, and 2) the City of St. Charles Storm Water Management Plan.

1. Ponds shall incorporate multi-stage outlets as necessary to limit the 2-year, 10-year and 100-year peak discharges to less than the pre-development discharge. Outlets shall provide skimming of at least the 2-year event.
2. Ponds shall include a water quality “extended detention” hydraulic volume equal to the volume from 1/2” of runoff from the impervious portion of the developed watershed, per MPCA permit requirements. The extended detention volume shall be above the pond normal water level. When the pond water level is at the extended detention elevation, the discharge shall not exceed 5.66 cfs/acre of pond surface area. The discharge rate shall be adequate to draw down the extended detention volume in less than 48 hours, to prevent vegetation kill.
3. Ponds shall include a water quality “dead storage” quiescent settling volume at least equal to the developed pond watershed runoff from a 1.8” 6-hour rainfall event, per the St. Charles Storm Water Management Plan. The dead storage volume shall be below the pond normal water level. The watershed 1.8” 6-hour runoff depth shall be interpolated from the following table, based on the developed pond watershed runoff curve number.

CN	66	68	70	72	74	76	78	80	82	84	86	88	90
Runoff (in.)	0.21	0.24	0.28	0.335	0.39	0.45	0.515	0.59	0.67	0.75	0.85	0.945	1.06

4. In addition to the dead storage water quality volume indicated above, the pond shall have at least the 20 year dead sediment storage volume (below the pond normal water level) per the following table:

Land Use	20 Year Sediment Vol. (Cu. Ft/Acre)
Low Density Residential	265
Medium Density Residential	343
High Density Residential	419
Commercial	497
Industrial	443

5. The pond plans shall include tabulation of the following data: Watershed Area (ac) [*total pond watershed including watershed of any upstream ponds*]; NWL Normal Water Level (ft); NWL Pond Surface Area (ac); NWL Pond Volume (a-f); 100-Yr High Water Level (ft); 100-Yr Bounce Volume (a-f); 100-Yr Peak Discharge (cfs); 10-Yr Peak Discharge (cfs); 2-Yr Peak Discharge (cfs); Dam Height (ft) [*toe of downstream side of dam to top of dam*]; and Maximum (Breach) Volume (a-f) [*at top of dam elevation, not including any volume below the elevation of the downstream toe of the dam*].

Available references for pond design include:

- 1) "Protecting Water Quality in Urban Areas – Best Management Practices" published by the MPCA available at: <http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html>
- 2) NRCS Conservation Practice Standard 378, "Pond" available at: <http://www.mn.nrcs.usda.gov/eng/standard/378mn.pdf>.

6. The Pond shall be located on a dedicated easement to the City and shall have permanent hard surfaced access for maintenance. All access shall be graded to allow easy truck access.

1005.8 Subdrains

Subdrains shall be constructed where necessary to drain wet soils within the roadway and/or for conveyance of flows from footing drains.

Edge drains to drain wet soils within the roadway shall be a minimum of 4" in diameter. The pipe shall be completely wrapped with a geotextile fabric and bedded according to the detail plate.

Subdrains with service connections shall be a minimum of 6" in diameter and shall be constructed of sanitary sewer quality pipe with perforations. The pipe shall be completely wrapped with a geotextile fabric and bedded according to the detail plate. Spacing of manholes shall not exceed 400 feet. Curved alignment of the subdrain is acceptable where the deflection angle of the alignment is not greater than 22.5 degrees, with not more than 2-22.5 degree fittings between manholes.

At locations without service connections, 4" perforated sanitary sewer quality pipe may be used.

Section 1006 Service Connections

1006.1 Sizing Service Connections

A. Sanitary Sewer

Sizing of Sanitary Sewer services shall be 4" minimum.

All sanitary sewers shall be designed to have sufficient slope to provide mean velocities of 2 fps based on Manning's formula using an N factor of 0.013.

The minimum elevation of the service shall be established by using the elevation at the top of the main, or riser plus a 2% slope to a point one foot from the inside edge of the sidewalk to a minimum depth of 7.5 ft below boulevard elevation.

B. Water

Small water services are to be 1 inch, 1 1/2 inch or 2 inch inside diameters only. For common

trench installation a vertical separation of 12” (minimum) is required. Water services are to be sized to provide the design flow rate while maintaining a minimum 20psi residual pressure at the last plumbing or process fixture connected to the service line. Designers are to anticipate water meter and required backflow preventer head losses in sizing water services.

If a water service is sized to serve a fire sprinkler system and domestic water consumption is anticipated to be small, construction of a separate small water service to provide for the domestic water service needs is recommended.

1006.2 Pipe Material

A. Sewer Service Pipe shall conform to the following:

1. Polyvinyl Chloride (PVC) Schedule 40 conforming to ASTM D 1785 (for use at building line only).
2. Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 2241 (not permitted within 1 foot of footing).
3. Polyvinyl Chloride (PVC) SDR 35 or SDR 26 conforming to ASTM D 3034 (not permitted within 1 foot of footing).
4. Cast iron soil pipe and fittings shall be the "Service Weight, Centrifugally Spun" grade and shall conform to ASTM A74-75.
5. Ductile iron pipe shall conform to ANSI 21.51.

B. Water Service Pipe shall conform to the following:

Pipe 2” diameter or smaller is to conform to the requirements of ASTM B88 for Seamless Copper Water Tube, Type K, Soft Annealed Temper. Water services larger than 2” diameter are to be ductile iron.

Section 1007 Erosion Control

1007.1 Required Documentation

1. An “Erosion Control Plan” shall be incorporated into the construction plans & specifications and/or grading plan. The plan shall conform to the Minnesota Pollution Control Agency (MPCA) permit requirements, and “Protecting Water Quality in Urban Areas – Best Management Practices” published by the MPCA. The plan shall include adequate temporary and permanent erosion and sediment control measures.
2. The Owner and Contractor shall obtain an NPDES Storm Water Construction Activity permit from the MPCA, if required, and any other permits required.

1007.2 Construction Requirements

1. The construction shall comply with the project Erosion Control Plan and applicable MPCA permit requirements, shall be as necessary to prevent off-site sedimentation and tracking, and shall include final stabilization.
2. Best Management Practices (BMPs) for sediment control shall be established on all down-gradient perimeters before grading is commenced, and shall be regularly maintained and remain in place until final stabilization.
3. The Developer shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives storm water from the subdivision. If erosion and sediment control measures taken are not adequate and result in downstream

sediment, the Developer shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary, including associated restoration. The Developer shall follow all instructions it receives from the City Engineer concerning the cleaning and maintenance of the storm sewer system. The Developer's obligations under this paragraph shall end after the last lot in the subdivision has been sold and built upon.

4. The Developer shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from silt and dirt from the subdivision for a period stated above.

5. All permanent storm water ponds shall be cleaned to original plan cross-section after final stabilization, and (if applicable) prior to final acceptance by the City Engineer.

1007.3 Temporary Erosion Control

Temporary erosion control includes the placement or construction of berms, ditches, sediment basins, fiber mats, fabrics, hay bales, seeding or other devices that are necessary to prevent soils and sediment from entering public waters, sewers, streets and adjacent properties. These temporary control measures include their eventual removal after conditions stabilize.

At a minimum all drainage ways shall contain ditch checks and all storm water inlets shall be screened with hay bales or erosion fence to prevent soils and sediment from entering the systems. At all locations where soils and sediment may erode and enter public improved streets, positive erosion control measures shall be taken to prevent the materials from entering the streets.

Contract pay items shall be provided for erosion control items and significant elements such as the construction of berms or ditches and the placement of ditch checks shall be shown on the plans.

1007.4 Permanent Erosion Control

Permanent erosion control includes the placement or construction of berms, ditches, sediment basins, fiber mats, sod, seed and mulching necessary to prevent soils and sediment from entering the public waters, sewers, streets and adjacent properties.

Contract pay items shall be provided for permanent erosion control items.

Section 1008 Standard Plans

1008.1 General

In order for the City to have standardized construction plans and record drawings, the City follows the Mn/DOT CADD Data Standards with the exception of AutoCAD file formats being substituted for Microstation files. The AutoCAD file versions used by the City is to ensure consistent data aggregation, element symbology, object usage, and locational accuracy of project CADD data that effectively enables:

- 1) Project data to be shared among functional business units in an integrated manner throughout the project design process.
- 2) CADD data to be accessible for use in specialized non-design project design process.
- 3) Engineer's electronic deliverables to concur with City design policies.

1008.2 Modifications to the Mn/DOT Plan

In addition the guidelines listed below shall be followed:

A. General

All sheets shall be reproducible on standard D-size sheets (22" x 34"). Scale 1" = 20' where there are more than two underground facilities (i.e. sewers, watermains, subdrains) or sheets that are otherwise crowded due to curvature, etc. On large simple detail plans a scale of 1" = 40' can be used.

All parcels shall be properly labeled with lot and block numbers and plat name, or Parcel Identification Number (PIN) in unplatted areas. Developed parcels shall have their address shown on the plan.

Existing utilities shall be shown in both plan and profile, labeled with stationing as existing.

All match-like breaks shall be clean with reference points clearly marked. All plans, which are broken by a match line, shall be on the same or consecutive sheets, or clearly referenced to location.

All sewer and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.

B. Grading and Paving Plans

Provide elevations at 25' intervals for property lines, top of curb, centerline, all lot corners on property line, all curb returns and mid points, and intersection layouts.

Plot top of curb profiles.

Typical sections including structural section to be shown on the Title Sheet, Detail Sheet or Plan View.

C. Sewer, water and service connection plans.

Identify fittings and structures on the plan view as follows:

- (a) Sanitary Sewer.....M.H. No. 1, M.H. No. 2, etc.
- (b) Watermain W-1, W-2, etc.
- (c) Storm SewerM.H. S-1, S-2, CB No. 1, CB No. 2, etc.
- (d) Subdrains.....M.H. SD-1, SD-2, etc.

Notes for fittings and structures shall include the station and relationship to street centerline. For structures, also provide the structure type, diameter, casting type, rim and invert elevation for inlets and outlets in the notes. Provide the center invert grades on the profile, along with pipeline grades at 25ft intervals.

All hydrants are to be at required height (see Standard Plates) after lawns, boulevards, etc. are finished (sod, seed, etc.) This will be the contractor's responsibility. Provide break-off elevations on hydrants.

All sanitary sewer services shall be drawn on the plan to the intended location. The station of the wye, the station and invert elevation of all sanitary sewer services at the end of the service in the boulevard, and the boulevard elevation at the service shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile.

The size and type of all sanitary sewer and water services shall be noted on the plans. Service connections shall be centered on the lots and shall terminate at the property line. A curb stop and box shall be placed at the end of the water service. The linear dimension from the property line to the service connection shall be shown on the record drawings.

D. Sidewalk and Bikeway Plans

Show sidewalk or bikeway as construct or future, with widths and distance from property lines on plan views.

Sidewalks with handicap accessible ramps shall be placed within the curb return area at all intersections, except roundabouts / traffic circles.

Section 1009 Submission of Plans

1009.1 Plans and Specifications

1. Submit three sets of plans & specifications to the City for review and comment.
2. The Developer shall obtain a Minnesota Department of Health permit for watermain extensions and a Minnesota Pollution Control Agency permit for sanitary sewer extensions.
3. After approval by the City, submit the electronic files together with four sets of final plans & specifications to the City; two of the plan sets may be reduced (half size) plans.

1009.2 Estimates

For public contracts furnish: specification number, six (6) digit extension code, item description, unit of measure, quantity and estimate of cost (including cost split if any) to the City Engineer for preparation of the Form of Proposal including the Engineer's Estimate and Schedule of Prices.

1009.3 Electronic Drawings

The Consultant shall verify and submit an electronic drawing file for the entire plan set, and shall contain an overall plan view drawing containing control point coordinate information accurately referenced to County Project Coordinates (NAD 27, or NAD83 coordinate base).

The drawing set shall consist of all related support files required to reproduce the electronic drawing file, as a hard copy, in the current City AutoCAD format. Support files required by the City will include any font files (*.shx) not supported by AutoCAD, external reference drawings (AutoCAD Xref), and plot configuration files (*.pcp, *.pc2, *.pc3...etc.). If software license agreements do not allow distribution of third party support files, then an AutoCAD supported equivalent shall be substituted prior to delivery to the City.

It is required that all files be in AutoCAD™ format. Formats, translations, etc., and the accuracy of data contained therein will be the total responsibility of the contracted source. The files delivered under contract must work in the AutoCAD™ environment as described above with no adjustments, modifications, translations or alterations while retaining all required element properties.

1009.4 Record Drawings

All record drawings shall be submitted in electronic (AutoCAD) format and on D-size Mylar prints. The plans shall be clearly legible drawings with unnecessary construction information removed (contours, trees, shrubs, fences, etc.). Place proper notes and statements, (i.e. type of alternate pipe used) on all sheets. All hydrants shall have benchmarks on them.

Record drawings on all public and private stormwater management ponds and drainage conveyance facilities are required. Plans shall indicate finished contours at two (2) foot intervals, normal water elevation, high water elevation, and the acre-feet of storage for each ponding area along with the final storm sewer plans.

The record drawing plans shall be submitted to the City Engineer within 3 months of the initial acceptance/commencement of the warranty period. Failure to submit the record drawings within the required 3-month period may result in an extension of the project warranty period for a length of time equal to the delinquency in plan submittal.

Section 1010 Construction

1010.1 Pre-Construction Conference

As soon as possible after the project has been approved, the Engineer should arrange a conference with the contractor and all other interested parties for the purpose of reviewing contract requirements, construction details, work schedules and any items peculiar to the project. Prior to this meeting the Engineer and all key inspectors and the survey crew chief should study the plans and become familiar with the project site to be well informed as to the requirements and existing conditions. Notify the City Engineer a minimum of 10 days prior to the time and place of the pre-construction meeting.

1010.2 Notice to Proceed

The Engineer will issue a "Notice to Proceed."

1010.3 Surveying

Surveying work includes: complete staking during construction, diaries and survey notes, final benchmarks on hydrants, etc.

1010.4 Observation

Engineering supervision ensures completion of construction contracts according to contract requirements; provides supervision for construction projects; documents contract work progress for payment of the contractors; keeps property owners and the public informed of construction operations within the area; and provides requested assistance to other governmental agencies on their construction projects. Maintains field records for record drawings.

1010.5 Utility Testing

- 1. Watermain Testing.** Coordinate watermain loading, pressure testing, conductivity test, bacteria testing, and visual inspection on valves and hydrants with the City Water Division. Only City personnel shall operate valves and hydrants and perform visual inspection on valves and hydrants.
- 2. Sanitary Sewer Testing.** City Personnel will observe the test and submit the certification of sanitary sewer air & deflection testing to the City Engineer.

1010.6 Detailed Stage Inspections

The Engineer shall notify the City Engineer 48 hours prior to “stage inspections.” The inspections will be performed in the presence of the Contractor, the project Consulting Engineer, and Public Works Department personnel. Inspections shall be performed at the following construction stages, unless otherwise indicated in the Contract. Submit the required material test reports to the City Engineer prior to or at the respective “stage inspection.” Any areas failing the stage inspection must be corrected and re-tested for compliance prior to re-inspection.

- 1. Subgrade Preparation.** Visual inspection of soils and conditions. Test rolling – one pass of a 7-ton per axle vehicle in each travel lane and parking lanes; one wheel shall be within the curb section during the parking lane pass. Prior to the inspection, submit test results to the City Engineer for utility trench compaction, embankment compaction, and subgrade compaction.
- 2. Aggregate Base.** Visual inspection of compaction. Test rolling as above, except no deflection allowed. Prior to the inspection, submit test results for aggregate quality, aggregate gradation, and aggregate compaction. Submit base course bituminous trial mix design to the City Engineer prior to paving.
- 3. Bituminous Base and Concrete Curb & Gutter.** Visual inspection for settling and cracking. Prior to the inspection, submit test results for concrete tests of the curb, bituminous aggregate quality, and bituminous base compaction/Marshall. Submit wear course bituminous trial mix design to the City Engineer prior to paving.

The City’s approval of various stages of the project work shall not constitute an acceptance of the work or the project, and the contractor shall be liable for defects due to faulty construction until the entire work under the Contract or City-Owner Contract is finally accepted by the City as stipulated in the Contract or City-Owner Contract.

1010.7 Acceptance

- 1. Project Construction Record.** Submit to the City Engineer the Project Construction Record, the material (e.g. pipe) certifications, material test results for bituminous wear course, and any other items listed in the Project Construction Record not previously submitted.
- 2. Engineer’s Certification of Acceptance.** After all Contract construction is complete including corrective work identified by the Engineer, submit the Engineer’s Certification of Acceptance to the City Engineer. The City will inspect the project and either:
 - a) process the initial acceptance and commencement of the warranty period, or
 - b) return the Engineer’s Certification with instructions for corrections in the work.
- 3. Record Drawings.** Electronic and Mylar record drawings shall be submitted as in section 1009.
- 4. Warranty Work.** Prior to the end of the two-year warranty, the City Engineer will inspect the project and provide instructions for corrections, if any. Notify the City Engineer when all corrections have been made.
- 5. Final Acceptance.** Upon expiration of the warranty and completion of all corrections, the City will process Final Acceptance and provide a copy to the Owner, Contractor, and Engineer. No future phase will be approved without the prior phase being inspected and any improvements needed done before new phase started.
- 6. Final Inspections.** Final Inspections will not be performed during the winter months.

Section 1011 Schedule of Materials Control

1011.1 General

The table below outlines the minimum required rate of sampling and testing for major construction items:

Material	Spec. No.	Minimum Required Acceptance Testing	Test Taken
Backfill Materials	T100, C150	1 / Source	Gradation
Embankment	2105	1 / 1000 cu yds (CV)	Moisture, Relative Density
Subgrade	2112	1 / 500' Block	Moisture, Relative Density
Longitudinal Trenching	T100, C150	1 / 300 ft/ 2' depth	Moisture, Relative Density
Transverse Trenching	T100, C150	1 / 2 trenches / 2' depth	Moisture, Relative Density
Aggregate Base	2211, 3138	1 / Source	Quality (LAR, Insoluble Residue)
		1 / 1000 ton or 500 cu yd (CV)	Gradation
		1 / 500 ft Block	Relative Density
Bituminous Materials	2331,2350	Use Mn/DOT Job-Mix-Formula	Proof roll prior to placement
Aggregates		1 / Mixture Blend 1 / Aggregate Type	Gradation Quality (LAR, Mag. Sulfate, Insoluble Residue)
Mixtures		1 / Mixture Blend/Day 1 / Mixture Blend/Day	Extraction/Gradation (% Air Voids)
Compaction		1 / 500 ft Block	Modified Specified Density
Concrete		Use Mn/DOT Mix-Proportions	Proof roll prior to placement
Aggregates	3126, 3137	1 / Source / Day 1 / Source	Gradation, Quality (LAR), Mag. Sulfate
Air Content		1 / 50 cu yd/ Day	(% Air Voids)
Slump		1 / 50 cu yd/ Day	Inches
Cylinders		1 / 100 cu yd/ Day	Compression (psi)

All test reports are to be delivered to the City of St. Charles Public Works Department.