

**SPECIFICATIONS
FOR
UTILITY & STREET CONSTRUCTION
FOR
GATEWAY at McKNIGHT TOWNHOMES 2ND ADDITION
IN
NORTH SAINT PAUL, MINNESOTA**

Date: November 22, 2019

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

Brian N. Molinaro
MN Reg. No. 47504

Date: November 22, 2019

P.E. Job # 118282

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INSTRUCTIONS TO BIDDERS

- 1-1. **PROPOSALS:** Each Proposal shall be typed or written in ink on the Proposal form provided by the Owner. No alterations in proposals, or in the printed forms therefore, by erasures, interpolations, or otherwise will be acceptable unless each such alteration is signed or initialed by the Bidder. Acknowledgment of all Addenda to the Contract Documents shall be made on the Proposal form. In cases of a difference between the stipulated amount of the proposal written in words and the stipulated amount written in figures, the amount written in words shall govern.

No bidder may submit more than one proposal. Two proposals under different names will not be accepted from one firm or association.

- 1-2. **WITHDRAWAL OF BID:** No bidder may withdraw his proposal for a period of sixty (60) days after the date and hour set for the opening. A bidder may, upon his written request, withdraw his proposal at any time prior to the deadline for submission of bids.

- 1-3. **ACCEPTANCE AND REJECTION OF BIDS:** The Owner reserves the right to accept the bid which is the most responsive and responsible bid; to reject any or all bids; and to waive irregularities or information in any bid.

- 1-4. **SIGNATURE OF BIDDERS:** Each bidder shall sign his proposal using his usual signature and giving his full business address. Bids by partnerships shall be signed with the partnership name followed by the signature and designation of one of the partners or other authorized representative. Bids by corporations shall be signed with the name of the corporation followed by the signature and designation of the person authorized to bind the corporation.

- 1-5. **INTERPRETATION OF CONTRACT DOCUMENTS:** If any questions should arise as to the true meaning of any part of the plans, specifications, or other proposed contract documents the prospective bidder may submit a written request to the Engineer for an interpretation thereof. The interpretation of the proposed contract documents will be made by addendum. A copy of each addendum will be mailed or delivered to each person obtaining a set of contract documents from the Engineer.

- 1-6. **LOCAL CONDITIONS AFFECTING WORK:** Each bidder shall visit the site of the work and shall thoroughly and fully inform himself relative to construction hazards and procedure, labor, and other conditions and factors, local and otherwise, which would affect the prosecution and completion of the work and its cost. Such considerations shall include the arrangement and conditions of existing structures and facilities affecting, or which are affected by, the proposed work, the procedure necessary for maintenance of uninterrupted operation of existing facilities, the availability and cost of labor, and facilities of transportation, handling, and storage of materials and equipment. All such factors shall be properly investigated and considered in the preparation of the bidder's proposal. There will be no subsequent financial adjustment to any contract for lack of such prior information or its effect on the cost of the work.

- 1-7. **PAYMENTS:** Payment for all work performed under the proposed contract will be issued and paid as provided in the General Conditions.
- 1-8. **TIME OF COMPLETION:** The time of completion is an essential part of the contract and it will be necessary for each bidder to satisfy the Owner of his ability to complete the work within the allowable time. In this connection, attention is directed to the provisions of the General Conditions and Special Provisions relative to delays, completion date, extensions of time, and liquidated damages.
- 1-9. **QUALIFICATIONS OF BIDDERS:** Bidders may be required to submit satisfactory evidence that they have a practical and technical knowledge of the particular work bid upon and that they have the necessary financial resources to complete the proposed work. Bidders shall also be required to take all actions and maintain all paperwork and documentation to prove that it is a Responsible Contractor or Party, as required by any applicable law or regulation.

Each bidder may be required to show that former work performed by him has been handled in such a manner that there are no just or proper claims pending against such work. No bid submitted by a bidder who is engaged on any work which would impair his ability to finance the work covered by such bid or to provide suitable equipment for its proper prosecution and completion, will be accepted.

A bidder will be disqualified for any of the following reasons: Collusion, unbalanced bids or failure to submit a price for each item of work called for in the proposal.

- 1-10. **PERFORMANCE BOND:** Each bidder to whom a contract is awarded will be required to furnish a performance bond to the Owner in an amount equal to one-hundred percent (100%) of the contract price as required by law.
- 1-11. **NON-DISCRIMINATION IN EMPLOYMENT:** Contracts for work under this proposal will obligate the contractors and all sub-contractors not to discriminate in the employment of common or skilled persons who are citizens of the United States and qualified to do the work required because of their race, creed or color. Any violation of these provisions shall be a misdemeanor and this contract may be canceled or terminated by the owner and all money due or to become due will be forfeited for a second or any subsequent violation of the terms or conditions of the contract.

**CONTRACT AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR
CONSTRUCTION CONTRACT**

This AGREEMENT, made and executed this **XX** day of **XMONTHX**, 2019, by and between M/I Homes, hereinafter referred to as the "OWNER" and **XCONTRACTORX** hereinafter referred to as the "CONTRACTOR".

WITNESSETH:

- I. CONTRACTOR hereby covenants and agrees to perform and execute all the provisions of the Plans and Specifications prepared by Pioneer Engineering P.A. referred to in Paragraph IV, as provided by the OWNER for:

PROJECT NAME: GATEWAY at McKNIGHT TOWNHOMES 2ND ADDITION

CONTRACTOR further agrees to comply with all duties and obligations required by this Agreement and the Contract Documents.

- II. OWNER agrees to pay and CONTRACTOR agrees to receive and accept payment in accordance with the prices bid for the lump sum items as set forth in the Proposal Form attached hereto which prices conform to those in the accepted CONTRACTOR'S proposal on file in the office of the Engineer. The aggregate sum of such prices, based on the estimated required quantities is estimated to be \$_____.
- III. Payments to CONTRACTOR by OWNER shall be made as provided in the Contract Documents.

Payment shall be made upon satisfactory completion of the Project.

- IV. The Contract Documents consist of the following component parts:

- | | |
|--|-------------------------------|
| (1) Legal and Procedural Documents | (5) General Conditions |
| (2) Detail Specifications Contract Agreement | (6) Plans |
| (3) Contractor's Performance Bond | (7) Accepted Proposal |
| (4) Contractor's Payment Bond | (8) Any Addenda later created |
| (5) Special Provisions | |

The Contract Documents are hereby incorporated with this Agreement and are as much a part of this Agreement as if fully set forth herein. This Agreement and the Contract Documents, together, constitute the contractual agreement between the Parties.

- IV. CONTRACTOR agrees to fully and satisfactorily complete the work contemplated by this Agreement in accordance with the following schedule or in accordance with the Contract Documents.

V. This Agreement shall be executed in 3 copies.

IN WITNESS WHEREOF, the parties to this Agreement have hereunto set their hands and seals as of the date first above written.

Owner: M/I Homes Contractor: _____

By: _____ By: _____

Title: _____ Title: _____

NOTICE OF AWARD

PIONEER ENGINEERING, P.A.
2422 ENTERPRISE DRIVE
MENDOTA HEIGHTS, MINNESOTA 55120

TO: **XCONTRACTORX**

The Owner, having considered the proposal submitted on **XMONTHX XX**, 2019, for the construction of Gateway at McKnight Townhomes 2nd Addition, and it appearing that your proposal is fair, equitable and to the best interest of the Owner, the said proposal is hereby accepted for the prices set forth therein.

In accordance with the terms of the Contract Documents, you are required to execute the formal Contract Agreements within ten (10) days from the date hereof.

PIONEER ENGINEERING, P.A.

For: M/I Homes
Owner

DATE: **XMONTHX XX**, 2019

Contract Amount: \$_____

NOTICE TO PROCEED

PIONEER ENGINEERING, P.A.
2422 ENTERPRISE DRIVE
MENDOTA HEIGHTS, MINNESOTA 55120

TO: XCONTRACTORX

You are hereby authorized to proceed on this date for the construction of Gateway at McKnight Townhomes 2nd Addition as set forth in detail on the contract documents, including Plans and Specifications.

DATE: XMONTHX XX, 2019

By: _____

For: M/I Homes
Owner

**SPECIAL PROVISIONS
FOR
UTILITY & STREET CONSTRUCTION
FOR
GATEWAY at McKNIGHT TOWNHOMES 2ND ADDITION
IN
NORTH SAINT PAUL, MINNESOTA**

SECTION A - GENERAL PROJECT REQUIREMENTS

A-1. SCOPE OF WORK

The work to be performed under the provisions of these Contract Documents shall include the furnishing of all materials, labor, tools and equipment necessary to successfully complete the construction of utilities, and street construction as described in the Plans and Specifications herein ("Work").

Contractor's Work shall include all appurtenances not specifically listed as bid items, but which are necessary to complete the Project in a satisfactory manner. Contractor shall provide all shall appurtenance, which shall be considered incidental items and no direct compensation will be made therefore.

A-2. LOCATION

The project is located on various streets and easements within the City of North Saint Paul as shown on the location map on the Plans.

A-3. PARTIES

The Contractor of the Project is XCONTRACTORX ("Contractor").

The Owner of the Project is M/I Homes ("Owner").

The Owner's representative as engineer for the project is Pioneer Engineering, P.A., 2422 Enterprise Drive, Mendota Heights, Minnesota 55120 ("Engineer").

Representatives from the City in which the Project is located will provide inspection for the grading, utility, and street construction. Upon completion of the work and final acceptance, the City of North Saint Paul will own and maintain the public utilities.

A-4. CONSTRUCTION STAKING

Construction staking will be provided by Engineer and shall be in accordance with Section 16 of the General Conditions. The Contractor shall request staking needs a minimum of two (2) working days in advance and such request shall encompass a sufficient amount of staking to provide for a minimum of three (3) working days without additional staking needs. Any additional staking or inspection work due to the Contractor's operations or caused by errors on the part of the Contractor shall be back charged to the Contractor by the Owner.

The following staking for rough grading will be provided by the owner as follows:

1. Street centerline grades at 50' stations - two (2) times.
2. Front and rear lots - one (1) time.
3. Final building pad elevations check - one (1) hub in the approximate center of the pads - one (1) time.

The following staking for utilities shall be provided by Owner.

1. Sanitary sewer/watermain/storm sewer, alignment and grade - one (1) time.
2. Service wyes - provided on cut sheets - one (1) time.
3. All structures, hydrants, curb stops location and grade stake - one (1) time.
4. Centerline check for subgrade - one (1) time.
5. Curb stakes - one (1) time.

A-5. SPECIFICATIONS WHICH APPLY

Except as modified herein, the following specifications shall apply and are, where applicable, hereby adopted by reference:

General Conditions	-	General Conditions, as contained herein.
Grading & Street	-	The Minnesota Department of Transportation Construction "Standard Specifications for Highway Construction," latest edition.
Utilities	-	City Engineers Association of Minnesota (CEAM) "Standard Specifications" 2013 Edition.
City of North Saint Paul	-	Standard Plates and Specifications, Latest Revision.

A-6. BONDS

A payment bond and performance bond are required in accordance with Section 7 of the General Conditions. The Contractor shall also furnish a two-year maintenance bond, and lien waivers or payment bonds upon final acceptance of the Work by the City.

A-7. STARTING AND COMPLETION DATES

In accordance with Section 3 of the General Conditions, Contractor shall meet with the Owner and Engineer to evaluate the progress of the Project at the discretion of the Owner. The Contractor shall provide a critical path project schedule to the Owner and Engineer. This schedule shall indicate starting and completion dates with a progressive list of the Work to be completed.

A-8. LISTING OF CONTRACTORS

The Contractor shall list in the space provided on the Bid Proposal all subcontractors who will perform Work on this Project, or supply materials or equipment for the Project.

A-9. GUARANTY

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of two (2) years from the date of final acceptance by City Council, or one (1) year following final acceptance by City Council of the final bituminous wear surface as approved by the City. By providing this guarantee, the Contractor warrants that the completed Work is free from all defects due to faulty materials or workmanship, and the Contractor shall promptly make such corrections as may be necessary by reason of such defects, including the repairs of any damage of other parts of the Work resulting from such defects. The Owner shall give notice of observed defects with reasonable promptness after it becomes aware of the defect. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defect, the Owner may do so and charge the Contractor the cost thereby incurred. A maintenance bond

shall remain in full force and effect through the guarantee period. This guarantee is in addition to any and all other rights or remedies that may accrue to the Owner under the law.

A-10. SITE CONDITIONS, SUB-SURFACE CONDITIONS, LATENT CONDITIONS & SOILS

The Contractor is reminded that Section 5 of the General Conditions places the responsibility for determining all surface and sub-surface conditions solely on the Contractor. This shall be construed to include, but not be limited to, the location of all underground utilities, the soil type, the depth of water table, the presence of perched water, the existence of rock or hard soils, latent sub-surface conditions, and all other factors having an influence on the Work. By submitting a proposal, Contractor waives any claim for, and releases the Owner, from any claims for additional compensation and reimbursement in whatever form relating to, or arising out of, known or unknown site conditions. If the Owner or Engineer provides the Contractor with any information concerning site conditions, it is solely for the convenience of the Contractor, and the Contractor shall conduct its own investigation concerning the accuracy of such information. The Contractor agrees not to rely on such information, and waives any claim relating to, or arising, there from.

A-11. SOIL BORINGS

The Owner, at its expense, has undertaken a program of having soil borings taken by a soils engineer for the design of the Project. The soil boring information is contained herein and also available at the office of Haugo Geotechnical Services. No warranty is given, implied or otherwise as to the accuracy or completeness of the data to show all underground soil conditions.

A-12. MPCA GENERAL STORM WATER PERMIT

The Contractor will be responsible for complete inspection and maintenance of erosion control devices, completing the inspection log, compliance of NPDES requirements and other applicable laws, rules and regulations, and any fines due to inadequate maintenance of erosion control devices. Inspection and maintenance of erosion control devices shall be the Contractor's responsibility until final acceptance of the Project.

A-13. WEATHER DELAYS

If adverse weather conditions are the basis of any claim for an extension of time or otherwise, the Contractor shall: (1) provide written notice of such claim within two (2) days of the event or condition giving rise to such claim; and (2) document the claim a reasonable time thereafter by written data: (a) substantiating that the weather conditions were not within the range of conditions that could have been anticipated based upon weather records for the area, and could not have otherwise been reasonably anticipated; (b) establishing that the weather conditions had an adverse effect on the scheduled construction; and (c) describing the efforts taken by the Contractor to maintain the scheduled construction in spite of the weather conditions. A claim without the required data is deemed insufficient, and may be rejected by the Engineer and Owner.

A-14. LABOR

Any language in this Contract to the contrary notwithstanding, it is specifically understood and agreed by the parties hereto that, in the event the Owner suffers (for a term lasting more than one week) any business interruption, work stoppage, picketing, bannering, or failure of the Contractor and its subcontractors and suppliers to deliver supplies to the Project or any other subdivision owned by and being developed by the Owner, as the result, in the Owner's sole opinion, of Owner's employing the Contractor hereunder or any employment or other practice of the Contractor, Owner reserves the right to terminate this Contract forthwith, upon delivery of written notice of the same to Contractor. Upon such termination, Owner shall pay Contractor for Work done to the date of delivery of such notice. Certification to the Owner by Engineer as to the Work by Contractor done to the date of delivery of such notice shall be final and binding on the parties hereto. Contractor shall upon delivery of such notice, forthwith remove all Contractor's equipment and personnel from the Project, and Owner shall be free to any time thereafter to employ another contractor or contractors to complete the Work hereunder, all such employment of another contractor or contractors to be at Contractor's own cost and expense.

Owner shall make delivery of the notice described in the preceding paragraph to Contractor at the address set forth in the first paragraph of this Contract, either personally or by Certified Mail, receipt card requested.

A-15. LIQUIDATED DAMAGES

Liquidated damages shall be assessed against the Contractor as set forth in Section 48 of the General Conditions, except the reference to a calendar day is omitted, and a working day is substituted as previously identified in the Contract Documents.

A-16. WORKING HOURS

Work shall be completed during the standard working hours allowed by the City. Work necessary for emergencies, or for the protection of equipment or work, may be executed as required.

SECTION B – MATERIALS

B-1. SANITARY SEWER PIPE

Sanitary sewer pipe and fittings shall conform to the requirements of CEAM 2621.2 and the City of North Saint Paul for PVC pipe and ductile iron pipe.

B-2. SANITARY SEWER MANHOLE

Sanitary sewer manholes shall conform to the requirements of CEAM 2621.2 and to the City of North Saint Paul standards.

B-3. SANITARY SERVICE PIPE

Sanitary service pipe and fittings shall conform to the requirements of CEAM 2621.2 and to the City of North Saint Paul standards for PVC and ductile iron service pipe.

B-4. GRANULAR FOUNDATION

Granular foundation materials shall conform to the requirements of CEAM 2621.2 and to the City of North Saint Paul standards.

B-5. WATERMAIN PIPE AND FITTINGS

Watermain pipe and fittings shall conform to the requirements of CEAM 2611.2 for Class 52 ductile iron pipe and fittings.

B-6. FIRE HYDRANTS

Fire Hydrants shall conform to the requirements of the City of North Saint Paul.

B-7. WATER SERVICES

Water service pipe shall conform to the requirements of CEAM 2611.2 and to the City of North Saint Paul standard plates for copper pipe, corporation stops and curb stops and boxes. 1-1/2" and 2" corporation stops shall be Mueller H15000 or approved equal 1-1/2" and 2" corporation stops shall require saddles. Saddles shall be Smith-Blair Type 313 or approved equal, with double, zinc plated straps.

B-8. COPPER FITTINGS

All fittings for copper tubing shall be cast brass, having uniformity in wall thickness and strength and shall be free of defects affecting serviceability. All copper pipe fittings shall be flared or compression type. All threads for underground service line fittings shall conform to the requirements of AWWA C-880, each fitting shall be plainly marked with name or trademark of the manufacture.

B-9. GATE VALVES

Gate valves shall conform to the requirements of CEAM 2611.2 and to the City of North Saint Paul standards for resilient wedge valves.

B-10. STORM SEWER PIPE & FLARED END SECTIONS

Storm sewer pipe & flared end sections shall conform to the requirements of CEAM 2621.2 and City of North Saint Paul standards for reinforced concrete pipe and fittings. All joints shall be R-4 gasketed joints.

B-11. STORM MANHOLES & CATCH BASINS

Storm manholes & catch basins shall conform to the requirements of CEAM 2621.2 and City of North Saint Paul standards.

B-12. METAL SEWER CASTINGS

Metal sewer castings shall conform to the requirements of CEAM 2621.2 and to the City of North Saint Paul standards.

Manhole castings shall be Neenah R-1642-B or equal.

Catch basin castings shall be Neenah R-3067 with vane grate or equal.

Catch basin castings which fall in or within 10' of driveways shall be Neenah R-3501-TR or R-3501-TL.

Beehive castings shall be Neenah R-4342 or equal.

B-13. RIP RAP

Rip rap shall conform to the requirements of MnDOT 3601 for Class 4 random rip rap. The geotextile filter shall conform to the requirements of MnDOT 3733.

B-14. AGGREGATE BASE

Aggregate base shall conform to the requirements of MnDOT 3138 for Class 5 aggregate and the City of North Saint Paul. The aggregate shall be 100% crushed limestone.

B-15. BITUMINOUS BASE & WEAR COURSE MIXTURE

Materials for bituminous base and wear courses shall conform to the requirements of MnDOT 2360.

Aggregate materials for bituminous mixtures shall meet requirements of MnDOT 3139.

Bituminous materials shall conform to the requirements of MnDOT 3151.

B-16. TACK COAT

Bituminous tack coat shall conform to the requirements of MnDOT 3151 for an emulsified asphalt.

B-17. CONCRETE FOR WALKS

Materials for concrete walks shall conform to the requirements of MnDOT 2521.

B-18. CONCRETE FOR CURBING

Materials for concrete curbing shall conform to the requirements of MnDOT 2531.

B-19. TURF ESTABLISHMENT

All disturbed areas shall have a minimum of six (6) inches of topsoil placed.

Materials for turf establishment shall meet the requirements of the MnDOT Seeding Manual, 2014 Edition and the Natural Resources Conservation Service, Conservation Practice Standard, Critical Area Planting, Code 342.

B-20. SELECT GRANULAR SUBGRADE

Select granular subgrade material shall conform to the requirements of MnDOT 2105 and 3149.

SECTION C - CONSTRUCTION REQUIREMENTS

C-1. **WORK (GENERAL)**

The provisions of MnDOT Specifications 2105 shall apply except as modified here.

The work to be done under this contract shall include the subgrade excavation, compaction, backfill and stockpiling, and portions of the embankment construction for the building pads and roadways so designated in these Plans and Specifications.

The Owner intends to have all lots acceptable to HUD/FHA and the Contractor shall conduct his operation in conformance with Data Sheet 79g standards. The Owner will enter into a separate agreement with the soils engineer to advise the Contractor to perform soils tests for the purpose of conforming with these standards. However, the responsibility for acceptance is borne by the Contractor.

Constructed slopes shall be a maximum of 3:1. Existing slopes shall remain as is.

All lots and building sites shall be graded so as to provide for positive drainage. The requirement to leave building pads below finished grade shall not be construed to allow the waiving of positive drainage.

C-2. **GRADING TOLERANCES**

Tolerance for street grading shall be plus or minus 0.05' or as directed by the Engineer. Tolerance for lot grading shall be plus or minus 0.25'. The Engineer will check centerline profile of street subgrade prior to placement of base and building pad elevations on a one-time basis only. Re-checking of street profiles due to construction errors is to be paid for by the Contractor, through deduction from his pay voucher or by contractor paying directly to engineer.

The Contractor shall not be allowed to take advantage of the stated tolerances by maintaining a consistently high or low elevation. In essence the Contractor accepts the intent of the Grading Plan and assumes the responsibility that there is sufficient material on site and drainage shall be in accordance with the Plan.

The Engineer or his authorized representative will assist the Owner by checking grading tolerance at limited spot locations and certifying by letter that the grading is within tolerance. This certification letter does not relieve the Contractor of his contract obligations or the Contractor's implied warranties. The Contractor is solely responsible to construct the project to plan grades and specification, in accordance with the contract documents.

The Engineer is required to provide a Certified Grading Plan to the City with the completion of the final grading.

C-3. **COMMON EXCAVATION**

This work includes of construction of excavation and embankments required to complete the Project in accordance with the Plans and Specifications but not specifically provided for elsewhere within these Project Special Conditions.

The Contractor shall excavate and segregate all the various materials encountered to the depth as shown in the Plan. All select material shall be used in the street and building pad construction.

Existing topsoil or organic material shall be salvaged by the Contractor to provide a 6" cover for all portions of the Project except streets. This material may be stripped prior to other earthwork or it may be segregated as provided elsewhere in these Specifications. The Contractor must exercise great care to salvage enough topsoil to provide 6" of cover.

Excavation areas shall be over excavated a minimum of 6" and embankment areas shall be left 6" below except in streets and the topsoil or organic material shall be spread thereon. Streets shall be graded to subgrade elevation and building areas as shown on the Plans. The finished Project shall have a smooth and blended appearance. The 6" over excavating in excavation areas is included in the Common Excavation Plan Quantity and shall be paid for as Common Excavation.

Embankment placed in roadway areas shall be constructed in accordance with the provision of MnDOT 2105. Minimum allowable density for roadway embankment construction to within 3 feet of subgrade shall be 95% of Standard Proctor Density. Roadway embankments placed within 3 feet of subgrade shall be compacted to a minimum of 100% Standard Proctor Density.

Minimum allowable density for building pad embankment construction shall be 100% of Standard Proctor Density.

All other embankments placed shall be subject to ordinary compaction requirement. Ordinary Compaction requirement is hereby defined as one foot loose lifts at nearly optimum moisture content compacted until no further yielding is evident. If so desired by the Engineer, density tests shall be taken to verify the field observations. Provided such tests are taken, 90% Standard Proctor Density shall be considered the minimum acceptable density.

Owner, at its expense, will employ a recognized soil laboratory to run compaction tests as required to determine compliance with this requirement. Failure to meet the compaction requirement shall mean removal of the material involved and replaced until this requirement is met, at no additional expense to the Owner. Any re-staking or grade re-verification will be paid for by the Contractor or by deduction from the pay voucher.

Building pad embankments placed under water shall be dewatered and embankments constructed to select granular borrow material to a depth of 2 feet above existing grade. Any slope steeper than 4:1 shall be notched prior to placing any fill thereon. The benching operation should result in benches not less than 10 feet wide nor more than 3 feet in height. Material other than select shall be used for embankment only where designated by the Engineer. This material shall be placed in the embankment by methods as similar to the Ordinary Compaction Method as is feasible.

C-4. SUBGRADE EXCAVATION (Stripping and Excavation Prior to Fill)

This work consists of excavation below finished grade or natural ground whichever is lower to remove unstable or organic material prior to placing embankments. This item does not apply to the normal subcut to allow topsoil placement as provided under "Common Excavation."

The limits of subgrade excavation will be 1-1/2:1 slopes providing sufficient width at the bottom of the excavation to allow a 1:1 side slope of the embankment, and length and depth as approved by the engineer or his authorized representative, and to the bottom of all organic materials. The excavation will be left open to allow the Engineer to inspect the foundation materials and take necessary tests.

The subgrade excavation shall be used as topsoil as needed.

C-5. CLEARING AND GRUBBING

The clearing, grubbing and disposal of all trees within the construction limits, inclusive of clearing and grubbing required to facilitate utility construction, shall be the responsibility of the Contractor.

The Contractor shall be responsible for securing a disposal area and shall comply with all regulations and secure any permits necessary for the proper disposal of the material.

C-6. TURF ESTABLISHMENT

Turf establishment shall be with materials listed in Section "B". Mulching shall be disked in. All seeding and mulching shall take place within One (1) week of the completed grading operation.

C-7. SILT FENCE

Silt fence shall be installed by the Contractor as shown on the plans and details. The Contractor shall maintain the silt fence until the seed and mulch has been placed and final stabilization has been completed. Any erosion or deposition of erosion material shall be promptly cleaned up by the Contractor. The contractor shall remove silt fence after final stabilization.

C-8. POND EXCAVATION/MITIGATION

Mitigation and restoration will be as directed by the owners authorized environmental representative.

C-9. CONNECT TO EXISTING UTILITY

The Contractor shall supply all labor, materials and equipment necessary to connect his work to the existing storm sewer, sanitary sewer or water mains. This work shall include locating the existing utility, any excavation, demolition work, and removal of bulkheads, thrust blocks, plugs or caps.

C-10. SANITARY SEWER TESTING

A deflection test shall be performed on all flexible pipe. The test shall be conducted in the presence of a public works representative from the City of North Saint Paul a minimum of 30 days after final backfilling of the pipe trench.

The deflection test shall be run using a rigid ball or mandrel with a diameter equal to 95 percent of the inside diameter of the pipe allowing for manufacturing tolerances. The test shall be performed without mechanical pulling devices.

Sections failing the test shall be repaired and retested prior to acceptance.

An air test conforming to the requirements of the City of North Saint Paul shall also be performed by the Contractor.

C-11. WATER TEST

The Contractor shall perform the following tests in accordance with CEAM specifications and to City of North Saint Paul standards.

1. Disinfect, flush and test as necessary for meeting the water quality requirements.
2. Electrical conductivity test.
3. Hydrostatic pressure test.

C-12. CLEANING SANITARY SEWER LINES

Prior to final acceptance of each section of the sewer line, the Contractor shall flush a ball, the full diameter of the sewer through the line. All dirt and debris shall be prevented from entering the existing sewer system by means of watertight plugs or other suitable methods. Upon completion of the testing and flushing, the Engineer will carefully inspect all sewers and appurtenances. Any unsatisfactory work shall be removed and replaced in a proper manner and the invert of the sewer and manholes shall be left clean and free from obstructions throughout the entire line.

C-13. SAWCUT PAVEMENT

The provision of MnDOT 2104 shall apply except as modified or supplemented herein. Bituminous and Concrete pavements shall be removed with straight line horizontal and vertical cuts at the limits of removal, or the nearest joint, as directed by the Engineer. The straight line cut shall be protected by the contractor against break-off.

C-14. MILL PAVEMENT

The work shall be performed in accordance with MnDOT 2232 except as modified or supplemented herein.

C-15. SUBGRADE PREPARATION

The provisions of MnDOT 2112 shall apply.

C-16. TEST ROLL

Provisions of MnDOT 211.1 shall apply except that: The test roll shall be performed upon completion of fine grading of the street subgrade, and prior to placement of any aggregate base.

A fully loaded tandem truck may be used in lieu of the specified roller.

C-17. AGGREGATE BASE

Provisions of MnDOT 2211 shall apply with the added provision that compaction shall be obtained by the Specified Density Method.

C-18. BITUMINOUS PAVEMENT

Provisions of MnDOT 2360 shall apply with the added provisions that compaction shall be obtained by the use of a rubber tired roller along with the steel drum roller for bituminous compaction by the Maximum Density Method.

C-19. CASTING ENCASEMENT

Provide concrete collar to encase all catch basin castings and rings. Use curb and gutter concrete mix for encasement.

C-20. CONCRETE CURB AND GUTTER

The provisions of Section 2531 MnDOT Specifications shall apply with the following modifications:

- a) The use of bituminous joint sealer is not required.
- b) Oil surface treatment will be applied to all weather surfaces cured by a method other than by a membrane-curing compound.
- c) Contraction joints shall be spaced at maximum of ten (10) feet.

Test cylinders for compression testing shall be provided by the Contractor at approximately 500-foot intervals. The cylinders will normally be taken by the project representative; however, all costs of breaking the cylinder shall be borne by the Contractor. If a substandard break occurs, the Contractor shall bear the expense of further testing of a nature satisfactory to the Engineer. This testing shall compare the proven strength of in-place concrete to that in question. The limits of any poor quality material shall be determined, and the substandard curb and gutter shall be removed and replaced at the Contractor's expense. All subcut operations required for curb and gutter construction shall be considered incidental to the cost per lineal foot of curb and gutter.

C-21. PERMANENT TRAFFIC BARRICADE

The Contractor shall furnish and install traffic barricades in accordance to the City of North Saint Paul standards at the locations designated on the plans.

C-22. BACKFILL CURBS AND RESTORE BOULEVARD

After the curbs have cured for a sufficient time the Contractor shall backfill the curbs and grade the boulevards to conform to grades shown on the typical section.

C-23. MPCA GENERAL STORM WATER PERMIT

Prior to the Award of the Contract, the Contractor must complete and sign the General Contractor Certification of the Application. The Contractor will be responsible for complete inspection and maintenance of erosion control devices, completing the inspection log and any fines due to inadequate maintenance of erosion control devices. Inspection and maintenance of erosion control

devices shall be the Contractor's responsibility until final acceptance of the project and shall be incidental to the project cost.

SECTION D - METHOD OF MEASUREMENT AND PAYMENT

The following shall apply as a method of measurement and payment. All prices to include the furnishing of all materials, labor, tools, equipment and applicable sales taxes to construct complete, in place, the work specified.

All items shown in the proposal, and not described herein, will be measured as the unit shown and shall include all work and materials necessary to construct the unit. Payment for all items shall be at the lump sum or unit price stated in the proposal.

D-1. MOBILIZATION

Mobilization shall be measured and paid for on a lump sum basis. This item shall consist of preparatory work and operations for the movement of all equipment, personnel, supplies and incidentals to the project site and establishment of any other facilities necessary for work on the project.

D-2. COMMON EXCAVATION

Existing topography of the site was obtained by a field topographic survey, prepared by Pioneer Engineering, P.A. Estimated earthwork computations are based upon such registration.

Measurement and payment for Common Excavation shall be at the unit price bid per cubic yard. Placement and compaction of embankment, subgrade hold down for pad, streets and topsoil and topsoil respread shall be considered incidental to the common excavation.

No consideration for deviations to the unit price bid for purposes of balancing the earthwork shall be given unless the owner requests a revision. In the event the Owner requests a revision, the Owner and Contractor shall agree upon a revised price.

D-3. COMMON EXCAVATION & IMPORT MATERIAL

The method of measurement and payment for this bid item shall be at the unit price per cubic yard. The Contractor shall provide the Owner with written documentation of the number and type of trucks used to import the required material.

The truck volumes will be paid on the following basis.

<u>Axel Type</u>	<u>Volume (LV) (CY)</u>
Tandem	10 1/2
Tri	12 1/2
Quad	14 1/2
Belly dump	17 1/2

D-4. SUBGRADE EXCAVATION

The method of measurement and payment for subgrade excavation shall be at the unit price bid per cubic yard. The estimated quantity is based upon the soil boring information. If actual conditions vary significantly from representations of the soil borings, the Contractor shall notify the Engineer immediately, and the area, which shows significant variation, shall be measured in the field, and paid for at the bid unit price. A significant variation shall be considered to be twenty (20) percent different than the soil boring representation or subgrade correction bid quantity. No unit price adjustments shall be allowed regardless of deviations from estimated contract quantity.

D-5. TURF ESTABLISHMENT

Measurement and payment for turf establishment shall be at the unit price bid per acre and shall include furnishing and application of seed, mulch and fertilizer in accordance with these Specifications.

The Owner reserves the right not to pay for dormant seeding or seeding that was applied outside of seeding dates until there is evidence that said seeding has germinated and broken ground surface with sufficient coverage to avoid re-seeding.

D-6. EROSION CONTROL FENCE

Measurement and payment for erosion control shall be at the unit price bid per linear foot and includes maintenance and removal. The cost of any other erosion control measures as required in these Specifications shall be considered incidental to the project with no direct compensation. The contractor shall be responsible to maintain and repair any erosion that occurs during grading operations until the seeding and mulching, and final stabilization is complete.

D-7. TOPSOIL STRIPPING & RESPREAD

Measurement and payment for topsoil stripping and respread shall be at the unit price bid per cubic yard.

D-8. CLEARING, GRUBBING, DEMOLITION AND DISPOSAL

Measurement and payment for clearing, grubbing and disposal shall be on a lump sum basis and shall include the removal and disposal of all trees, stumps, brush, debris and etc. from within the construction limits or property limits as required.

D-9. GRANULAR MATERIAL FOR PIPE BEDDING

Granular material required for use in pipe bedding and encasement zones for PVC sewer pipe shall be considered incidental to the project with no direct compensation. Compensation for the excavation of unstable material and the replacement with granular material shall be accepted only when directed by the Engineer. The measurement and payment for granular material as directed by the Engineer shall be per cubic yard, loose volume basis. Material placed for the convenience of the workman shall not be an item for measurement.

D-10. PAYDEPTHS FOR SANITARY SEWER

Paydepths for sanitary sewer shall be from invert to finished grade. Measurement for lengths of pipe shall be from the center of manhole to the center of manhole or end of stub for each diameter and type of pipe.

D-11. SANITARY MANHOLES

Measurement and payment for manholes shall be per each for manholes 0-10' in depth including base and casting. The measurement shall be made from the invert of the lowest pipe to the top of the casting. Measurement for manhole extra depth shall be for measured depth over 10 feet. Payment for manhole extra depth shall be at the unit price bid per linear foot.

D-12. SANITARY MANHOLE DROP CONNECTION

Payment for manhole drop connection shall be at the unit bid price per vertical foot including all fittings, pipe and materials necessary for a complete structure. Measurement of drop connections shall be from the invert of the inlet pipe to the lowest invert of the manhole.

D-13. SANITARY SERVICE WYES

Measurement and payment for sanitary service wyes shall be at the unit price bid for each wye.

D-14. SANITARY SERVICE PIPE

Measurement of sanitary service pipe shall be from the center of the main at the wye horizontally to the plug at the end of the pipe. Payment shall be at the unit price bid per linear foot. No payment will be made for any additional fittings other than those provided for on the bid proposal.

D-15. SERVICE RISERS

Measurement and payment for service risers shall be at the unit price bid per vertical foot. Measurement of service risers shall be the vertical length from the invert of the sewer main at the wye location to the invert of the horizontal service pipe at the top of the riser.

D-16. SANITARY SEWER CLEAN OUT

Measurement and payment for sanitary sewer clean out shall be per each at the unit price bid.

D-17. WATERMAIN

Measurement and payment for water main shall be at the unit price bid per linear foot for each size and type. Measurement of pipe shall be made from end to end with out regard to bends, tees or gate valves. Lengths of branches shall be measured from the center of the connecting pipe to the hydrant gate valve on the end of the pipe. Any thrust blocks, tie rods, glands, bolts or other accessories shall be incidental to pipe installation for which no separate payment will be made.

D-18. PIPE FITTINGS

Measurement and payment for watermain fitting shall be at the unit price bid per pound for the standard weight of fittings installed.

D-19. GATE VALVE AND BOX

Measurement and payment for gate valves and boxes including extensions shall be at the unit price bid for each size and type.

D-20. HYDRANTS

Measurement and payment for hydrants shall be at the unit price bid for each hydrant installed complete with drainage pit.

D-21. COPPER WATER SERVICE PIPE

Measurement and payment for a copper water service pipe shall be at the unit price bid per linear foot. Measurement shall be the horizontal length of copper pipe from the center of the main at the corporation to the end of the tail.

D-22. CORPORATION STOP

Measurement and payment for corporation stops shall be at the unit price bid per each including tapping and service saddles where required.

D-23. CURB STOP

Measurement and payment for curb stops shall be at the unit price bid per each complete with box, steel marker post and base.

D-24. STORM SEWER PIPE AND FLARED END SECTION

Measurement and payment for storm sewer pipe shall be at the unit price bid per linear foot for each size and type. Measurement of storm sewer pipe shall be from the center of structure to center of structure, end section or bend. The length of bends, end sections or tees shall be subtracted from the length of pipe and paid for per each. Flared end sections shall include a trash guard for which no separate payment shall be made.

Tie rods where indicating on the plans or in the specifications shall be incidental to storm sewer construction for which no separate payment shall be made. Construction of bulkheads at the ends of pipes shall be considered incidental.

D-25. STORM MANHOLES AND CATCH BASINS

Measurement and payment for storm sewer manholes and catch basins shall be on a per each basis of the size and type designated on the Plans and Bid Proposal including base and castings.

D-26. CONNECT TO EXISTING UTILITY MAIN

Measurement and payment for connect to existing utility main shall be per each at the unit price bid.

D-27. SANITARY SEWER TEST

Payment for the sanitary sewer test shall be lump sum for performing the specified tests to the complete sanitary sewer. No additional compensation will be given for failed tests, retesting or testing in stages.

D-28. WATER TEST

Payment for the water test shall be lump sum for performing the specified test to the complete water system. No additional compensation will be given for failed tests, retesting or testing in stages.

D-29. RIP RAP

Measurement and payment for rip rap shall be per cubic yard in place at the unit price bid including filter fabric.

D-30. ADJUST CASTINGS

Measurement and payment for adjusting manhole, gate valves and catch basin castings within the roadway to finished grade shall be per each structure. Adjustment of castings to the top of the bituminous base of aggregate base shall be considered incidental work for which no payment shall be made therefore.

D-31. SUBGRADE PREPARATION

Payment for subgrade preparation shall be at the unit price bid per square yard. Test rolling of the subgrade shall be incidental work and no direct compensation will be made therefore.

D-32. AGGREGATE BASE

Measurement and payment for aggregate base shall be at the unit price bid per square yard, and shall include furnishing, placement and compaction of the aggregate base to the depth specified on the Plans and Specifications. Measurement and payment for aggregate base used to restore utility trenches in existing streets shall be per ton or square yard at the unit price bid.

D-33. SAW CUT PAVEMENT

Measurement and payment for saw cutting bituminous and concrete pavement shall be at the unit price bid per linear foot.

D-34. MILL BITUMINOUS PAVEMENT

Measurement and payment for milling bituminous pavement shall be at the unit price bid per square yard.

D-35. REMOVE CONCRETE SIDEWALK

Measurement and payment for removal of concrete sidewalk shall be at the unit price bid per linear foot and shall include saw cutting and disposal of materials.

D-36. REMOVE CONCRETE CURB & GUTTER

Measurement and payment for removal of concrete sidewalk shall be at the unit price bid per linear foot and shall include saw cutting and disposal of materials.

D-37. REMOVE BITUMINOUS SECTION

Measurement and payment for removal of bituminous pavement section shall be at the unit price bid per square yard and shall include disposal of materials.

D-38. SELECT GRANULAR SUBGRADE

Payment for select granular subgrade material shall be at the unit price bid per square yard compacted in place and graded to the specified tolerance. Test rolling of the subgrade shall be incidental work and no direct compensation will be made therefore.

D-39. PLANT MIXED BITUMINOUS PAVEMENT (MnDOT 2360/2350)

Measurement and payment for bituminous pavement shall be at the unit price bid per square yard, and shall include furnishing, placement and compaction of the bituminous pavement to the depth specified on the Plans and Specifications. Measurement and payment for bituminous pavement used to restore utility trenches in existing streets shall be per ton at the unit price bid.

D-40. CONCRETE CURB & GUTTER

Measurement and payment for curb and gutter shall be at the unit price bid per linear foot.

D-41. CONCRETE VALLEY GUTTER

Measurement for concrete valley gutter shall be per each, except that payment for the curb & gutter in the curb radii shall be per linear foot at the unit price bid for curb & gutter.

D-42. CONCRETE SIDEWALK

Measurement for concrete sidewalk shall be at the unit price bid per square foot.

D-43. TACK COAT

Measurement and payment shall be at the unit price bid per gallon for tack coat placed according to the specifications.

D-44. BACKFILL CURB AND RESTORE BOULEVARDS

Measurement and payment for backfill curb and restore boulevards shall be lump sum.

D-45. DEWATERING

Measurement and payment for dewatering on a lump sum basis

D-46. METHOD OF PAYMENT

Payment for all work shall be at the unit prices as set forth in the bid proposal. Please note the Owner will retain 5% from all request for payment, until the project is completed and written accepted of the subdivision improvements by the City is received.

D-47. FINAL PAYMENT

When all work is completed and final written acceptance has been received from the City a request for final payment may be made. The request for final payment shall be submitted to the Owner's Engineer.

SECTION E – WATERMAIN & WATER SERVICES SPECIFICATIONS

2504 – (CEAM 2611) WATERMAIN AND WATER SERVICES

The provisions of MnDOT 2504 and CEAM 2611 are modified and/or supplemented with the following: 2504.1 – (CEAM 2611.1) DESCRIPTION

The provisions herein shall be applicable to all labor, materials, and equipment associated with constructing water distribution system components as specified in the plans or as directed by the Engineer.

Adjust Curb Box: This item shall include the adjustment of existing curb boxes not intended to be replaced, if needed, to bring each existing curb box to proper grade for top of pavement or top of topsoil. Curb boxes needing adjustment will be marked in the field by the Engineer.

Reconstruct Valve Box: This item shall include the repair of any broken valve boxes they require replacement of either the top section and/or the entire valve standpipe

2504.2 – (CEAM 2611.2) MATERIALS

Polyvinyl Chloride Pipe: All PVC water main pipe shall conform to AWWA Standard C-900-97 (DR 18). The bell shall consist of an integral wall section with a factory-installed, solid cross-section elastomeric ring that meets the requirements of ASTM F-477.

Tracer wire shall be laid with all PVC water mains and shall be included in the unit price bid per lineal foot of pipe. The tracer wire shall also be connected to all fire hydrants, gate valve boxes, and water services as shown in Appendix F. The tracer wire shall be connected next to the water service per the details in Appendix F and include an access box. The bronze ground clamp and any nuts required to install the tracer wire, shall also be in the unit price bid per lineal foot of pipe.

Water service taps shall not be made directly to PVC water main pipe. Service taps shall be made only to ductile iron fittings (saddles).

Drive-in Grounding Anode rods shall be placed per the details in Appendix F.

All hydrant lead piping (hydrant assembly) shall be ductile iron pipe in accordance with AWWA C-151 of the class shown on the plans. All hydrant lead pipe shall have polyethylene encasement in accordance with AWWA C-105 furnished with standard thickness cement mortar lining conforming to AWWA C-104. All pipes shall have push-on joints as specified in AWWA C-111.

Tracer Wire: Tracer Wire shall be Copper-Clad Steel (CCS) Wire designed for use in directional drilling/pipe bursting applications such as “Copperhead SoloShot™ Burst Extra High Strength

Reinforced Tracer Wire”, or approved equivalent of multi-strand 304 stainless steel wire as shown in Appendix F. Tracer wire shall have a 45 mil, blue, high molecular weight – high-density polyethylene jacket. The tracer wire manufacturer shall warrant that the tracer wire and insulation will be free from defects for a period of five (5) years. Tracer wire shall be extended up to the ground level and secured onto a tracer wire access box as shown in Appendix F.

At the point of connection between ductile iron water mains with any non-iron water main or service, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of one-quarter inch (1/4”) thick and shall be protected from contamination by the backfill material with the use of a plastic Membrane – See Appendix F for more details.

Service Saddles: The service saddle shall have all metal parts made of 304 stainless steel. The saddle shall have a keeper bar through which the studs extend to assist with installation. The fingers of the lugs shall be MIG-welded to the base. The saddle band shall be TIG-welded to the lug bases. The studs shall be five-eighths inch (5/8”) 304 stainless steel with a fusion bonded Flexi-Coat epoxy coating to prevent galling. The studs shall be MIG-welded to the lug bases. The nuts shall be 304 stainless steel and fluoropolymer coated to prevent galling. The saddle shall be a minimum seven and one-half inches (7 1/2”). The all-stainless steel service saddle shall have an NPT or AWWA threaded female outlet TIG- welded into a drawn opening in the saddle band. The gasket shall be made of Nitrile (Buna N) specially compounded to resist water, oil, acids, alkalis, natural gas, most (aliphatic) hydrocarbon fluids, and many other chemicals. The temperature range of the gasket shall be -20°F thru +180°F. The saddle must have the outlet gasket molded into the band gasket to provide optimum sealing efficiency. The outlet gasket shall have a hydro-mechanical lip that improves sealing as the pressure increases. The gasket shall have a gridded pattern and shall be tapered on the ends for a smooth transition. The coupling shall be a Smith- Blair, Inc., 372 All-Stainless Steel saddle or approved equal.

Ductile Iron Pipe: Ductile iron pipe shall be Class 52 for six-inch (6”) and eight-inch (8”) diameter pipe. For pipe larger than eight-inch (8”) diameter, the pipe class shall be as shown on the plans. All DIP hydrant leads shall have polyethylene encasement in accordance with ANSI/AWWA C105/A21.5-82. All water mains shall have the standard thickness of cement mortar lining conforming to AWWA C-104. All water mains shall have push-on joints as specified in AWWA C-111. Polyethylene encasement shall be included in the unit price bid per lineal foot of pipe for six-inch (6”) hydrant leads.

High-Density Polyethylene Pipe: All HDPE water service pipe shall conform to AWWA Standard C901/C906 for SDR 11 IPS PE Pipe. All HDPE pipe materials used for the manufacture of polyethylene pipe shall be extra high molecular weight, high-density ethylene/hexane copolymer PW 4710 polyethylene resin. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. Polyethylene materials used shall be of High Density Polyethylene (HDPE), meeting 1600 Design Stress @ 23°C or 1000 Design Stress @ 60°C applicable requirements for PE4710 pipe & tubing as defined by ASTM D-3350, Cell Classification 445576E.

Insulation shall be equal to Dow Chemical Company “Styrofoam Highload” brand plastic foam or Engineer approved equal, with compressive strength able to withstand compaction and standard traffic loading.

Typical Raw Material Properties

	Values		ASTM
	English Units	SI Units	Method
Density (Natural)		0.949 g/cc	D4883
Density (Blue)		0.959 g/cc	
Melt Index 190 C/ 21.6 kg		8g/10 min	D1238
Tensile Strength			
@ Yield (2 in/min)	3625 psi	25.0 MPa	D638
@ Break (2 in/min)	5500 psi	38.0 MPa	D638
Elongation			
@ Break (2 in/min)	>600%	>600%	D638
Flexural Modulus ²	135,000 psi	930 MPa	D790A
Notched Izod Impact Strength	12 ft-lbf/in	12 kJ/m ²	D256
Hardness (Shore D)	64	64	D2240
Brittleness Temperature	<-180° F	<-118° C	D746
Vicat Softening Point	259° F	126° C	D1525
Thermal Stability	464° F min	240° C min	D3350
Hydrostatic Design Basis			
@23° C	1600 psi	11.0 MPa	D2837
@60° C	1000 psi	6.9 MPa	D2837
Minimum Required Strength	1,450 psi	10.0MPa	ISO 9080/12162
Environmental Stress Crack Resistance ³	>5,000 hrs	>5,000 hrs	D1693
Notch Tensile (PENT)	>10,000 hrs	>10,000 hrs	F1473
Cell Classification	445574E	445576E	D3350

² 2% Secant-Method 1

³ Condition B

The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties throughout.

Socket fusion shall NOT be used. Extrusion welding of hot gas welding shall NOT be used. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to mechanically connect the HDPE pipe without butt fusion, but shall be in accordance with manufacturer’s recommendations.

Alpha Restrained Joint Couplings made by Romac Industries, Inc. or approved equal are to be used to join dissimilar water main pipe materials.

Pipe and Tubing shall be Permanently Indented continuously along the pipes barrel - identifying the pipe or tubing with Manufacturers name or Logo, Pressure rating, Nominal size, NSF-pw Logo, and QC control codes.

HDPE Fittings: When utilizing a mechanical fitting to join HDPE to HDPE, PVC or DIP an appropriately sized stainless steel pipe stiffener shall be used. The stiffener must be sized to encompass the entire bearing length of the restraint device. This shall be considered incidental to watermain pipe.

8" High Density Polyethylene Pipe (HDPE) (Directionally Drilled): Drilled or pulled water main shall be HDPE DR-11 meeting the testing requirements of the most current version of AWWA C-901 (1/2" through 3") or C- 906 (4" through 63"). Segments shall be fused. A Tracer Wire shall be pulled along with the HDPE pipe and shall be included in the unit price bid per lineal foot of pipe. The tracer wire shall be welded to all manhole castings along the pipe run.

Ductile Iron Fittings: All fittings shall be ductile iron Class 350 compact fittings in accordance with ANSI/AWWA C153/A21.53-84, covering compact fittings. All fittings shall be fusion-bonded epoxy coated, conforming to ANSI/AWWA C550 and C116/A21.16 requirements. The thickness of the coating shall be six to eight (6-8) mils. Bolts supplied for fittings shall be stainless steel or core blue. All mechanical joints shall conform to AWWA Specifications, C111, latest revisions, with gaskets.

Retainer Glands: Retainer glands shall be ductile iron designed to withstand pressures shown in Table No. 9-6 of American Cast Iron Pipe Company's catalog. Retainer glands shall be by American, US Pipe or Mega-Lug type and shall be used at all changes in direction and at all fittings and valves in addition to reaction blocking. This shall be considered incidental to watermain pipe.

Fire Hydrants: Fire hydrants shall be American Flow Control Model WB67-250 Pacer Fire Hydrant as manufactured by the Waterous Company, South St. Paul, MN. All hydrants shall conform to AWWA C- 502 latest revision unless otherwise specified in the Contract Documents. Hydrants shall be furnished in compliance with the additional standards set forth in Section 3.08 of the City Specification. Hydrant Assembly shall be defined as all elements from the tee at the main to and including the fire hydrant.

Tracer wire shall be extended up the fire hydrant and secure onto the hydrant base. A one inch (1") PVC trace wire access box shall be provided to cover the tracer wire as it extends from the ground to the hydrant. The PVC pipe shall extend a minimum of two inches (2") above ground.

Gate Valves: All gate valves six-inch to eight-inch (6" to 8") shall be resilient-seated gate valves meeting City Specifications. Mechanical joints shall conform to AWWA C111/ANSI A21.11-85. All gears on gate valves shall be cut tooth steel gears, housed in heavy cast iron extended type grease cases of approved design.

Resilient wedge gate valve shall conform to ANSI/AWWAC509. Valve shall be R/W resilient wedge gate valves as manufactured by Clow Corporation or equal. Valves shall be non-rising stem with a two-inch (2") square operating nut. The wedge shall be cast iron completely encapsulated with polyurethane rubber (except for guide and stem area). The polyurethane rubber shall be permanently bonded to the cast iron wedge to meet ASTM tests for rubber to metal bond ASTM D-429.

Stems for non-rising stem assemblies shall be cast bronze with integral collars. The non-rising stem stuffing box shall be the O-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open at full rated working pressure. There shall be two (2) low torque thrust bearings located above and below the stem collar. The stem nut shall be separate from the wedge and shall be of solid bronze. The waterway shall be smooth and free of all pockets, cavities, and depression in the seat area. Both interior and exterior of the body and bonnet shall be coated with fusion- bonded epoxy.

All gate valves require a bonnet adapter.

Valve Boxes: Valve boxes shall be screw-type meeting City Specifications requirements, with a drop lid cover marked with "Water". Box to be adjustable a minimum of six inches (6") up and down from the specified depth of pipe bury.

Corporation Stops: Water service taps made directly to PVC watermain pipe shall require stainless steel saddles per the detail in the plans. Saddles shall be incidental to the corporation stop.

Curb Stops: Service stops shall be for copper service pipe inlet and outlet, without a drain, and shall include HDPE to copper transition fittings. All fittings necessary to transition pipe material shall be included in the unit price for curb stop and box or pipe.

Curb Boxes: Where curb boxes are placed in concrete or bituminous pavement, a meter box cover, such as the Ford model A1 eight-inch (8") cover, shall be installed at no additional compensation.

Flared End Couplings: Flared end couplings shall be by Ford C22 of the size required. Compression joint couplings will not be accepted.

Reconstruct Valve Box: This item shall include the repair of any broken valve boxes that require replacement of the top section and the entire valve standpipe to the bell. Reconstruction of valve box shall include drop lid cover marked with "Water."

Any properly marked valve box in the construction area that is broken due to the Contractor's negligence shall be repaired by the Contractor with no additional compensation.

All watermain materials including but not limited to Pipe and Ductile Iron Fittings, Hydrants, Valve Boxes, Gate Valves, Saddles, Service Saddles and Service Piping, Corporation Stops, Curb Stops and Boxes, and Retainer Glands (Megalugs) and bolts shall be manufactured and produced in the United States.

Pipe Bedding: Pipe shall be bedded in and covered by six-inch (6") MnDOT 3149 specified granular material. Pipe bedding material shall be incidental to the pipe installation.

2504.3 – (CEAM 2611.3) CONSTRUCTION REQUIREMENTS

Testing: The CONTRACTOR shall perform all testing in the presence of the Engineer in the field. The City Observer shall receive at least twenty-four (24) hour advance notice for all testing.

Establishing Line and Grade: The Contractor shall give the Engineer forty-eight (48) hours of notice for the establishment of line and grade so the Engineer may have time to provide them. After line and grade has been provided by the Engineer, the Contractor shall be held responsible for the protection and preservation until authorized to remove them by the Inspector. The Contractor shall bear the full cost of replacement that may be caused by their unauthorized removal. The Engineer may require that work be suspended at any time and for any reason when such marks cannot be properly followed. No additional compensation shall be allowed the Contractor for any claims of crews being held up because of lack of line and grade stakes.

Operational Limitations and Requirements: Any dewatering necessary shall be the responsibility of the Contractor and shall be considered incidental to the installation of watermain.

The trench shall be dug only so far in advance of the work. Advance excavation shall be the minimum consistent with the Contractor's methods and scheduling, shall be subject to the approval of the Engineer and consistent with other sections of these specifications. The sides of the trench shall be sloped and/or braced and the trench drained to provide stable excavation, protect adjacent structures, and permit the pipe to be laid in a dry trench.

The trench excavation must conform to all local, state and federal requirements. All work must be confined to the limits of the construction and to easements or rights-of-way as indicated on the plans. The Contractor shall install at his expense shoring, bracing, or other trench support necessary to meet the varying soil conditions and to protect existing structures and property.

Disinfection of Water and Mains: All water distribution system or extension to existing system or any valved section of such extension, or replacement shall be disinfected prior to placing same in service. Such chlorination shall consist of a dosage of chlorine equivalent of fifty (50)

parts per million of chlorine. This may be accomplished by using a commercial type dry calcium hypochlorite such as "HTH" "PERCHLORON" or "MAXOCHLOR" at the rate of one pound (1#) of material containing seventy percent (70%) available chlorine per each 1,680 gallons of water in the line.

A predetermined dose shall be shaken into the pipe at the first joint attached to the existing water pipe, and the dosage shall be repeated at each pipe joint as the pipe laying progresses, or as may be directed by the Engineer.

When treated with dry calcium hypochlorite or with dry chlorinated lime, the newly laid pipe shall be filled very slowly to avoid washing the powder to the extremity of the pipeline.

Treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. This period shall be at least twenty-four (24) hours and preferably longer as may be directed. After chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least five (5) parts per million.

In process of chlorinated newly laid water pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent.

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities until the replacement water throughout its length, shall, upon a minimum of **two (2)** tests per closed system, both chemically and bacteriologically, be proven equal to the water quality served the public from the existing water supply system, and approved by the State Board or Department of Health. Both tests must be conducted by a certified independent lab. All costs associated with the testing shall be incidental to the watermain installation. In the event that either test in the opinion of the Engineer proves unsatisfactory, chlorination shall be repeated until a satisfactory condition of the water within the pipe is established. If any test is unsatisfactory, the Contractor will be required to repeat both tests at their expense.

Unless the Engineer shall direct otherwise, cuts made in existing pipe lines for the insertion of valves, fittings, repairs, or for any other purpose shall be chlorinated by shaking a quantity of the powder, pre-determined by the Engineer, into the pipe on each side of the cut-in. After slowly filling the section and reversing the flow, the chlorinated water shall be retained for several hours then flushed until no odor of chlorine can be detected in the waste water, or preferably until a check shall have been made for residual chlorine.

The Contractor is cautioned to take **extreme care** when disinfecting watermain which will replace in-place watermain. The Contractor will note that the City water system is **not** chlorinated, so special requirements will be required when connecting to the existing system. The City or Engineer will be present at all times a connection to the existing system is made. The new main shall be thoroughly flushed before any in-place services are connected to the new watermain.

Hydrostatic Testing of Water Mains: After the pipe has been laid and partially backfilled as specified, all newly laid pipe, or any valved section of it shall, unless otherwise specified, be subjected to hydrostatic pressure of 150 pounds per square inch (psi) in residential areas and 200 pounds per square inch (psi) in the commercial areas. The duration of each pressure test shall be two (2) hours. The gauge is not allowed to lose more than four (4) pounds of pressure through the duration of the test. More than four (4) pounds of change during the two (2) hour test in pressure will cause the test to be deemed unsatisfactory and must be redone.

Each valved section of pipe shall be slowly filled with water from a safe source of the specified test pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump pipe connection, gauges, and all necessary apparatus shall be furnished by the Contractor. Gauges and measuring devices must meet the approval of the Engineer and the necessary pipe taps made as directed.

Before applying the test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation, and afterwards tightly plugged.

All exposed pipes, fittings, valves, hydrants, and joints will be carefully examined during the open trench test. Any cracks or defective pipes, fittings, valves, or hydrants discovered in consequence of the pressure test shall be removed and replaced by the Contractor with sound material in the manner provided and the test shall be repeated until satisfactory to the Engineer.

Service pipes may be tested at the time of the foregoing test, if installed at the Contractor's option; however, testing of service pipes may be completed as a separate operation from main testing and if so, the test pressure shall be 100 pounds per square inch (psi). Service pipe testing, if done separately shall be done with the corporation stop open.

Tracer Wire Test: The Contractor shall perform a conductivity test on all tracer wire prior to acceptance of the watermain system. A low voltage circuit shall be completed with the use of a suitable voltage source and meter to ensure continuity of the tracer wire. In the event that a close clamp circuit cannot be completed, the cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

Pipeline Backfilling Operations: Backfilling shall be done in uniform lifts completely compacted over the full width of the excavated area. The material shall be compacted to ninety-five percent (95%) Standard Proctor Density, except that the top three feet (3') of the trench shall be compacted to 100% standard proctor density. Backfill shall be placed such that the final moisture content of the soil is in an acceptable range as determined by the City's testing laboratory.

Trench backfill shall be by use of suitable material from the excavation. The Contractor is responsible for excavating, stockpiling, and handling materials in such a way as to not degrade suitability of materials for backfill. Backfill material shall be tested by the Contractor for

optimum moisture content with the Contractor responsible for adding moisture or for reasonable soil drying measures to allow for material placement at a moisture content that will allow compaction to the required Standard Proctor Density.

All pipe backfill material, placement and compaction shall be incidental to pipe sewer price per linear foot for each size and type of pipe and all bedding requirements.

Granular Pipe Bedding: Granular pipe bedding shall be used when installing PVC watermain. Piping shall be installed in accordance with MnDOT provisions 2451.3D and/or 3149.2H according to the details for PVC pipe.

Connection to or Interruption of Existing Facilities: Prior to connecting to existing watermain, the project Inspector and City Utility Supervisor must be notified. Any residents who will be affected by the shutting off water shall be given a minimum of twenty-four (24) hour advance notice in writing as to when and for how long service will be interrupted. Temporary water shutoffs shall not exceed four (4) hours in duration, and shall only occur between the hours of 9:00 a.m. and 3:00 p.m., Monday through Friday. The Contractor shall at all times, coordinate his work with the Engineer and the City's Public Works Department.

During the installation of the new watermain, service shall be maintained. To maintain service to all properties, it may be necessary to maintain temporary pipes on the surface with connections to outside hose bibs. The temporary connections must be according to Department of Health standards as approved by the Engineer. New installations shall be coordinated so that no home or business is on temporary water service for more than 14 days. The Contractor shall be responsible for any improvements to homes or businesses necessary to facilitate the temporary water connections.

When it is necessary to connect to the existing water system or close existing portions of the water system due to construction operations, the Contractor shall discuss that phase of the project with the City Public Works Department five (5) working days in advance of the planned starting date to allow the orderly planning and coordination by the City. The Contractor shall provide temporary water service to all residences and businesses affected by the project.

Connect to Existing Watermain: The Contractor shall notify the Project Representative and the City Utility Supervisor at least 72 hours prior to connecting to existing watermain when residents or businesses will be without water. All residents who will be affected by the shutting off of the water service shall receive written notice from the Owner at least twenty-four (24) hour notice as to when and for how long service will be interrupted.

Water Service Installation: This project will include the installation of new corporation stops, curb stops and boxes, stand pipe, service saddles, tracer wire, and water service lines to the property line. Tracer wire shall be laid with all water services and shall be included in the unit price bid per lineal foot of pipe. The tracer wire shall be connected to the water service at the curb stop lid. The bronze ground clamp and any nuts required to install the tracer wire, shall also be in the unit price bid per lineal foot of pipe.

Residential services will be installed at one-inch (1") size for the corporation, curb stop, saddle, and copper, so as to match the existing service size. The service line may need to be modified at the property line to tie into the existing service. Any fittings necessary to modify the size of the service line, along with landscape block under the curb stop and the necessary couplings to connect to the existing service shall be included as "Connect to Existing Water Service." The Contractor shall make note of the service condition and report to the City Inspector any deficiencies that may exist.

Corporation stops shall be tapped into the main only when full of water under operating pressure. No taps shall be made into a dry pipe. Corporation stops shall be turned into the pipe until tight and shall not be turned back to facilitate having the operating nut on top.

The water service shall be installed with seven and one-half feet (7.5') of cover as shown on the detail plate or to depths shown on plans.

Water service replacements with less than ten feet (10') of separation from existing sanitary sewer service locations shall be installed as allowed by Minnesota Plumbing Code 4715.1710 Subp.2. The Contractor shall be responsible for following the requirements as identified in this Code.

At least two (2) ties shall be made for each service. All ties shall be completed prior to street construction.

The Contractor will be required to remove the existing curb stop, box, and service line once a new connection is made. The removal for each water service and curb box shall be paid at the unit price bid.

Connect to Existing Water Service: The Contractor shall connect the existing service pipe to the new curb stop. The Contractor shall reconnect the water service pipe in such a manner as to minimize joints. In the event that the connection requires an additional coupler the Contractor shall use only a flared copper to copper coupler.

Curb Box Repair: The damaged curb box shall be replaced to the curb stop or repaired as approved by the Engineer. Additionally, if a curb stop is located in a sidewalk or driveway, a meter box cover, such as the Ford model A1 eight (8) inch cover, shall be installed at no additional compensation.

Setting Valves, Hydrants, Fittings and Specials: Hydrant bury shall be eight (8) feet defined as the nominal distance from ground line to bottom of connecting pipe. (Also refer to Section 2504.2 – Materials.)

Hydrants shall be located as directed by the Engineer. Fittings and other materials used for connecting to existing hydrant leads shall be furnished and installed by the Contractor to satisfy dimensional requirements found in the field.

Procedure: All hydrants shall stand plumb and shall have their nozzles parallel with or right angles to the curb, with the pumper nozzle facing the curb, unless otherwise instructed by the Engineer. Hydrants shall be supported upon a concrete base eighteen-inch (18") square and a minimum of five inches (5") thick.

After each hydrant has been set, there shall be placed around the base of the hydrant, not less than one

(1) yard of one-inch (1") to one and one-half inch (1 1/2") rock, from which all fine matter shall be screened. Cover all gravel, with a minimum of two layers of tar paper. Hydrants must maintain a vertical position, and must not be knocked out of plumb during the backfilling.

Installation: Hydrants shall be set, so that the pumper nozzle shall be 24 inches above the final sodded grade, and center of hydrant shall be three feet (3') behind back of curb unless otherwise directed by Engineer. Setting the grade of the hydrant shall include all labor and materials necessary to set hydrant as specified herein including the installation of City furnished 'Grade Lock' devices.

Drain Holes: Drain holes are open except in those areas where the static ground water table is higher than the drain hole location on the hydrant, where the drain holes shall be securely plugged according to the manufacturer's recommendation and specifications.

Gate Valves and Boxes: Gate valve boxes shall be adjusted to grade after placement of bituminous base and/or binder courses.

Abandon Water Service: Water service abandonment shall include the removal of a portion of the water service to a location as directed by the Engineer. Both ends of the service pipe shall be encased in concrete to ensure soil will not enter the pipe. All materials necessary to complete this work shall be Included in this bid item.

8" HDPE Water Main (Directionally Drilled): The boring operation shall be completed in accordance with the pipe manufacturer's recommendations for the proposed application. The Contractor is responsible for cleaning and inspecting each length of pipe to be free of shavings, foreign debris, sediment, etc. prior to fusing. Surface disruption shall be minimized; however, bituminous pavement removal, replacement, and maintenance to traffic to adjacent properties will be required. The Contractor is responsible for containing and removing slurry material so that no damage to private structures occurs or voids develop around the pipe. The Contractor shall utilize the drilling tools and procedures that will minimize the discharge of any drill fluids. The Contractor shall comply with all mitigation measures listed in the required permits and elsewhere in these Specifications. If necessary, the Engineer will obtain the right-of entries from the adjacent property owners.

The Contractor shall submit a plan showing the work zone equipment configuration at the end of the bore(s), staging areas, storage areas and the location of slurry, cuttings, and pit spoil handling areas. The Contractor shall provide a description of the boring procedure, tooling for drilling, method to control slurry, design of entrance and exit pits, and the method of verifying that the installed utilities is acceptable. The Contractor shall plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding thirty (30) feet. This “as built” plan and profile shall be updated as the pilot bore is advanced. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow and pressure.

The alignment of each pilot bore must be approved by the Engineer before pipe can be pulled. If the pilot bore fails to conform to the above tolerances, the Engineer may require a new pilot boring to be made.

Should the directional boring hit any obstructions or be deflected off the specified alignment, the Contractor shall take the necessary corrective action.

2504.5 – (CEAM 2611.5) BASIS OF PAYMENT

Watermain: Payment shall be made by the linear foot for each size and type at the unit prices in the proposal. The unit price shall include excavation to the foundation grade, pumping, sheeting, pipe completely installed, polywrap (where specified), tracer wire, furnishing, placing and compacting backfill materials, and testing.

Connect to Existing Watermain: Payment shall be on a unit basis for each connection, including removal of existing watermain, pipe and fittings, materials/fittings, labor and equipment required to provide a complete connection as specified. All obsolete watermain pipe must be removed from the trench, and shall become property of the Contractor unless abandoned as approved by the Engineer.

Ductile Iron Fittings: Payment shall be made by the cast iron body weight by the pound at the unit price in the proposal and shall include all labor and materials necessary to install the fitting. Pipe plugs and caps shall be paid as fittings.

Gate Valve and Box: Payment shall be for each valve installed at the size specified in the plans and shall include the valve box, valve box adaptor, and all labor and materials required to install the gate valve and box.

Hydrant Assembly: Payment shall be for each Hydrant Assembly installed. Each hydrant assembly includes all materials required to install the hydrant from the main line tee as shown in Standard detail plate W-1, including but not limited to, six-inch (6”) gate valve and box, and hydrant. Hydrant assembly does not include the 6” Ductile Iron Pipe which paid for separately.

Mechanical Joint Coupling: Payment shall be made by each Romac Alpha or equal coupling installed at the unit price in the proposal and shall include all labor and materials necessary to install the fitting.

Connect to Existing Water Service: This item shall be paid for at the unit price bid per each, and shall include all labor, equipment, and connectors required to successfully reconnect the water service. Any fittings shall be considered incidental to the length of pipe required to reconnect the service, which shall be paid for under the provided proposal item per the lineal foot.

HDPE Service Pipe: Payment shall be made by the linear foot at the unit prices in the proposal. The unit price shall also include furnishing and installing tracer wire.

Corporation Stops: Payment shall be made for each installed at the unit price in the proposal and shall include service saddles as required per the provisions above.

Curb Stop and Box: Payment shall be made for each installed at the unit price in the proposal, including all adjustments. Where curb boxes are placed in concrete or bituminous pavement, a meter box cover, such as the Ford model A1 eight-inch (8") cover, shall be installed at no additional compensation.

Watermain Lowerings/Raisings: Watermain lowerings or raisings, if required, will be paid for through the necessary pipe and fitting quantities and will be compensation for all labor, materials, and equipment necessary to complete the lowering and avoid utility conflicts.

Four-inch (4") Polystyrene Insulation: Payment shall be made by the square yard installed at the unit price in the proposal.

Abandon Water Service: Abandon water service is considered **incidental** to the water service pipe.

8" HDPE Water Main (Directionally Drilled): Directional drilling of the 8" HDPE Water Main shall be measured and paid at the contract unit price per linear foot, which shall be compensation in full for all labor, equipment, and material necessary to complete the work as specified. Tracer wire shall be included in the unit price bid for the length of pipe requiring tracer wire.

Adjust Curb Box: Payment shall be made for each existing curb box adjusted at the unit price in the proposal and shall be compensation in full for all time, materials, and labor to complete the work and provide a functioning and properly adjusted curb box as directed by the Engineer. Where curb boxes are placed in concrete or bituminous pavement, a meter box cover, such as the Ford model A1 eight-inch (8") cover, shall be installed at no additional compensation.

Pipe Bedding: Pipe bedding is considered **incidental** to the cost of the water main pipe.

Tracer Wire: Tracer Wire is considered *incidental* to the cost of the water main pipe and includes wire, access boxes, magnesium anode rods and all other appurtenances.

2504 – (CEAM 2641) WATERMAIN PIPE BURSTING

The provisions of MnDOT 2504 and CEAM 2641 are modified and/or supplemented with the following: 2504.1 – (CEAM 2641.1) DESCRIPTION

This section addresses the procedures to be employed for pipe bursting existing water main trunk pipe of various sizes using the static method, as identified on the drawings, and replacing with new fusible PVC C900 DR 18 water main pipe.

The Contractor must be an existing licensee to perform pipeline replacement operations using the pipe bursting methodology in accordance with the patent owner.

2504.3 – (CEAM 2641.7) CONSTRUCTION REQUIREMENTS

The method approved for rehabilitation of existing water main by pipe bursting and installation of new polyethylene pipe is TT Technologies, Inc. GRUNDOBURST system (800.533.2078), or approved equal. The Contractor shall be licensed to use the required technology proposed for this work. Bids submitted by unlicensed Contractors will be non-responsive and not allowed.

Sewer/Water Utility - Trace Wire Specification

Materials

General

All trace wire and trace wire products shall be domestically manufactured in the U.S.A.

All trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.

Trace wire

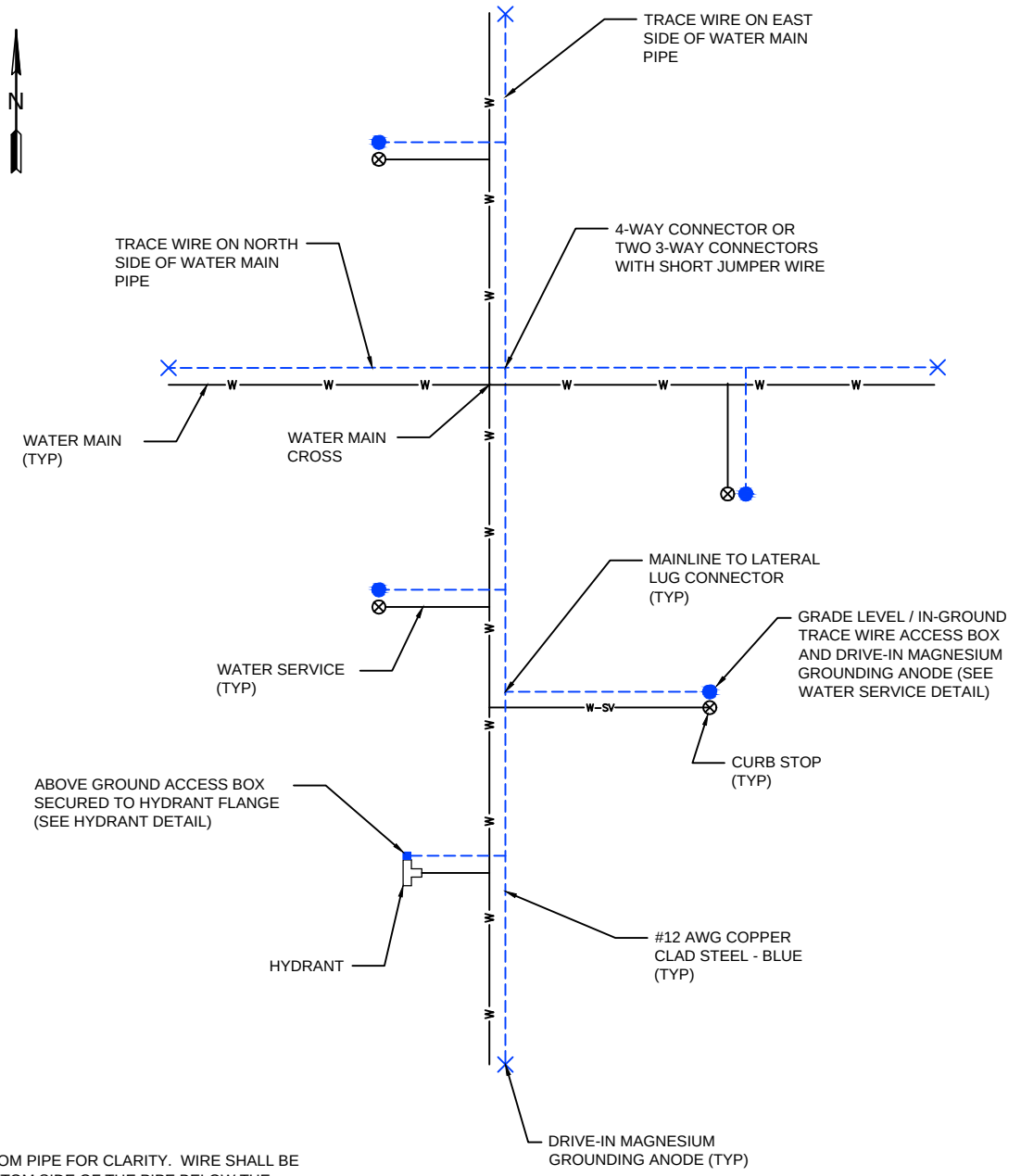
- **Open Trench** - Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Directional Drilling/Boring** - Trace wire shall be #12 AWG Copper Clad Steel, Extra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Trace wire – Pipe Bursting/Slip Lining** - Trace wire shall be 7 x 7 Stranded Copper Clad Steel, Extreme Strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.

Connectors

- All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
- **Direct bury wire connectors** – shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
- Non locking friction fit, twist on or taped connectors are prohibited.

Termination/Access

- All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
- All grade level/in-ground access boxes shall be appropriately identified with “sewer” or “water” cast into the cap and be color coded.
- A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.
- All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
- Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.



NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.

TRACE WIRE PLAN (WATER)

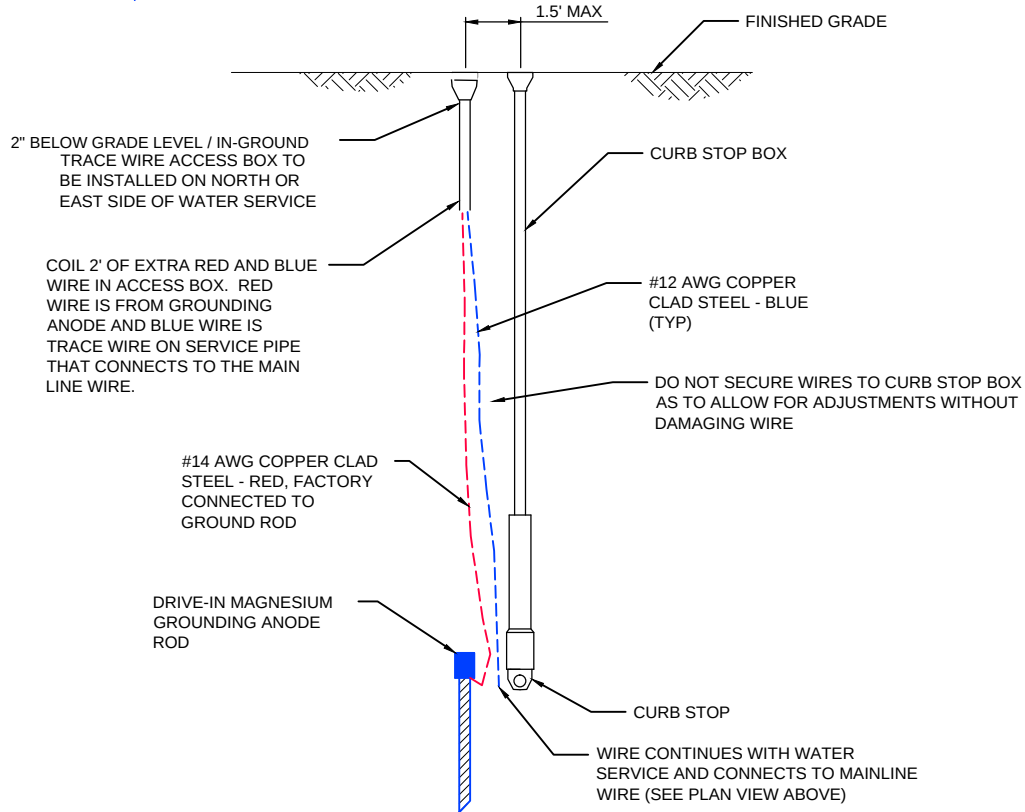
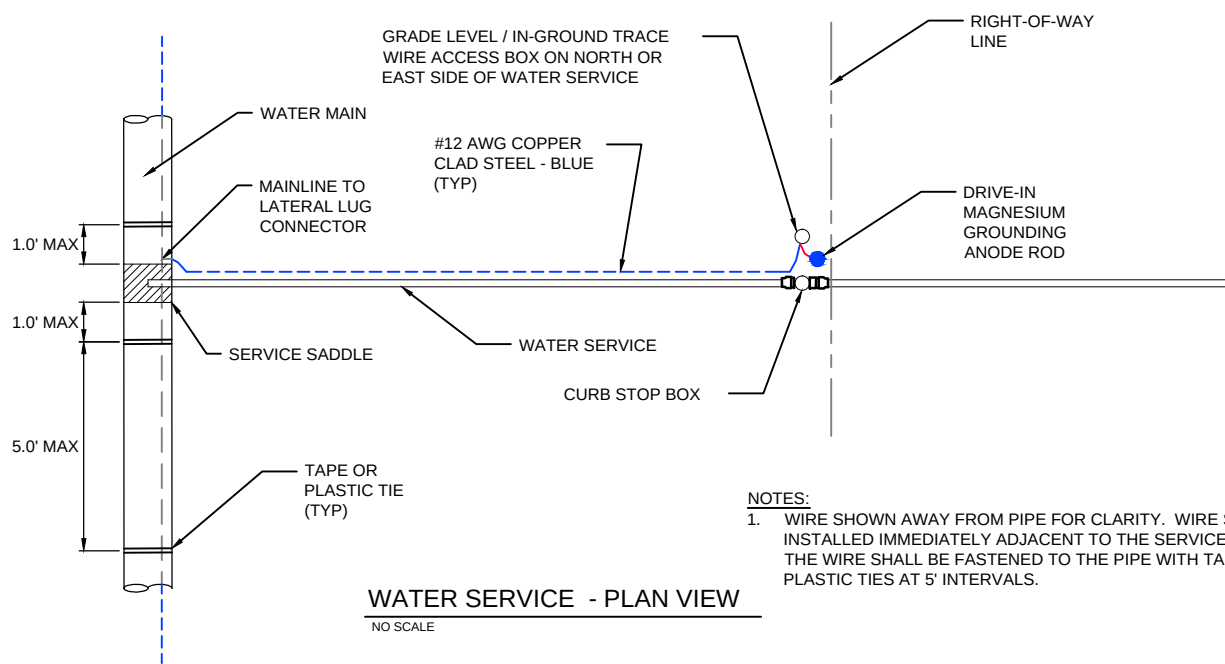
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MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
SAMPLE WATER PLAN

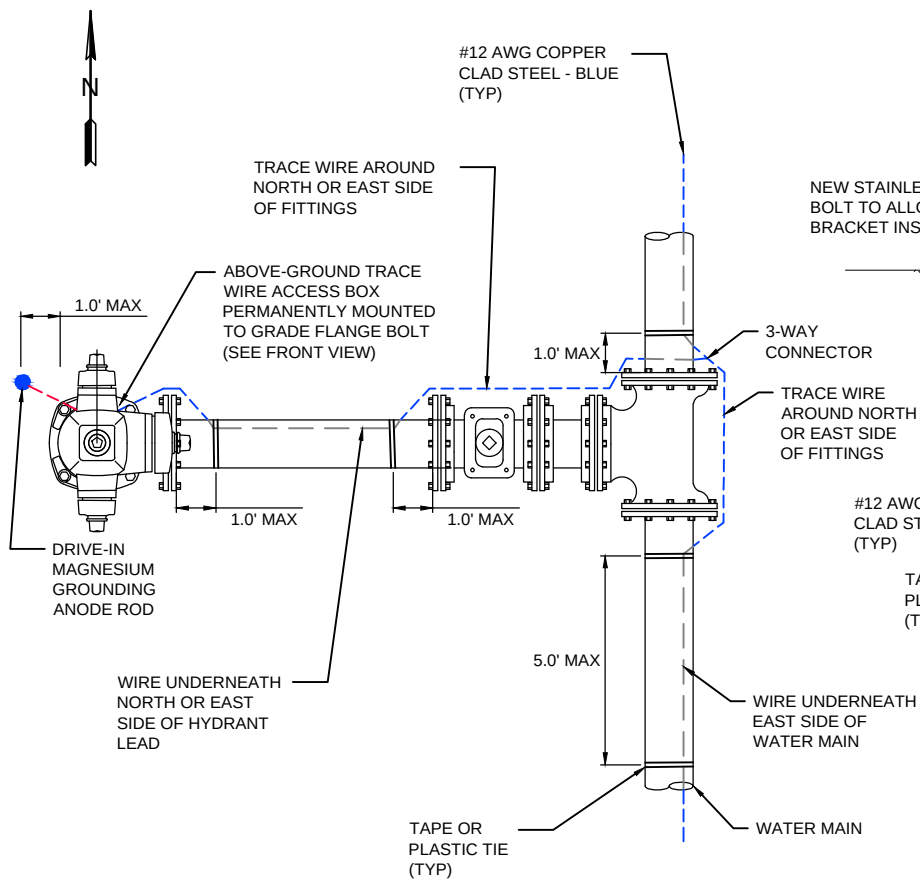
May 28, 2014



MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

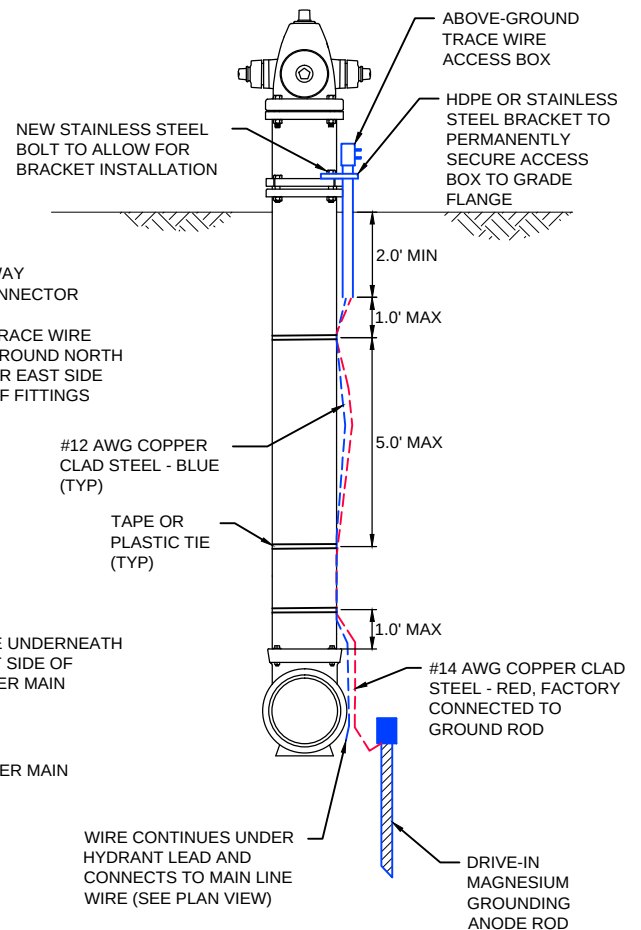
TRACE WIRE
WATER SERVICE DETAIL

May 28, 2014



HYDRANT - PLAN VIEW

NO SCALE



HYDRANT - SECTION VIEW

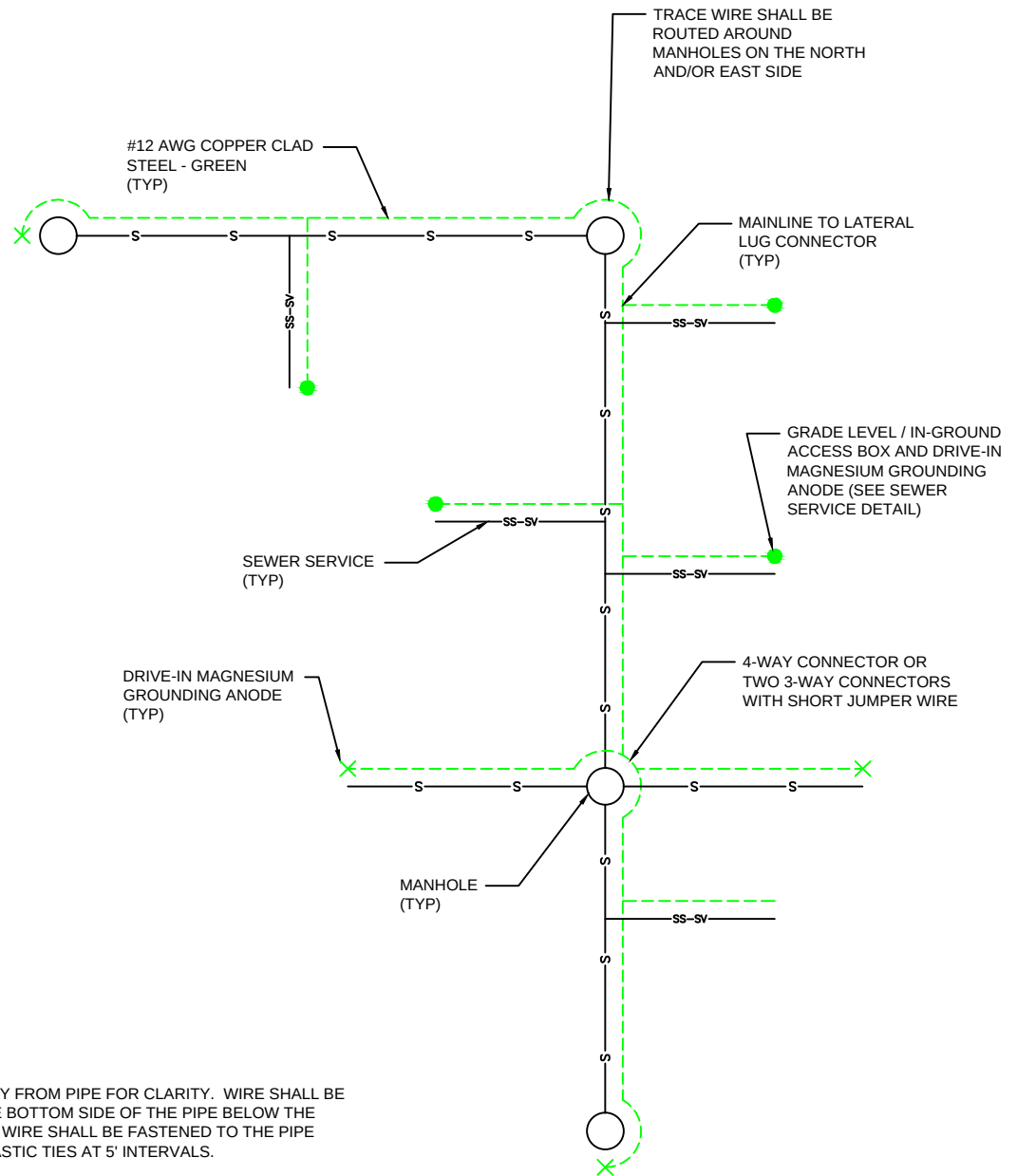
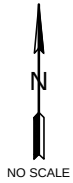
NO SCALE



MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
HYDRANT DETAIL

May 28, 2014



NOTES:

1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.

TRACE WIRE PLAN (SEWER)

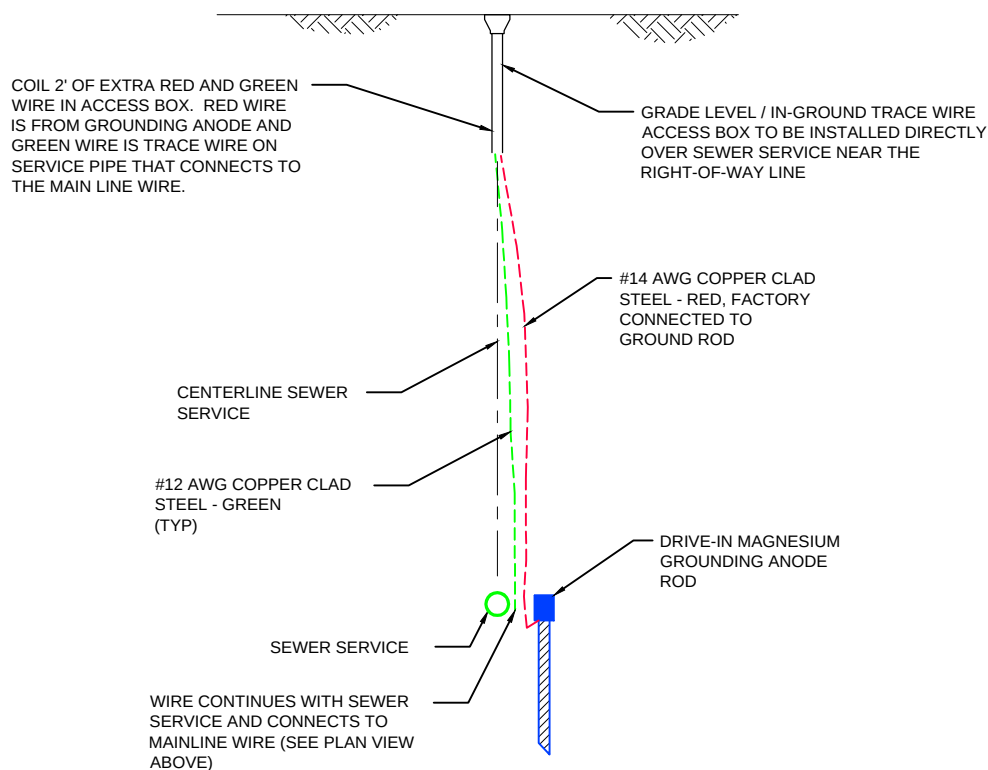
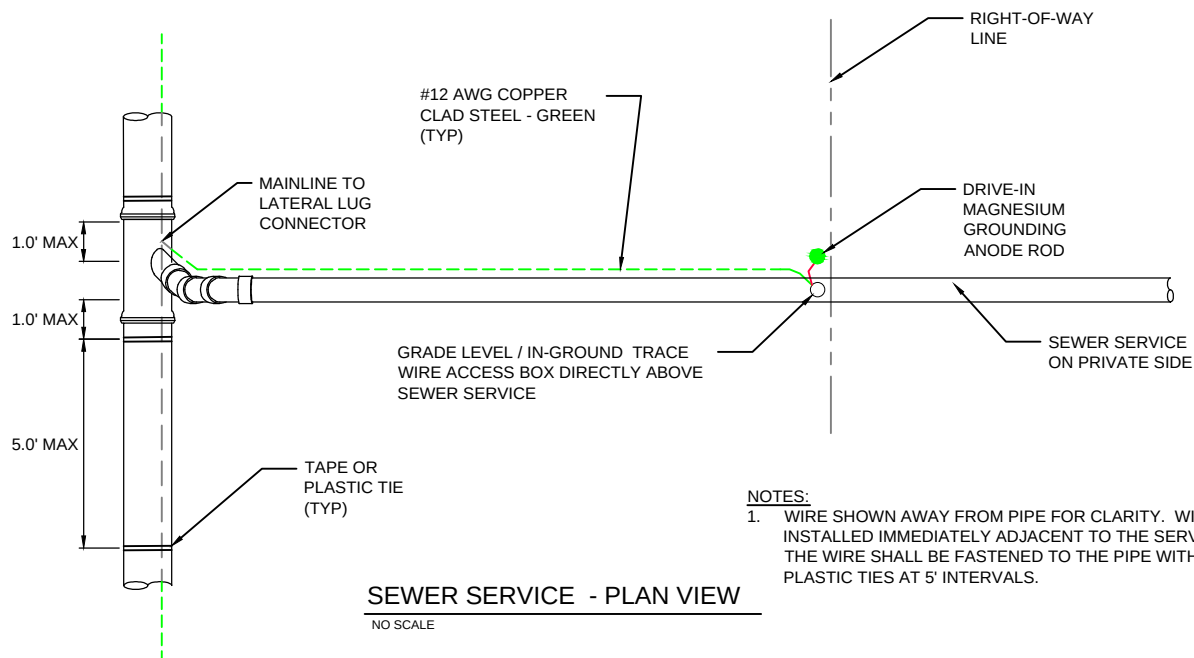
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MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
SAMPLE SEWER PLAN

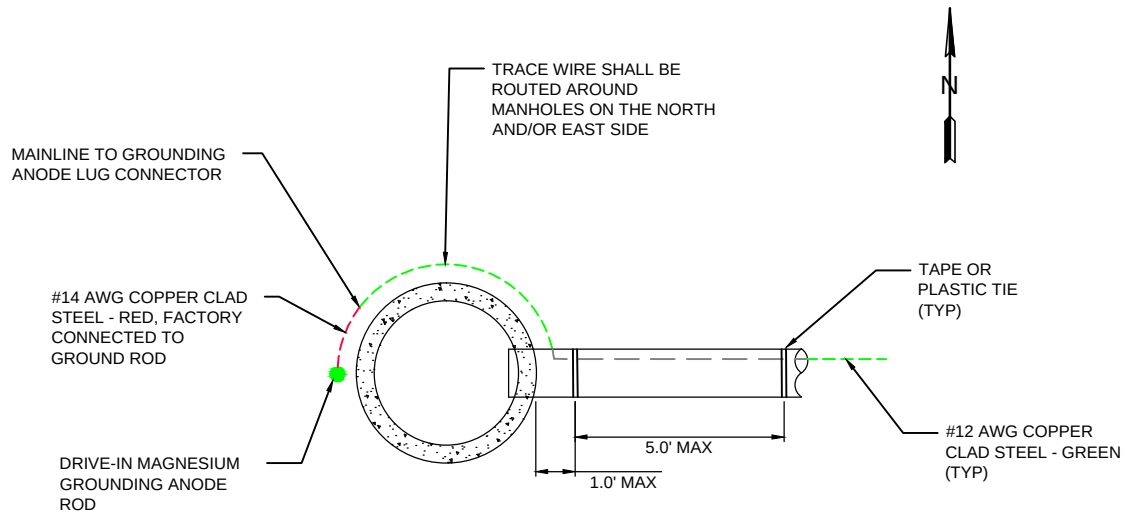
May 28, 2014



MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

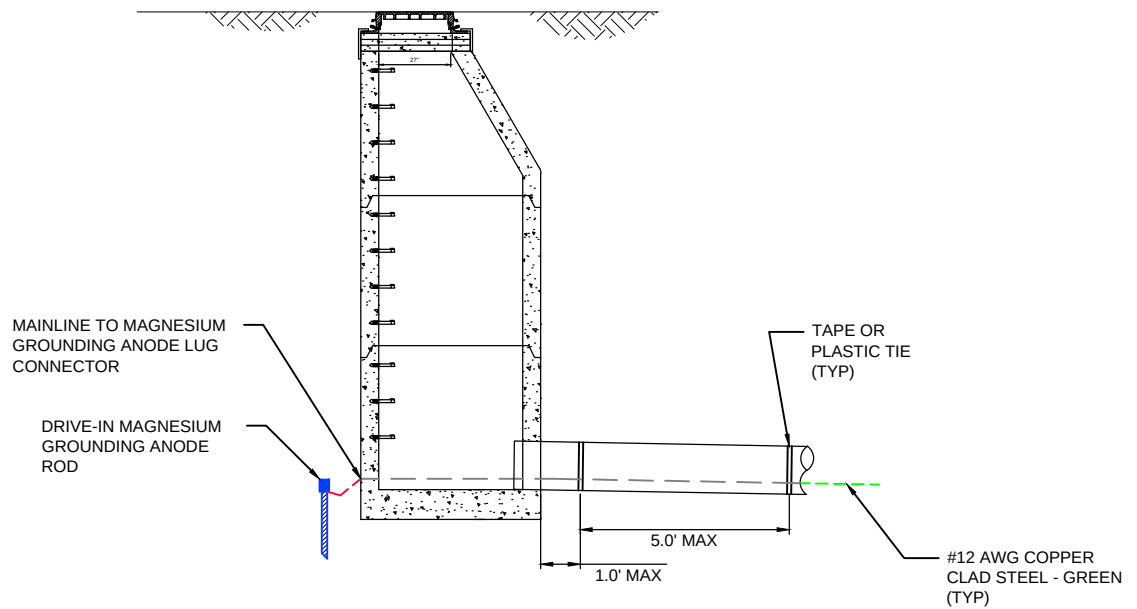
TRACE WIRE
SEWER SERVICE DETAIL

May 28, 2014



SEWER MANHOLE - PLAN VIEW

NO SCALE



SEWER MANHOLE - SECTION VIEW

NO SCALE



MINNESOTA RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
SEWER MANHOLE DETAIL

May 28, 2014

Sewer/Water Utility - Trace Wire Specification

- **Service Laterals on public property** - Trace wire must terminate at an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.
- **Service Laterals on private property** - Trace wire must terminate at an approved above-ground trace wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.
- **Hydrants** – Trace wire must terminate at an approved above-ground trace wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)
- **Long-runs, in excess of 500 linear feet without service laterals or hydrants** - Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.

Grounding

- Trace wire must be properly grounded at all dead ends/stubs
- Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose, and buried at the same elevation as the utility.
- When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
- When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector.
- Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

Installation

General

- Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
- Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.

Sewer/Water Utility - Trace Wire Specification

- Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
- Trace wire shall be installed at the bottom half of the pipe and secured (taped/tied) at 5' intervals.
- Trace wire must be properly grounded as specified.
- Trace wire on all service laterals/stubs must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-of-way, but out of the roadway. (See Trace wire Termination/Access)
- At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. (See Grounding)
- Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire.
- All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.
- In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.

Sanitary Sewer System

- A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
- Lay mainline trace wire continuously, by-passing around the outside of manholes/structures on the North or East side.
- Trace wire on all sanitary service laterals must terminate at an approved trace wire access box color coded green and located directly above the service lateral at the edge of road right of way.

Water System

- A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
- Lay mainline trace wire continuously, by-passing around the outside of valves and fittings on the North or East side.
- Trace wire on all water service laterals must terminate at an approved trace wire access box color coded blue and located directly above the service lateral at the edge of road right of way.
- Above-ground tracer wire access boxes will be installed on all fire hydrants.
- All conductive and non-conductive service lines shall include tracer wire.

Sewer/Water Utility - Trace Wire Specification

Storm Sewer System

This section shall be included at the discretion of the facility owner.

- If the storm sewer system includes service laterals for connection of private drains and tile lines, it shall be specified the same as a sanitary sewer application.
- Lay mainline trace wire continuously, by-passing around the outside of manholes/structure on the North or East side.

Prohibited Products and Methods

The following products and methods shall not be allowed or acceptable

- Uninsulated trace wire
- Trace wire insulations other than HDPE
- Trace wires not domestically manufactured
- Non locking, friction fit, twist on or taped connectors
- Brass or copper ground rods
- Wire connections utilizing taping or spray-on waterproofing
- Looped wire or continuous wire installations, that has multiple wires laid side-by-side or in close proximity to one another
- Trace wire wrapped around the corresponding utility
- Brass fittings with trace wire connection lugs
- Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.
- Connecting trace wire to existing conductive utilities

Testing

All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, engineer and facility owner as applicable, prior to acceptance of ownership.

This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project.

Continuity testing in lieu of actual line tracing shall not be accepted.

Sewer/Water Utility - Trace Wire Specification

Products

The following products have been deemed acceptable and appropriate. These products are a guide only to help you choose the correct applications for your tracer wire project.

- Copper clad Steel (CCS) trace wire
 - Open Trench – Copperhead #12 High Strength part # 1230-HS
 - Directional Drilling/Boring - Copperhead Extra High Strength part # 1245*EHS
 - Pipe Bursting/Slip Lining – Copperhead SoloShot Extreme Strength 7 x 7 Stranded part # PBX-50
- Connectors
 - Copperhead 3-way locking connector part # LSC1230*
 - DryConn 3- way Direct Bury Lug: Copperhead Part # 3WB-01
- Termination/Access
 - Non-Roadway access boxes applications: Trace wire access boxes Grade level Copperhead adjustable lite duty Part # LD14*TP
 - Concrete / Driveway access box applications: Trace wire access boxes Grade level Copperhead Part # CD14*TP 14”
 - Fire hydrant trace wire access box applications: Above ground two terminal with 1” conduit. Copperhead part # T3-75-F (Cobra T3 Test Station, denoting “F” includes mounting flange)
- Grounding
 - Drive in Magnesium Anode: Copperhead Part # ANO-1005 (1.5 lb)

Manufacture product options:

The information provided by Copperhead Industries gives you product options to help you choose the correct wire – termination/access points – connectors and grounding products. Other manufactures provide these products; this information is only a guide.

GENERAL CONDITIONS

Revised August 23, 2004

SECTION 1: DEFINITIONS

- 1.1 Wherever used in the CONTRACT DOCUMENTS, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:
- 1.2 **AGREEMENT** – Written or graphic instruments issued prior to the execution of the AGREEMENT which modify or interpret the CONTRACT DOCUMENTS, drawings and SPECIFICATIONS, by additions, deletions, and/or clarifications of corrections.
- 1.3 **BID** – The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the WORK to be performed.
- 1.4 **BIDDER** – Any person, firm or corporation submitting a BID for the work.
- 1.5 **BONDS** – BID, Performance, and Payment BONDS and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.
- 1.6 **CHANGE ORDER** – A written order to the CONTRACTOR signed by the OWNER authorizing an addition, deletion or revision in the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE or the CONTRACT TIME.
- 1.7 **CONTRACT DOCUMENTS** – The AGREEMENT, SPECIFICATIONS, drawings, addenda and modifications.
- 1.8 **CONTRACT PRICE** – The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.
- 1.9 **CONTRACT TIME** – The number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.
- 1.10 **CONTRACTOR** – The person, firm or corporation with whom the OWNER has executed the AGREEMENT.
- 1.11 **PLANS** – The official drawings, PLANS, profiles, elevation, cross-sections and supplemental drawings, or reproductions thereof, approved by the ENGINEER, which show the location, character, dimensions and details of WORK to be performed. All such drawings, as listed elsewhere in the CONTRACT DOCUMENTS, are a part of the PLANS whether attached to the CONTRACT DOCUMENTS or separate therefrom.
- 1.12 **ENGINEER** – The person, firm or corporation named as such in the CONTRACT DOCUMENTS.
- 1.13 **FIELD ORDER** – A written order issued by the ENGINEER to the CONTRACTOR during construction effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME.
- 1.14 **NOTICE OF AWARD** – The WRITTEN NOTICE of the acceptance of the BID from the OWNER to the successful BIDDER.

- 1.15 **NOTICE TO PROCEED** – Written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.
- 1.16 **OWNER** – A public body, agency or authority, corporation, association, partnership, or individual for whom the WORK is to be performed.
- 1.17 **PROJECT** – The entire undertaking to be performed as provided in the CONTRACT DOCUMENTS.
- 1.18 **PROJECT REPRESENTATIVE** – An authorized REPRESENTATIVE of the OWNER assigned to provide periodic observation of the WORK.
- 1.19 **SUPERINTENDENT** – The Executive Representative for the CONTRACTOR present on the WORK at all times during progress, authorized to receive and fulfill instructions from the ENGINEER and capable of superintending the WORK efficiently.
- 1.20 **SHOP DRAWINGS** – All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, SUPPLIER or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.
- 1.21 **SPECIFICATIONS** – These GENERAL CONDITIONS, the special conditions, and the technical provisions consisting of written descriptions of a technical nature of materials, equipment construction systems, standards and workmanship.
- 1.22 **SUBCONTRACTOR** – An individual, firm or corporation having a direct contract with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.
- 1.23 **SUBSTANTIAL COMPLETION** – That date as certified in writing by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently complete in accordance with the CONTRACT DOCUMENTS for use by the owner.
- 1.24 **WORK** – Any and all obligations, duties and responsibility necessary to the successful completion of the PROJECT assigned to or undertaken by the CONTRACTOR under the CONTRACT DOCUMENTS, including the furnishing of all labor, materials, equipment and other incidentals.
- 1.25 **WRITTEN NOTICE** – Any notice to any party of the AGREEMENT relative to any part of this AGREEMENT in writing and considered delivered and the service thereof completed when posted by certified or registered mail to the said party at his last given address or delivered in person to said party or his authorized representative on the WORK.
- 1.26 **ABBREVIATIONS** –

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

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

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

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

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

MN/DOT The Minnesota Department of Transportation. All references to MN/DOT Specifications shall be understood to refer to their latest published edition.

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

SECTION 2: AWARD, EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

2.1 The award of the CONTRACT, if it is awarded, shall be to the lowest responsible BIDDER whose qualifications indicate the award will be in the best interest of the OWNER and whose proposal complies with all the prescribed requirements. No award will be made until the OWNER has concluded such investigations as he deems necessary to establish the responsibility, qualifications and financial ability of the BIDDERS to do the WORK in accordance with the CONTRACT DOCUMENTS to the satisfaction of the OWNER within the time prescribed. The OWNER reserves the right to reject the BID of any BIDDER who does not pass such investigation to the OWNER'S satisfaction. If analyzing BIDS, the OWNER may take into consideration alternates and unit prices, if requested by the BID forms. If the CONTRACT is awarded, the OWNER will give the BIDDER WRITTEN NOTICE of the award within thirty days (30) after opening of the BIDS.

2.2 The CONTRACT AGREEMENT shall be signed in triplicate by the OWNER and CONTRACTOR. The ENGINEER will identify those portions of the CONTRACT DOCUMENTS not so signed and such identification will be binding on all parties. The OWNER, the CONTRACTOR and the ENGINEER will each receive an executed copy of the CONTRACT DOCUMENTS.

Failure of the successful BIDDER to execute the AGREEMENT and deliver the required BONDS within ten (10) days of the NOTICE OF THE AWARD shall be just cause for the OWNER to annul the award and declare the BID and any guarantee thereof forfeited.

2.3 The CONTRACT DOCUMENTS are complimentary and what is called for by one shall be as binding as if called for by all. In case of conflict between the CONTRACT DOCUMENTS, the following priority is established:

1. Addenda and Change Order;
2. Form of Agreement;
3. Plans and Special Detail Drawings;
4. Special Provisions, Bid Proposal Forms, and Instruction to Bidders;
5. Specifications and Standard Detail or Typical Drawings;
6. General Conditions of Contract.

Figure dimensions on drawings shall govern over scale dimensions, and detailed drawings shall govern over general drawings. Any WORK that may reasonably be inferred from the SPECIFICATIONS or drawings as being required to produce the intended results shall be supplied whether or not it is specifically called for. WORK, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to refer to such recognized standards.

- 2.4 The intent of the CONTRACT DOCUMENTS is to portray a complete improvement which will function as intended by the ENGINEER and which the CONTRACTOR undertakes to do. The CONTRACTOR shall do all the WORK including such additional, extra, and incidental WORK as may be considered necessary to complete the PROJECT in a manner acceptable to the ENGINEER and all governmental agencies having authority, as provided in the CONTRACT DOCUMENTS. He shall furnish, unless otherwise provided, all materials, equipment, tools, labor and incidental necessary to prosecute the completion of the WORK.
- 2.5 Any discrepancies found between the drawings and SPECIFICATIONS and site conditions or any inconsistencies or ambiguities in the drawings or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.

SECTION 3: PROGRESS AND SUBMISSION SCHEDULE, PRECONSTRUCTION CONFERENCE AND TIME OF STARTING WORK

- 3.1 Within fourteen (14) days after execution of the AGREEMENT, the CONTRACTOR will submit to the ENGINEER for approval an estimated progress schedule indicating the starting and completion dates of the various stages of the WORK, schedule of SHOP DRAWINGS submissions and a schedule of materials to be incorporated in the PROJECT.

Before starting the WORK, a conference will be held to review the above schedules, to establish a working understanding between the parties as to the PROJECT. Present at the conference will be the ENGINEER, PROJECT REPRESENTATIVE, the CONTRACTOR, his SUPERINTENDENT, the OWNER and any others who may have an interest in the project.

Prior to starting the WORK, the CONTRACTOR will furnish the ENGINEER certificates of insurance as required by the appropriate provisions of the CONTRACT DOCUMENTS.

The WORK contemplated hereunder shall be commenced within ten (10) days after receipt by the CONTRACTOR of WRITTEN NOTICE to proceed from the ENGINEER and shall be completed within the time limits set forth in the Special Provisions, as specified elsewhere in the CONTRACT DOCUMENTS, except for delays occasioned by strikes and acts of God. CONTRACT completion date will be extended an equal number of days lost through strikes and acts of God other than normal weather patterns.

SECTION 4: OWNERSHIP AND COPIES DOCUMENTS, RECORD DOCUMENTS

- 4.1 All SPECIFICATIONS, drawings and copies thereof furnished by the ENGINEER shall remain his property. They shall not be used on another PROJECT, and, with the exception of those sets which have been signed in connection with the execution of the AGREEMENT, shall be returned to the ENGINEER on request upon completion of the PROJECT.

- 4.2 The OWNER will furnish to the CONTRACTOR up to four copies of the SPECIFICATIONS and drawings as are reasonably necessary for the execution of the WORK. Additional copies will be furnished, upon request, at the cost of reproduction.
- 4.3 The CONTRACTOR will keep one record copy of all SPECIFICATIONS, drawings, addenda, and SHOP DRAWINGS at the site in good order and annotated to show all changes made during the construction process. These shall be available to the ENGINEER and shall be delivered to him upon completion of the PROJECT.

SECTION 5: SUBSOIL CONDITIONS AND CONDITIONS OF THE SITE

- 5.1 Unless otherwise stipulated, it shall be the CONTRACTOR'S responsibility to determine subsoil conditions prior to bidding the job regardless of any verbal or written information which may be furnished by the OWNER or ENGINEER.
- 5.2 The CONTRACTOR shall become familiar with all conditions of the site prior to submitting his BID proposal. Submission of a proposal shall be considered as evidence that the BIDDER is familiar with the site and understands all the conditions of the site affecting the WORK and all else that is required to complete the WORK in accordance with the CONTRACT DOCUMENTS.

SECTION 6: BID PROPOSAL

- 6.1 The CONTRACTOR shall submit his BID on the Bid Proposal forms furnished by the OWNER. All blanks shall be completed unless specified otherwise.
- 6.2 All BIDS shall be closed in sealed envelopes, addressed to the OWNER and clearly marked "Bid Proposal" and with any other information required in the Invitation or Advertisement for BIDS.

SECTION 7: BONDS

- 7.1 BID BOND/Security: All BIDS must be accompanied by a certified check or BID BOND payable without recourse to the OWNER in such amount stated in the Advertisement or Invitation for BIDS and in no case, unless completely waived, for less than five percent (5%) of the amount of the BID. The certified check or bid bond provided shall be forfeited if the CONTRACTOR shall fail to provide the proper bond and to enter into a CONTRACT as provided by law.
- 7.2 Performance BOND: The CONTRACTOR shall within ten (10) days after the receipt of the NOTICE TO AWARD furnish the OWNER with a Performance BOND and a Payment BOND in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions and AGREEMENT of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these BONDS shall be borne by the CONTRACTOR. If, at any time, a surety on any such BOND is declared bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the list of Surety Companies accepted on Federal Bonds, CONTRACTOR shall within ten (10) days after

notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

SECTION 8: ASSIGNMENTS

- 8.1 Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign or otherwise dispose of the CONTRACT or any portion thereof, or of his right, title or interest therein, or his obligations thereunder, without written consent of the other party.

SECTION 9: INDEMNIFICATION

- 9.1 The CONTRACTOR will indemnify and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.
- 9.2 In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by any employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under Workmen's Compensation Acts, disability benefit acts or other employee benefits acts.
- 9.3 The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, CHANGE ORDERS, designs or SPECIFICATIONS.

SECTION 10: PRECONSTRUCTION CONFERENCE

- 10.1 Prior to the beginning of any WORK under this CONTRACT, the OWNER or ENGINEER may require a Preconstruction Conference. This meeting will be held for the purpose of coordinating the WORK, to discuss construction needs and procedures, to determine the schedule of WORK, and to finalize other administrative details. The CONTRACTOR shall be responsible for having those individuals from his firm and from any SUBCONTRACTOR firms who will actually be on the site and in charge of the WORK present at this conference.

SECTION 11: NOTIFICATION OF INTENT TO BEGIN WORK

- 11.1 It shall be the CONTRACTOR'S responsibility to make any and all notifications of his intention to begin the WORK. This notification shall include, but not necessarily be limited to, the OWNER, the Watershed District, Private Utility Companies, and Residences in the area of his operation which will or may be affected thereby.

SECTION 12: WORK BY OTHERS AND SUBCONTRACTORS

- 12.1 The OWNER may perform additional WORK related to the PROJECT or may let other direct contracts therefrom which shall contain general conditions similar to these. The CONTRACTOR will afford the other CONTRACTORS who are parties to such direct contracts (or the OWNER, if performing the additional WORK), reasonable opportunity for the introduction and storage of materials and equipment and the execution of WORK, and shall properly connect and coordinate the WORK with other CONTRACTORS.
- 12.2 If any part of the CONTRACTOR'S WORK depends upon the WORK of any such other CONTRACTOR (or the OWNER) for proper execution or results, the CONTRACTOR will inspect and promptly report to the ENGINEER in writing any defects or deficiencies in such WORK that render it unsuitable for such proper execution and results. The CONTRACTOR'S failure to report shall constitute an acceptance of the other WORK as fit and proper for the relationship of his WORK except as to defects and deficiencies which may appear in the other WORK after the execution of his WORK.
- 12.3 The CONTRACTOR will do all cutting, fitting and patching of the WORK that may be required to make several parts come together properly and fit to receive or be received by such other WORK. The CONTRACTOR will not endanger any WORK of others by cutting, excavating or otherwise altering other's WORK and will only cut or alter their WORK with the written consent of the ENGINEER.
- 12.4 Ten (10) days prior to the start of the WORK, the CONTRACTOR will submit to the ENGINEER for acceptance a list of names of SUBCONTRACTORS and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for those portions of the WORK for which the identity of the SUBCONTRACTORS and other persons and organizations must be submitted as specified in the CONTRACT DOCUMENTS. Prior to the execution of the WORK, the ENGINEER will notify the CONTRACTOR in writing if either the OWNER or the ENGINEER, after due investigation, has reasonable objection to any SUBCONTRACTOR, person or organization on such list. The failure of the OWNER or the ENGINEER to make objection to any SUBCONTRACTOR, person or organization on the list prior to the execution of the WORK shall constitute any acceptance of such SUBCONTRACTOR, person or organization. Acceptance of any such SUBCONTRACTOR, person or organization shall not constitute a waiver of any right of the OWNER or the ENGINEER to reject defective workmanship, material, equipment or employees of the CONTRACTOR, or WORK, material or equipment not in conformance with the requirements of the CONTRACT DOCUMENTS.
- 12.5 If, prior to the execution of the WORK, the OWNER or the ENGINEER has reasonable objection to and refuses to accept any SUBCONTRACTOR, person or organization on such list, the CONTRACTOR may, prior to such execution, either 1) submit an acceptable substitute without an increase in his CONTRACT PRICE or 2) withdraw his BID and forfeit his BID security. If, after the execution of the CONTRACT, the OWNER or the ENGINEER refuses to accept any SUBCONTRACTOR, person or organization on such list, the CONTRACTOR will submit an acceptable substitute and the CONTRACT PRICE shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate CHANGE ORDER shall be issued; however, no such increase in the CONTRACT PRICE shall be allowed in respect of any substitution unless the CONTRACTOR has acted promptly and reasonably in submitting a name with respect thereto to the execution of the WORK.

- 12.6 The CONTRACTOR will not employ any SUBCONTRACTOR (whether initially or as a substitute) against whom the OWNER or the ENGINEER may have reasonable objection, nor will the CONTRACTOR be required to employ any SUBCONTRACTOR against whom the CONTRACTOR has reasonable objection. The CONTRACTOR will not make any substitution for any SUBCONTRACTOR who has been accepted by the OWNER and the ENGINEER, unless the ENGINEER determines that there is good cause for doing so.
- 12.7 The CONTRACTOR will be fully responsible for all acts and omissions of his SUBCONTRACTORS and of persons directly employed by them and of persons for whose acts any of them may be liable to the same extent that the CONTRACTOR is responsible for the acts and omissions of any person directly employed by the CONTRACTOR. Nothing in the CONTRACT DOCUMENTS shall create any contractual relationship between any SUBCONTRACTOR and the OWNER or the ENGINEER or any obligation on the part of the OWNER.
- 12.8 The divisions and sections of the SPECIFICATIONS and the identifications of any drawings shall not control the CONTRACTOR in dividing the WORK among SUBCONTRACTORS or delineating the WORK to be performed by any trade.
- 12.9 The CONTRACTOR agrees to specifically bind every SUBCONTRACTOR to all of the applicable terms and conditions of the CONTRACT DOCUMENTS. Every SUBCONTRACTOR, by undertaking to perform any of the WORK, will thereby automatically be deemed to be bound by such terms and conditions.
- 12.10 All WORK performed for the CONTRACTOR by a SUBCONTRACTOR shall be pursuant to an appropriate AGREEMENT between the CONTRACTOR and the SUBCONTRACTOR which shall contain provisions that waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by insurance provided in accordance with CONTRACT DOCUMENTS. The CONTRACTOR will pay each SUBCONTRACTOR a just share of any insurance monies received by the CONTRACTOR.

SECTION 13: MATERIALS EQUIPMENT AND LABOR: SUBSTITUTE MATERIAL OR EQUIPMENT

- 13.1 The CONTRACTOR will provide and pay for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the WORK.
- 13.2 All materials and equipment will be new. If required by the ENGINEER, the CONTRACTOR will furnish satisfactory evidence as to the kind and quality of materials and equipment.
- 13.3 Whenever a material, article or piece of equipment is identified on the drawings or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance of other salient requirements and that other products of equal capacities, quality and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE, and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The

CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

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

SECTION 14: PATENTS

- 14.1 The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof, except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified; however, if the CONTRACTOR has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

SECTION 15: PERMITS, LAWS, TAXES AND REGULATIONS

- 15.1 Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SUPPLEMENTAL GENERAL CONDITIONS. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified.
- 15.2 The CONTRACTOR will give all notices and comply with all laws, ordinances, rules and regulations applicable to the WORK. If the CONTRACTOR observes that the SPECIFICATIONS or drawings are at variance therewith, the CONTRACTOR will give the ENGINEER prompt WRITTEN NOTICE thereof, and any necessary changes shall be adjusted by an appropriate modification. If the CONTRACTOR performs any WORK knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the ENGINEER, the CONTRACTOR will bear all costs arising therefrom.
- 15.3 The CONTRACTOR will pay all sales, consumer, use and other similar taxes required by the law of the place where the WORK is to be performed.

SECTION 16: SURVEYS

- 16.1 The OWNER shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the WORK together with a suitable number of bench marks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.
- 16.2 The CONTRACTOR shall carefully preserve bench marks, reference points and stake, and in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance. The CONTRACTOR will report to the ENGINEER whenever any reference

point is lost or destroyed or requires relocation because of necessary changes in grades or location.

16.3 Unless otherwise specified, the following schedule indicates the standard locations and number of stakes to be established by the ENGINEER. Marks are to be finished grade unless otherwise marked:

- (a) Rough-grading stakes shall be placed on street centerline at fifty (50) foot intervals and on rear lot corners for residential lot grading, or at the discretion of the ENGINEER on a grid pattern selected by the ENGINEER;
- (b) Slope stakes shall be placed on the heel or toe of the slope at 100 foot intervals, but no separate slope stakes will be provided unless the cut or fill exceeds six (6) feet;
- (c) Stakes for sanitary and storm sewers will be placed at twenty-five (25) foot intervals and stakes for watermain will be placed at fifty (50) foot intervals on an offset line parallel to the proposed pipe-line. Unless the CONTRACTOR specifies to the contrary, the location of the offset line will be determined by the survey crew;
- (d) Stakes for concrete curb will be placed at twenty-five (25) foot intervals wherever the grade is less than five percent (5%) and at fifty (50) foot intervals wherever the grade is more than five percent (5%). Unless otherwise requested, stakes shall be on a three (3) foot offset line from back of curb;
- (e) Stakes for bituminous curb shall consist of a PK-nail set on centerline in the bituminous surface at twenty-five (25) foot intervals and shall be for alignment only;
- (f) Stakes for gravel base shall be set only when no concrete curb is proposed or when the roadway width between the concrete curbs exceeds fifty (50) feet. Stakes shall be set on centerline at fifty (50) foot intervals. When concrete curb is proposed, the CONTRACTOR shall use the curb to determine the proper elevations of all WORK between the curbs.

SECTION 17: CONTRACTOR'S INTERPRETATION OF STAKES

17.1 The CONTRACTOR shall make no change from the alignment or grade as established by the staking, but shall use his best judgment as an expert in construction in questioning a possible error in the staking. Whenever such a possible error exists, it shall be the CONTRACTOR'S responsibility to contact the ENGINEER for a clarification or field check. Any WORK performed after such notification and prior to such clarification by the ENGINEER shall be replaced or repaired at the CONTRACTOR'S expense if the WORK is determined to be incorrect or unacceptable.

SECTION 18: AVAILABILITY OF LANDS

18.1 The OWNER will provide, as indicated in the CONTRACT DOCUMENTS and not later than the date when needed by the CONTRACTOR, the lands upon which the WORK is to be done, rights-of-way for access thereto, and such other lands which are designated for the use of the CONTRACTOR, the CONTRACTOR will provide all additional lands and access

thereto that may be required for temporary construction facilities or storage of materials and equipment.

SECTION 19: USE OF PREMISES

- 19.1 The CONTRACTOR will confine his equipment, the storage of materials and equipment and the operations of his workmen to areas permitted by law, ordinances, permits or the requirements of the CONTRACT DOCUMENTS, and shall not unreasonably encumber the premises with materials or equipment.

SECTION 20: ENGINEERS STATUS DURING CONSTRUCTION

- 20.1 The ENGINEER shall be the OWNER'S representative during the construction period. All instructions of the OWNER to the CONTRACTOR shall be issued through the ENGINEER. The duties and responsibilities and the limitations of authority of the ENGINEER as the OWNER'S representative during construction are set forth in all Articles of these GENERAL CONDITIONS and shall not be extended without written consent of the OWNER and the ENGINEER.
- 20.2 The ENGINEER will make regular visits to the site to observe the progress and quality of the executed WORK and to determine, in general, if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS. The ENGINEER will be required to make continuous on-site observation to check the quality and quantity of the WORK. The ENGINEER'S efforts will be directed toward providing assurance for the OWNER that the completed PROJECT will conform to the requirements of the CONTRACT DOCUMENTS. On the basis of the ENGINEER'S on-site observations as an experienced and qualified design professional, he will advise the OWNER as to the progress of the WORK and the performance of the CONTRACTOR.
- 20.3 The ENGINEER will have authority to disapprove of or reject WORK which is defective; i.e., is unsatisfactory, faulty or defective, or does not conform to the requirements of the CONTRACT DOCUMENTS or does not meet the requirements of any inspection, test or approval. The ENGINEER will also have authority to require special inspection or testing of the WORK whether or not the WORK is fabricated, installed or completed.
- 20.4 The ENGINEER will provide one or more full-time RESIDENT PROJECT REPRESENTATIVES to assist the ENGINEER in carrying out his responsibilities at the site during construction activity. The duties, responsibilities and limitations of authority of any such RESIDENT PROJECT REPRESENTATIVE shall be as set forth in Section 21, "RESIDENT PROJECT REPRESENTATIVE."
- 20.5 Neither the ENGINEER'S authority to act under this section nor any decision made by him in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the ENGINEER to the CONTRACTOR, and SUBCONTRACTOR, any of their agents or employees or any other person performing any of the WORK.

SECTION 21: RESIDENT PROJECT REPRESENTATIVE

- 21.1 The RESIDENT PROJECT REPRESENTATIVE is a representative of the ENGINEER. He is under the authority and supervision of the ENGINEER. It is his duty to observe the workmanship and materials of the CONTRACTOR for compliance with the CONTRACT DOCUMENTS. He has the same authority as the ENGINEER except that he may not make changes in either the PLANS or SPECIFICATIONS. He has the authority to stop the WORK

whenever such stoppage is necessary for proper execution of the CONTRACT. He then will immediately contact the ENGINEER to get a decision on proceeding. If the CONTRACTOR continues to WORK after being told by the RESIDENT PROJECT REPRESENTATIVE to suspend WORK, he does so at his own risk, and any such WORK may be ordered redone at the CONTRACTOR'S expense.

SECTION 22: ENGINEER'S INTERPRETATIONS AND DECISIONS

- 22.1 The ENGINEER will issue with reasonable promptness such written clarifications or interpretations to be consistent with or reasonably inferable from the overall intent of the CONTRACT DOCUMENTS.
- 22.2 The ENGINEER will be the initial interpreter of the terms and conditions of the CONTRACT DOCUMENTS and the judge of the performance thereunder. In his capacity as interpreter and judge, the ENGINEER will exercise his best efforts to insure faithful performance by the CONTRACTOR. The ENGINEER will not show partiality and shall not be liable for the result of any interpretation or decision rendered in good faith. Claims, disputes and other matters relating to the execution and progress of the WORK or the interpretation of or performance under the CONTRACT DOCUMENTS shall be referred initially to the ENGINEER for decision, which the ENGINEER shall render in writing within a reasonable time.
- 22.3 Either the OWNER or the CONTRACTOR may demand arbitration with respect to any such claim, dispute or other matter, except any of which have been waived by the making or acceptance of final payment as provided elsewhere in the CONTRACT DOCUMENTS, such arbitration to be in accordance with the appropriate article herein. However, no demand for arbitration of any such claim, dispute or other matter shall be made until the earlier of:
- (a) The date on which the ENGINEER has rendered his decision; or
 - (b) The third day after the parties have presented evidence to the ENGINEER if the ENGINEER has not rendered a written decision before that date.

No demand for arbitration shall be made later than ten (10) days after the date on which the ENGINEER rendered a written decision in respect of the claim, dispute or other matter as to which arbitration which said ten (10) day period shall result in the ENGINEER'S decision being final and binding upon the OWNER and the CONTRACTOR. If the ENGINEER renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

SECTION 23: CONTRACTOR'S SUPERVISION AND SUPERINTENDENCE

- 23.1 The CONTRACTOR will supervise and direct the WORK efficiently and with skill and attention. The CONTRACTOR will be solely responsible for the means, methods, techniques, sequences and procedures of construction. Before undertaking the WORK the CONTRACTOR will carefully study and compare the CONTRACT DOCUMENTS and check and verify all figures shown thereon and all field measurements. The CONTRACTOR will at once report in writing to the ENGINEER any conflict, error or discrepancy which he may discover. The CONTRACTOR will be responsible to see that the finished WORK complies accurately with the CONTRACT DOCUMENTS.
- 23.2 The CONTRACTOR will keep on the WORK at all times during its progress a RESIDENT SUPERINTENDENT satisfactory to the ENGINEER. The SUPERINTENDENT shall not be

replaced without the consent of the ENGINEER except under extraordinary circumstances. The SUPERINTENDENT will be the CONTRACTOR'S representative at the site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the SUPERINTENDENT shall be as binding as if given to the CONTRACTOR.

- 23.3 The CONTRACTOR will provide competent, suitable qualified personnel to survey and lay out the WORK and perform construction as required by the CONTRACT DOCUMENTS. He will, at all times, maintain good discipline and order among his employees at the site.
- 23.4 The ENGINEER and/or OWNER will not be responsible for the acts or omissions of the CONTRACT, or any SUBCONTRACTORS, or any agents or employees or any other persons performing any of the WORK.
- 23.5 Unless otherwise provided, the CONTRACTOR shall be responsible for keeping daily records of all underground utility locations, and materials delivered that are incorporated in the WORK. Other records and information as may be required by the ENGINEER shall be kept current as WORK progresses. All records shall be furnished on a timely basis so that sufficient time is allowed for verification by the ENGINEER.

SECTION 24: SHOP DRAWINGS AND SAMPLES

- 24.1 After checking and verifying all field measurements, the CONTRACTOR will submit to the ENGINEER for approval, in accordance with the accepted schedule of SHOP DRAWINGS submission, five copies (or at the ENGINEER'S option, one reproducible copy) of all SHOP DRAWINGS, which shall have been checked by and stamped with the approval of the CONTRACTOR and identified as the ENGINEER may require. The data shown on the SHOP DRAWINGS will be complete with respect to dimensions, design, criteria, materials of construction and the like to enable the ENGINEER to review the information as required.
- 24.2 The CONTRACTOR will also submit to the ENGINEER for approval, with such promptness as to cause no delay in WORK, all samples required by the CONTRACT DOCUMENTS. All samples will have been checked by and stamped with the approval of the CONTRACTOR, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.
- 24.3 At the time of each submission, the CONTRACTOR will, in writing, call the ENGINEER'S attention to any deviations that the SHOP DRAWINGS or sample may have from the requirements of the CONTRACT DOCUMENTS.
- 24.4 The ENGINEER will check and approve with reasonable promptness SHOP DRAWINGS and samples; however, checking and approval shall be only for conformance with the design concept of the PROJECT and for compliance with the information given in the CONTRACT DOCUMENTS. The approval of a separate item, as such, will not indicate approval of the assembly in which the item functions. The CONTRACTOR will make any corrections required by the ENGINEER and will return the required number of correct copies of SHOP DRAWINGS and resubmit new samples until approved. The CONTRACTOR shall direct specific attention in writing or on resubmitted SHOP DRAWINGS to revisions other than the corrections called for by the ENGINEER on previous submissions.
- 24.5 No WORK requiring SHOP DRAWINGS or sample submission shall be commenced until the submission has been approved by the ENGINEER.

- 24.6 The ENGINEER'S approval of SHOP DRAWINGS or samples shall not relieve the CONTRACTOR from his responsibility for any deviations from the requirements of the CONTRACT DOCUMENTS unless the CONTRACTOR has in writing called the ENGINEER'S attention to such deviations at the time of submission and the ENGINEER has given written approval to the specific deviation, nor shall any approval by the ENGINEER relieve the CONTRACTOR from responsibility for errors or omissions in the SHOP DRAWINGS.

SECTION 25: INSPECTION AND TESTING

- 25.1 All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.
- 25.2 The OWNER shall provide all inspection and testing services not required by the CONTRACT DOCUMENTS.
- 25.3 The CONTRACTOR shall provide at his expense the testing and inspection services required by the CONTRACT DOCUMENTS.
- 25.4 If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing or approval. All such tests will be in accordance with the methods prescribed by the American Society for Testing and Materials or such other applicable organization as may be required by law or the CONTRACT DOCUMENTS.
- 25.5 Inspections, tests or approvals by the ENGINEER or others shall not relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.
- 25.6 The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating Federal or state agency shall be permitted to inspect all WORK, materials, payrolls, records, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection, or testing thereof.
- 25.7 If any WORK is covered contrary to the written instructions of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observation and replaced at the CONTRACTOR'S expense.
- 25.8 If the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request, will uncover, expose or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools and equipment. If it is found that such WORK is defective, the CONTRACTOR will bear all the expenses of such uncovering, exposure, observation, inspection, testing, and satisfactory reconstruction. If, however, such work is not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME,

or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction, and an appropriate CHANGE ORDER shall be issued.

SECTION 26: SAFETY AND PROTECTION: EMERGENCIES

- 26.1 The CONTRACTOR will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to:
- (a) All employees on the WORK and other persons who may be affected thereby;
 - (b) All the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site; and
 - (c) Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
- 26.2 The CONTRACTOR will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury or loss. The CONTRACTOR will erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection, including posting danger signs and other warnings against hazards and promulgating safety regulations. The CONTRACTOR will notify owners of adjacent utilities when execution of WORK may affect them. When the use or storage of explosives or other hazardous materials is necessary for the performance of the WORK, the CONTRACTOR will exercise the utmost care and will carry on such activities under the supervision of properly qualified personnel. All damage, injury or loss to any property referred to in this paragraph caused, directly or indirectly, in whole or in part, by the CONTRACTOR, or SUBCONTRACTOR, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, will be remedied by the CONTRACTOR, except damage or loss attributable to the fault of drawings or SPECIFICATIONS, or to the acts or omissions of the OWNER or the ENGINEER, or anyone employed by either of them or for whose acts either of them may be liable, and not attributable to the fault or negligence of the CONTRACTOR.
- 26.3 The CONTRACTOR will designate a responsible employee at the site whose duty shall be the prevention of accidents. This person shall be the CONTRACTOR'S SUPERINTENDENT unless otherwise designated in writing by the CONTRACT to the OWNER and the ENGINEER.
- 26.4 In emergencies affecting the safety of persons, or the WORK, or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER, is obligated to act, at his discretion, to prevent threatened damage, injury or loss. The CONTRACTOR will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall thereupon be issued covering the changes and deviations involved.

SECTION 27: CHANGES IN THE WORK

- 27.1 Without invalidating the AGREEMENT, the OWNER may at any time or from time-to-time, order additions, deletions or revisions in the WORK; these will be authorized by CHANGE ORDERS. Upon receipt of a CHANGE ORDER, the CONTRACTOR will proceed with the WORK involved. All such WORK shall be executed under the applicable conditions of the CONTRACT DOCUMENTS. If any CHANGE ORDER causes an increase or decrease in the CONTRACT PRICE, or an extension or shortening of the CONTRACT TIME, an equitable adjustment will be made as provided in the CONTRACT DOCUMENTS.
- 27.2 The ENGINEER may authorize minor changes or alterations in the WORK not involving extra cost and not inconsistent with the overall intent of the CONTRACT DOCUMENTS. These may be accomplished by a FIELD ORDER.
- 27.3 Additional WORK performed by the CONTRACTOR without authorization of a CHANGE ORDER will not entitle him to an increase in the CONTRACT PRICE or any extensions of the CONTRACT TIME, except in the case of an emergency as provided for elsewhere herein.
- 27.4 The OWNER will execute any appropriate CHANGE ORDER prepared by the ENGINEER covering changes in the WORK to be performed and WORK performed in an emergency and any other claim of the CONTRACTOR for a change in the CONTRACT TIME or CONTRACT PRICE which is approved by the OWNER and ENGINEER.
- 27.5 It is the CONTRACTOR'S responsibility to notify his Surety of any changes affecting the general scope of the WORK or changes in the CONTRACT PRICE and the amount of the applicable BONDS shall be adjusted accordingly. The CONTRACTOR will furnish proof of such adjustment to the ENGINEER upon its occurrence.
- 27.6 The CONTRACTOR shall proceed with the WORK as changed and the values of such extra WORK or change shall be determined by:
- (a) Estimate and acceptance in a lump sum;
 - (b) Unit prices named in the CONTRACT or subsequently agreed upon; or
 - (c) Cost and percentage or by cost and fixed fee.
- 27.7 If prices cannot be agreed upon by one or more of the above specified manners, the CONTRACTOR shall be compensated for such WORK as force account work as provided in Section 28, "Force Account Work."

SECTION 28: FORCE ACCOUNT WORK

- 28.1 If the OWNER orders, in writing, the performance of any WORK not covered by the PLANS or included in the SPECIFICATIONS, and for which no item in the CONTRACT is provided, and for which no unit price or lump sum basis can be agreed upon, then such extra WORK shall be done on a Cost-Plus-Percentage basis of payment as follows:
- (a) The CONTRACTOR shall be reimbursed for all costs incurred in doing the WORK, and shall receive an additional payment of 10% of all such costs to cover his indirect overhead costs and profit;

- (b) The term "cost" shall cover all payroll charges for men employed and supervision required under the specific order, including proportionate cost of BOND, liability and property damage insurance, Workmen's Compensation, Social Security, pension and retirement allowance, social insurance, or other regular payroll charges on same; the cost of all materials and supplies required of either temporary or permanent character; rental of all power-driven equipment at rates as agreed upon in writing, together with cost of fuel and supply charges on same; and any other costs incurred by the CONTRACTOR as a direct result of executing the order if approved by the ENGINEER;
- (c) The cost of the WORK done each day shall be submitted to the OWNER in satisfactory form on the following day, and shall be approved by him or adjusted at once.

SECTION 29: CHANGE OF CONTRACT PRICE

- 29.1 The CONTRACT PRICE constitutes the total compensation payable to the CONTRACTOR for performing the WORK. All duties, responsibilities and obligations assigned to or undertaken by the CONTRACTOR shall be at the CONTRACTOR'S expense without change in the CONTRACT PRICE.
- 29.2 The CONTRACT PRICE may only be changed by a CHANGE ORDER. If the CONTRACTOR is entitled by the CONTRACT DOCUMENTS to a change in the CONTRACT PRICE, the claim shall be in delivered to the ENGINEER in writing within five (5) days of the occurrence of the event giving rise to the claim. All valid claims for adjustments in the CONTRACT PRICE shall be determined by the ENGINEER. Any change in the CONTRACT PRICE resulting from any such claim shall be incorporated in a CHANGE ORDER.
- 29.3 The value of any WORK covered by a CHANGE ORDER or of any claims for a change in the CONTRACT PRICE shall be determined in one of the following ways:
 - (a) Where the WORK involved is covered by unit prices contained in the CONTRACT DOCUMENTS, by application of unit prices to the quantities of the items involved;
 - (b) By mutual acceptance of a lump sum;
 - (c) By cost and a mutually acceptable fixed amount for overhead and profit;
 - (d) If none of the above methods is agreed upon, the value shall be determined by the ENGINEER on the basis of costs and a percentage for overhead and profit. Costs shall only include labor (payroll, payroll taxes, fringe benefits, Workmen's Compensation, etc.), materials and equipment directly related to the WORK involved. The maximum percentage which shall be allowed for the CONTRACTOR'S combined overhead and profit shall be as follows:
 - (1) For all such WORK done by his own organization, the CONTRACTOR may add up to fifteen percent (15%) of actual net costs for combined overhead and profit; provided that no overhead or profit shall be allowed on costs incurred in connection with premiums for public liability insurance or other special insurance directly related to such WORK;

- (2) In such case and also under this paragraph, the CONTRACTOR will submit in the form prescribed by the ENGINEER, an itemized cost breakdown together with supporting data.

29.4 The amount of credit to be allowed by the CONTRACTOR to the OWNER for any such changes in cost will be the amount of the actual net cost plus fifteen percent (15%).

SECTION 30: CHANGES IN CONTRACT COMPLETION TIME

30.1 Change in CONTRACT completion time may be initiated by either the OWNER or the CONTRACTOR. All changes shall be initiated in writing. Approval of a reduction or an extension of time shall be by CHANGE ORDER to the CONTRACT and denial of a request shall be in writing from the OWNER or ENGINEER.

30.2 The time for completion of the WORK as set forth in the CONTRACT DOCUMENTS may be extended for working time lost only to the extent that causes beyond the control of the CONTRACTOR, through no fault or negligence on his part, delayed the WORK and when no adjustment of the schedule of WORK would make up the lost time. An extension of time may be allowed for delays in the progress of the WORK caused by unavoidable delays such as:

- (a) Failure on the part of the OWNER to award a CONTRACT within the time specified;
- (b) Phenomenon of nature beyond the ability of the CONTRACTOR to foresee or defend against including flood, cyclone, tornado, high intensity or prolonged rainfall or other sudden disastrous events;
- (c) Delays caused by acts of the Government, a political subdivision or by acts of the public enemy including fires and epidemics, labor strikes and embargos;
- (d) Suspension of the WORK when ordered by the ENGINEER or OWNER;
- (e) Non-completion of WORK being done by others except SUBCONTRACTORS or the CONTRACTOR which must be completed in order for CONTRACTOR to complete his WORK.

30.3 An extension of time shall not be allowed for avoidable delays which the CONTRACTOR could foresee or could have prevented such as:

- (a) Conditions of the PROJECT that could be foreseen or anticipated prior to the time of submitting a BID;
- (b) The failure of the CONTRACTOR to provide sufficient and skilled workmen and equipment to maintain satisfactory progress needed to complete the WORK on time.

30.4 Any plea by the CONTRACTOR that insufficient time was allowed in the CONTRACT when it was awarded shall not be reason for granting an extension to time.

SECTION 31: NEGLECTED WORK

- 31.1 If the CONTRACTOR should neglect to prosecute the WORK in accordance with the CONTRACT DOCUMENTS, including any requirements of the progress schedule, the OWNER after five (5) days WRITTEN NOTICE to the CONTRACTOR may, without prejudice to any other remedy, make good such deficiencies and the cost thereof (including compensation for additional professional services) shall be charged against the CONTRACTOR, in which case a CHANGE ORDER shall be issued incorporating the necessary revisions in the CONTRACT DOCUMENTS including an appropriate reduction in the CONTRACT.

SECTION 32: WARRANTY AND GUARANTEE: CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

- 32.1 The CONTRACTOR warrants and guarantees to the OWNER that all materials and equipment will be new unless otherwise specified and that all WORK will be of good quality and free from faults or defects and in accordance with the requirements of the CONTRACT DOCUMENTS and of any inspections, tests or approvals referred to elsewhere in the CONTRACT DOCUMENTS. All unsatisfactory WORK, all faulty or defective WORK and all WORK not conforming to the requirements of the CONTRACT DOCUMENTS or of such inspections, tests or approvals shall be considered defective. Prompt notice of all defects shall be given to the CONTRACTOR. All defective WORK, whether or not in place, may be rejected.
- 32.2 If required by the ENGINEER, prior to approval of final payment, the CONTRACTOR will promptly, without cost to the OWNER and as required by the ENGINEER, either correct any defective WORK, whether or not fabricated, installed or completed, or, if the WORK has been rejected by the ENGINEER, remove it from the site and replace it with non-defective WORK. If the CONTRACTOR does not correct such defective WORK or remove and replace such rejected WORK within a reasonable time, all as required by WRITTEN NOTICE from the ENGINEER, the OWNER may have the deficiency corrected or the rejected WORK removed and replaced. All direct or indirect costs of such correction or removal and replacement, including compensation for additional professional services shall be paid by the CONTRACTOR and an appropriate CHANGE ORDER shall be issued deducting all such costs from the CONTRACT PRICE. The CONTRACTOR will also bear the expenses of making good all WORK of others destroyed or damaged by his correction, removal or replacement of his defective WORK.
- 32.3 If, after the approval of final payment and prior to the expiration of one (1) year after the date of SUBSTANTIAL COMPLETION or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the CONTRACT DOCUMENTS, and WORK is found to be defective, the CONTRACTOR will, promptly, without cost to the OWNER and in accordance with the OWNER'S written instructions, either correct such defective WORK, or, if it has been rejected by the OWNER, remove it from the site and replace it with non-defective WORK. If the CONTRACTOR does not promptly comply with the terms of such instructions, the OWNER may have the defective WORK corrected or the rejected WORK removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, will be paid by the CONTRACTOR.
- 32.4 If, instead of requiring correction or removal and replacement of defective WORK, the OWNER (prior to approval of final payment) and also the ENGINEER prefer to accept it, he may do so. In such case, if acceptance occurs prior to approval of final payment, a

CHANGE ORDER shall be issued incorporating the necessary revisions in the CONTRACT DOCUMENTS, including appropriate reduction in the CONTRACT PRICE; or, if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by the CONTRACTOR.

SECTION 33: ORDER OF COMPLETION

- 33.1 The CONTRACTOR shall submit, at such times as may reasonably be requested by the ENGINEER, schedules which shall state the order in which the CONTRACTOR proposes to carry on the WORK and the proposed starting and completion dates of the various parts of the WORK.
- 33.2 The ENGINEER shall have the right to require that certain segments of the WORK shall be completed prior to other segments to improve the overall schedule for completion, to improve coordination with other CONTRACTORS, or to meet the needs of the OWNER. This requirement may be imposed either before or during the WORK.

SECTION 34: VERBAL AGREEMENTS

- 34.1 No verbal agreement or conversation with any officer, agent or employee of the OWNER either before or after execution of this CONTRACT shall affect or modify any of the terms or obligations contained in any of the CONTRACT DOCUMENTS.

SECTION 35: DUST AND NOISE CONTROL

- 35.1 The OWNER or the ENGINEER shall have authority to establish working hours on the PROJECT. In the event no other regulation is imposed, the CONTRACTOR shall confine his hours of operation to between 7:00 A.M. and 6:30 P.M., Monday through Saturday.
- 35.2 The CONTRACTOR will be responsible for sweeping, cleaning or applying water to control dust and maintain cleanliness of existing streets during the life of the CONTRACT. It shall be the responsibility of the CONTRACTOR to make the necessary arrangements with the City for water and shall pay all costs therefore. All dust control and maintenance measures shall be incidental to the PROJECT and no direct compensation will be made therefore.

SECTION 36: EROSION CONTROL

- 36.1 The CONTRACTOR shall comply with the provisions and intent of Section 1803.5 of the Standard Specifications for Highway Construction as prepared by the Minnesota Department of Transportation latest edition, except as modified herein, and with the conditions of any jurisdictional agency.
- 36.2 All temporary erosion control structures and devices shall remain in place until other means of permanent erosion control such as turf establishment has taken place or been installed or constructed. It shall be the CONTRACTOR'S responsibility to maintain these structures throughout their temporary life unless such responsibility has been assumed by the OWNER or others in writing. This maintenance shall be considered incidental to the CONTRACT and no additional direct compensation shall be made therefore.
- 36.3 The final configuration and placement of erosion control structures shall be subject to the approval of all local governing authority including the Municipality, the County, the Watershed District, and the Minnesota Department of Natural Resources.

SECTION 37: SUSPENSION OF WORK BY THE OWNER

- 37.1 The OWNER may suspend the WORK, or any part thereof, for a stipulated period of time by giving the CONTRACTOR thirty (30) days WRITTEN NOTICE. The CONTRACTOR may submit a request for extra compensation under provisions of Section 29 and Section 30 for expenses incurred by this suspension.
- 37.2 The ENGINEER shall have the authority to suspend the WORK wholly or in part for such periods as he may deem necessary, because of unsuitable weather or such other conditions as are considered unfavorable for prosecution of satisfactory WORK, or because of failure on the part of the CONTRACTOR to carry out orders given or perform any or all provisions of the CONTRACT. No additional or extra compensation or additional CONTRACT time will be allowed due to suspension of operations by the ENGINEER except as provided elsewhere herein.
- 37.3 In the event it should become necessary to stop WORK for an indefinite period, the CONTRACTOR shall store all materials in such a manner that they will not obstruct or impede the traveling public unnecessarily nor be damaged in any way, and he shall take every precaution to prevent damage to or deterioration of the WORK performed. He shall provide suitable drainage of the WORK by opening ditches, drains, etc., and shall erect temporary structures where necessary.

SECTION 38: WORK TEMPORARILY SUSPENDED OVER THE WINTER

- 38.1 Work will be allowed to proceed during the winter months provided that all construction requirements are fulfilled, but no additional compensation shall be allowed for costs incurred by the CONTRACTOR due to winter suspension and for additional start-up in the spring except by special agreement in writing between the CONTRACTOR and the OWNER.
- 38.2 Unless specifically allowed in the Special Provisions or specifically written into the AGREEMENT or agreed upon in separate agreement by and between the OWNER and the CONTRACTOR, the OWNER shall not release the retainer specified in Section 43, "Application for Partial Payment," of the GENERAL CONDITIONS when WORK is suspended due to winter conditions.

SECTION 39: THE OWNER'S RIGHT TO TERMINATE CONTRACT

- 39.1 The OWNER shall have the right to terminate the employment of the CONTRACTOR and take possession of the premises and of all materials, tools and appliances thereof and finish the WORK by whatever means or method he may deem expedient after giving the CONTRACTOR seven (7) days WRITTEN NOTICE of such termination. Such WRITTEN NOTICE shall be to the CONTRACTOR and his Surety stating that cause exists to justify such action and may be done without prejudice to any other right or remedy and may be given for any of the following:
- (a) If the CONTRACTOR should be adjudged a bankrupt or if he should make a general assignment for the benefit of his creditors;
 - (b) If a receiver should be appointed because of insolvency of the CONTRACTOR;

- (c) If the CONTRACTOR should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen, equipment, or proper materials;
- (d) If the CONTRACTOR should fail to make prompt payments to SUBCONTRACTORS or for materials or labor;
- (e) If the CONTRACTOR should persistently disregard laws or ordinances or the instructions of the ENGINEER;
- (f) If the CONTRACTOR should be guilty of a substantial violation of any provision of the CONTRACT.

39.2 In case of termination the CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished.

39.3 If the unpaid balance of CONTRACT PRICE shall exceed the expense of finishing the WORK, including compensation for additional managerial and administrative services, such excess shall be paid to the CONTRACTOR. If such expense shall exceed such unpaid balance, the CONTRACTOR shall pay the difference to the OWNER. The expense incurred as herein provided, by the OWNER and damage incurred through the CONTRACTOR'S default, shall be determined by the ENGINEER.

39.4 Where the CONTRACT has been terminated by the OWNER, said termination shall not affect any of the rights of the OWNER as against the CONTRACTOR or his surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the OWNER due the CONTRACTOR under the terms of the CONTRACT shall not release the CONTRACTOR or his surety from liability for his default.

SECTION 40: CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

40.1 If the ENGINEER should fail to issue any estimate for payment within ten (10) days after it is due, or if the OWNER shall fail to pay the CONTRACTOR within thirty (30) days of its presentation of any sum certified by the ENGINEER or awarded by arbitrators, then the CONTRACTOR may, upon seven (7) days WRITTEN NOTICE to the OWNER and ENGINEER, stop WORK or terminate this CONTRACT and recover from the OWNER payment for all WORK executed, plus loss sustained upon any plant or materials plus reasonable profit and damages.

SECTION 41: REMOVAL OF EQUIPMENT

41.1 In the case of termination of this CONTRACT before completion for any cause whatever, the CONTRACTOR, if notified to do so by the OWNER, shall promptly remove any part or all of his equipment or supplies from the property of the OWNER, failing which the OWNER shall have the right to remove such equipment and supplies at the expense of the CONTRACTOR.

SECTION 42: USE OF COMPLETED PORTIONS

42.1 The OWNER may, at any time during progress of the WORK, and after notifying the CONTRACTOR, take over and place in service any completed portions of the WORK which are ready for service. Such taking of possession by the OWNER shall not be deemed an acceptance of any other portion of the WORK, nor of any WORK not completed in accordance with the CONTRACT DOCUMENTS. If such prior use increases the cost of or

delays completion of the PROJECT, the CONTRACTOR shall have a basis for a request for extra compensation or extension of time.

SECTION 43: APPLICATION FOR PARTIAL PAYMENT

- 43.1 Before the first working day of each calendar month, the CONTRACTOR shall submit to the ENGINEER a detailed estimate of the amount earned for the separate portions of the WORK, and request payment. As used in this Article the words "amount earned" means the value, on the date of the estimate for partial payment, of the WORK completed in accordance with the CONTRACT DOCUMENTS, and the value of approved materials delivered to the PROJECT site are suitably stored and protected prior to incorporation into the WORK. IF the CONTRACTOR'S estimate of amount earned conforms with the ENGINEER'S evaluation, the ENGINEER will calculate the amount due the CONTRACTOR and make recommendation to the OWNER for payment.
- 43.2 After deducting the retainages and the amount of all previous partial payments made to the CONTRACTOR, the amount earned as of the current month will be made payable to the CONTRACTOR fifteen (15) days after the last day of said month.
- 43.3 The CONTRACTOR warrants and guarantees that title to all WORK, materials and equipment covered by an application for payment will have passed to the OWNER prior to the making of application for payment free and clear of all liens, claims, security interest and encumbrances (hereafter in these GENERAL CONDITIONS referred to as "liens"); and that no WORK, materials or equipment covered by an application for payment will have been acquired by the CONTRACTOR or by any other person performing the WORK at the site or furnishing materials and equipment for the PROJECT, subject to an AGREEMENT under which an interest therein or encumbrance thereon is retained by the seller or otherwise imposed by the CONTRACTOR or such other person.
- 43.4 The ENGINEER will, within fifteen (15) days after receipt of application for payment, either indicate in writing his approval of payment and present the application to the OWNER, or return the application to the CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the application. The OWNER will pay the CONTRACTOR the amount approved by the ENGINEER and OWNER.

SECTION 44: APPROVAL OF PAYMENT

- 44.1 The ENGINEER'S approval of any payment requested in an application for payment shall constitute a representation by him to the OWNER, based on the ENGINEER'S on-site observations of the WORK in progress as an experienced and qualified design professional and on his review of the application for payment and the supporting data, that the WORK has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the WORK is in accordance with the CONTRACT DOCUMENTS (subject to an evaluation of the WORK as a functioning PROJECT upon completion, to the results of any subsequent tests called for in the contract documents and any qualifications stated in his approval); and that the CONTRACTOR is entitled to payment of the amount approved.
- 44.2 The ENGINEER'S approval of final payment shall constitute an additional representation by his to the OWNER that the conditions precedent to the CONTRACTOR'S being entitled to final payment as set forth in the AGREEMENT have been fulfilled.

44.3 The ENGINEER may refuse to approve the whole or any part of any payment if, in his opinion, he is unable to make such representations to the OWNER. He may also refuse to approve any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved, to such extent as may be necessary in his opinion to protect the OWNER from loss because:

- (a) The WORK is defective;
- (b) Claims have been filed or there is reasonable evidence to suggest such filing thereof;
- (c) The CONTRACT PRICE has been reduced because of modifications or changes;
- (d) The OWNER has been required to correct defective WORK or complete the WORK;
- (e) Unsatisfactory performance of the WORK, including failure to clean up.

SECTION 45: COMPLETION

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

45.2 The OWNER shall have the right to exclude the CONTRACTOR from the PROJECT after the date of completion, but the OWNER will allow the CONTRACTOR reasonable access to complete or correct items of repair and maintenance.

SECTION 46: FINAL PAYMENT

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

- 46.2 If on the basis of his observation and review of the WORK during construction, his final inspection and his review of the final application for payment – all as required by the CONTRACT DOCUMENTS, the ENGINEER is satisfied that the WORK has been completed and the CONTRACTOR has fulfilled all of his obligations under the CONTRACT DOCUMENTS, he will, within fifteen (15) days after receipt of the final application for payment, indicate in writing his approval of payment and present the application to the OWNER for payment. Otherwise, he will return the application to the CONTRACTOR, indicating in writing his reasons for refusing to approve final payment, in which case the CONTRACTOR will make the necessary corrections and resubmit the application. The OWNER will, within twenty (20) days of presentation to him of an approved application for payment, pay the CONTRACTOR the amount approved by the ENGINEER.

SECTION 47: RETENTION OF A PORTION OF THE CONTRACT SUM

- 47.1 The OWNER may retain up to a maximum of ten percent (10%) of value of WORK completed and requested for payment. After fifty percent (50%) of the WORK has been completed, the CONTRACTOR may request consideration for reduction in the retained amount. Where the OWNER is subject to the provisions of Minnesota State Statutes 429.041 Section 6, the maximum retained amount shall be five percent (5%) released with approval of the governing body. Those amounts released shall be considered not required to be retained to protect the OWNER'S interest in satisfactory completion of the contract.

SECTION 48: LIQUIDATED DAMAGES

- 48.1 The parties hereto recognize that failure on the part of the CONTRACTOR to complete the WORK within the time period set forth hereinabove shall cause damage to the OWNER; and should the CONTRACTOR not complete the WORK within that period of time, or otherwise be guilty of substantial violation of this contract, the OWNER may deduct amounts per the following schedule per calendar day after the completion date and all legal and engineering costs related thereto, for each day exceeding said completion date, from the total contract sum to be paid to the CONTRACTOR, and among its other remedies, terminate this AGREEMENT and complete the WORK by whatever method the OWNER may deem expedient, at the expense of the CONTRACTOR; and such action by OWNER shall not relieve CONTRACTOR of its liability to OWNER for any damages caused by the CONTRACTOR'S default, including, but not limited to, the excess expense of finishing the WORK over the unpaid balance of the CONTRACT PRICE. In the event the OWNER elects to complete the WORK following CONTRACTOR'S default as above set forth, the CONTRACTOR agrees to extend its full cooperation, executing such instruments and performing such acts necessary for the expeditious completion of the WORK contemplated under this AGREEMENT. The amount deducted under this paragraph shall not be construed as a penalty, but rather as liquidated damages resulting from the non-completion of the WORK within the specified time.

SCHEDULE OF LIQUIDATED DAMAGES

<u>Original Contract Amount</u>		
<u>From more than</u>	<u>To and Including</u>	<u>Charge Per Calendar Day</u>
\$ 0.00	\$ 499,999.99	\$200.00
\$ 500,000.00	\$ 999,999.99	\$300.00
\$1,000,000.00	unlimited	\$500.00

SECTION 49: WAIVERS OF CLAIMS AND CONTINUING OBLIGATIONS

- 49.1 The CONTRACTOR'S obligation to perform the WORK and complete the PROJECT in accordance with the CONTRACT DOCUMENTS shall be absolute. Neither the approval of any payment by the ENGINEER, nor the issuance of certificate of completion, nor any payment by the OWNER to the CONTRACTOR under the CONTRACT DOCUMENTS, nor any use or occupancy of the PROJECT or any part thereof by the OWNER, nor any act of acceptance by the OWNER nor any failure to do so, nor any correction of faulty or defective WORK by the OWNER shall constitute an acceptance of WORK not in accordance with the CONTRACT DOCUMENTS.
- 49.2 The making an acceptance of payments shall constitute:
- (a) A waiver of all claims by the OWNER against the CONTRACTOR other than those arising from unsettled liens, from faulty or defective WORK appearing after final payment or from failure to comply with the requirements of the CONTRACT DOCUMENTS or the terms of any special guarantees specified therein; and
 - (b) A waiver of all claims by the CONTRACTOR against the OWNER other than those previously made in writing and still unsettled.

SECTION 50: ERRORS IN PAYMENT

- 50.1 No certificate issued nor payments made nor partial nor entire use or occupancy of the WORK by the OWNER shall be deemed as acceptance of any part of the WORK or materials not in accordance with the CONTRACT.
- 50.2 Where an error is found after payment is made, the OWNER shall have the right to recover or shall be reimbursed for all overpayments to the CONTRACTOR.

SECTION 51: INSURANCE

- 51.1 The CONTRACTOR shall provide (from insurance companies acceptable to the OWNER) the insurance coverage designated hereinafter and pay all costs.
- 51.2 Before commencing WORK under this CONTRACT, the CONTRACTOR shall furnish the OWNER with certificates of insurance specified herein showing the type, amount, class of operations covered, effective dates, and date of expiration of policies, and containing substantially the following statement:
- "The insurance covered by this certificate will not be canceled or materially altered, except after ten (10) days WRITTEN NOTICE has been received by the OWNER."
- 51.3 In case of the breach of any provision of this Article, the OWNER, at his option, may take out and maintain, at the expense of the CONTRACTOR, such insurance as the OWNER may deem proper and may deduct the cost of such insurance from any monies which may be due or become due the CONTRACTOR under this CONTRACT.

SECTION 52: CONTRACTOR AND SUBCONTRACTOR INSURANCE

- 52.1 The CONTRACTOR shall not commence WORK under this CONTRACT until he has obtained all the insurance, has been reviewed by the OWNER, nor shall the CONTRACTOR allow any SUBCONTRACTOR to commence WORK on his SUBCONTRACT until all similar

insurance required for that portion of the WORK has been so obtained and reviewed. Review of the insurance by the OWNER shall not relieve or decrease the liability of the CONTRACTOR hereunder.

SECTION 53: COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE

- 53.1 The CONTRACTOR shall maintain during the life of this CONTRACT the statutory Workmen's Compensation, in addition to, Employer's Liability Insurance in an amount not less than \$100,000 for each accident/\$500,000 disease – policy limit and \$100,000 disease – each employee limit. Workmen's Compensation coverage must extend to every employer, including all owners/officers of a closely held corporation and/or individuals operating as a sole proprietorship or partnership. In case any such WORK is sublet, the CONTRACTOR shall require the SUBCONTRACTOR similarly to provide Worker's Compensation and Employer's Liability Insurance for all of the latter's employees to be engaged in such WORK. Where WORK under this CONTRACT includes any water or navigational exposure, coverage shall be included to cover the Federal Longshoremen's and Harborworker's Act and the Federal Jones Act.

SECTION 54: PUBLIC LIABILITY (INCLUDING AUTOMOTIVE) AND PROPERTY DAMAGE INSURANCE

- 54.1 The CONTRACTOR shall maintain during the life of this CONTRACT such public liability and property damage insurance and automobile public liability and property damage insurance and shall protect him, the OWNER, the ENGINEER, and any SUBCONTRACTOR performing WORK covered by this CONTRACT from claims for damages for personal injury, including accidental death, as well as from claims for property damage, which may arise from negligent operations under this CONTRACT, whether such operations are by himself or by a SUBCONTRACTOR or by anyone directly or indirectly employed by either of them, and the amounts of such insurance shall not be less than:

(a) Commercial General Liability:

Bodily Injury and Property Damage:

Each Occurrence/Aggregate: \$1,000,000.00

(b) Automobile Liability:

Combined Single Limit: \$1,000,000.00

(c) Umbrella Liability:

Per Occurrence/Aggregate: \$1,000,000.00

- 54.2 The insurance coverage shall include the following named insured under the CONTRACTOR'S policy:

- (a) The Municipality in which the WORK is to be performed;
- (b) The OWNER, as defined herein; its officers, agents and employees;
- (c) Pioneer Engineering, P.A.; its officers, agents and employees.

SECTION 55: INSURANCE COVERAGE FOR SPECIAL CONDITIONS

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

SECTION 56: CLEANING UP AND SURFACE RESTORATION

- 56.1 Surplus pipe, materials, tools and temporary structures shall be removed by the CONTRACTOR. All dirt, rubbish and excess earth excavation shall be hauled to a dump site selected by the CONTRACTOR, and the construction site shall be left clean to the satisfaction of the ENGINEER.
- 56.2 Unless stated specifically to the contrary in the Special Provision, the CONTRACTOR shall replace all surface material and shall restore paving, curbing, sidewalks, gutters, fences, sod and other items disturbed, to a condition equal to or better than that before the WORK began, furnishing all labor, materials and equipment necessary to do this WORK. No permanent paving shall be placed within thirty (30) days after back-filling is completed except by order of the ENGINEER. Traveled streets shall be kept open and maintained by the CONTRACTOR after back-filling and before surfacing or final inspection.

SECTION 57: ARBITRATION

- 57.1 All disputes, claims, or questions subject to arbitration under this CONTRACT shall be submitted to arbitration in accordance with Chapter 572, Statutes of the State of Minnesota prior to the issuance by the ENGINEER of the Final Payment Voucher. Any dispute, claim or question not submitted to arbitration prior to the issuance of Final Payment Voucher, and any question of procedure not agreed upon by both parties may be submitted to a court of competent jurisdiction for ruling.
- 57.2 The Arbitration Board shall consist of three (3) members: one shall be selected by each party; and the two so selected shall choose the third, neutral arbitrator. The arbitrators shall be paid an amount agreed upon by the parties. No arbitrator shall have a vested interest, financial, competitive, or family relationship with either party.
- 57.3 The CONTRACTOR shall not cause a delay of the WORK because of pending arbitration proceedings except with the written permission of the ENGINEER and then only until the arbitrators shall have an opportunity to determine whether or not the WORK shall continue until they decide the matters in dispute.
- 57.4 Notice of the demand for arbitration of a dispute shall be filed in writing, with the ENGINEER and the other party to the CONTRACT. If the arbitration is an appeal from the ENGINEER'S decision, demand shall be made within ten (10) days of receipt of the ENGINEER'S decision. In any other case, the demand for arbitration shall be made within a reasonable time after dispute has arisen. In no case shall a demand be made after the final payment except as otherwise expressly stipulated in the CONTRACT DOCUMENTS.
- 57.5 The arbitrators, if they deem the case requires it, are authorized to award to the party whose contention is sustained such sums as they or a majority of them shall deem proper to compensate for the time and expense incident to the proceedings, and if the arbitration was

demanded without reasonable cause, they may also award damages for delay. The arbitrators may assess the costs and charges of the proceedings upon either or both parties.

SECTION 58: DAMAGES

- 58.1 If either party to this CONTRACT should suffer injury or damages in any manner because of any wrongful act or neglect of the other party or of anyone employed by him, then he shall be reimbursed by the other party for such damages.

SECTION 59: MISCELLANEOUS

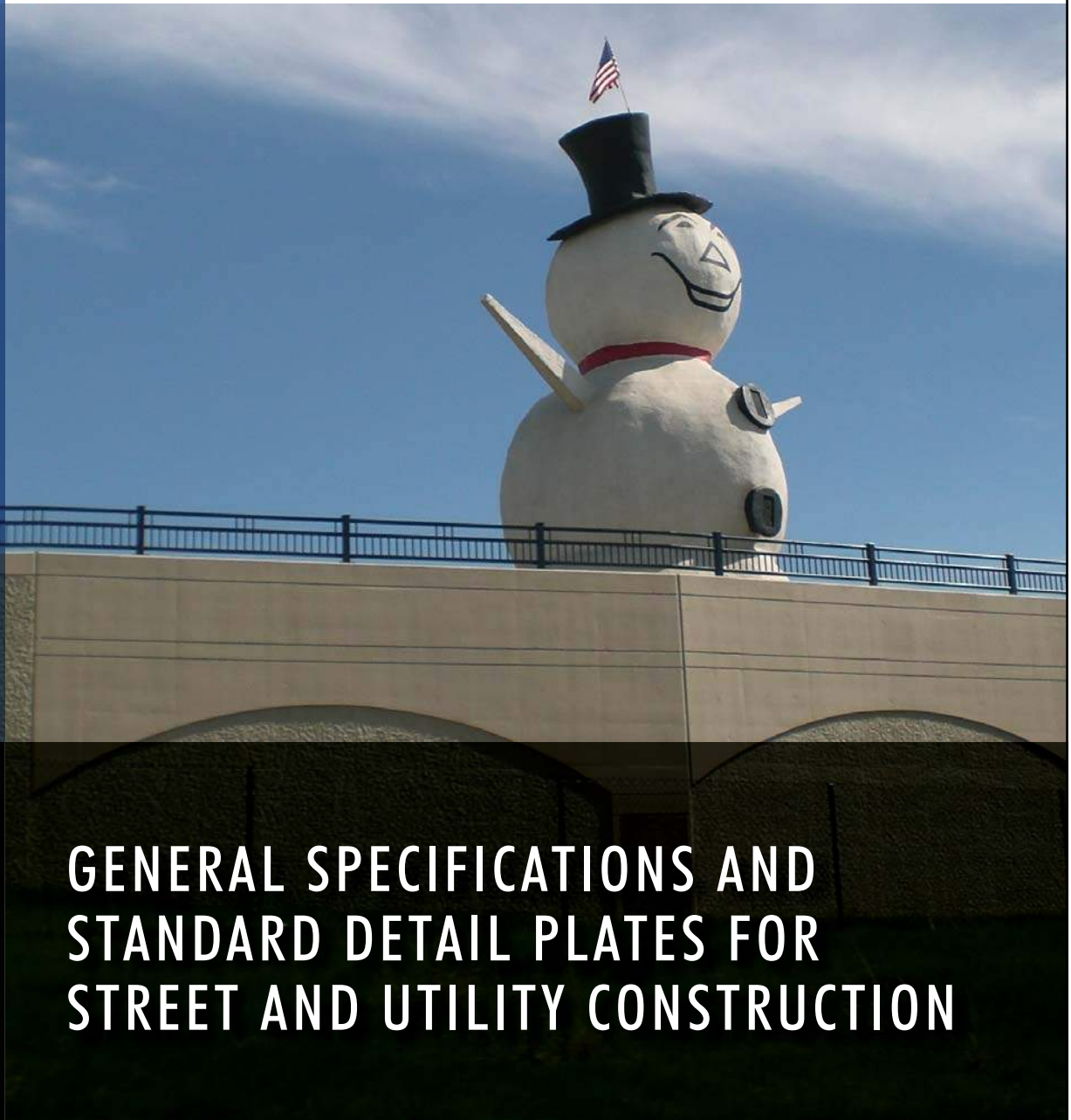
- 59.1 Whenever any provision of the CONTRACT DOCUMENTS requires the giving of WRITTEN NOTICE it shall be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to him who gives the notice.
- 59.2 The duties and obligations imposed by these GENERAL CONDITIONS and the rights and remedies available hereunder, and in particular but without limitation, the warranties, guarantees, and obligations imposed upon the CONTRACTOR and the rights and remedies available to the OWNER and ENGINEER thereon, shall be in addition to and not a limitation of any otherwise imposed or available by law, by special guarantee or other provisions of the CONTRACT DOCUMENTS.
- 59.3 The CONTRACT DOCUMENTS shall be governed by the law of the place where the PROJECT is located.

SECTION 60: GUARANTEE

- 60.1 The CONTRACTOR shall hold himself responsible for any and all defects which may develop in any part of the entire installation furnished by him, and upon receipt of WRITTEN NOTICE from the ENGINEER, shall immediately replace and make good without expense to the OWNER, all such faulty part or parts and damage done by reason of same, during a period of one (1) year from the date of final acceptance of the installation except when specific guarantee for another length of time is elsewhere specified.
- 60.2 The acceptance of the installation, or any part of it, shall not act to waive the liability on the part of the CONTRACTOR.



City of North St. Paul
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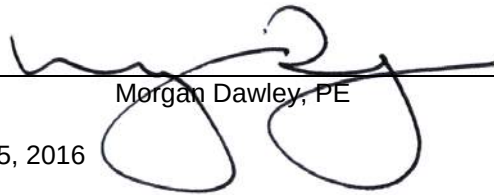
2016

GENERAL SPECIFICATIONS AND STANDARD DETAIL PLATES FOR STREET AND UTILITY CONSTRUCTION



CERTIFICATION

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



Morgan Dawley, PE

Date: January 15, 2016

Lic. No. 44178

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*

- a. Contractor shall submit the number of Samples required in the Specifications.
- b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
- a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
- a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY GENERAL CONDITIONS

SGC 0 INTRODUCTION

These Supplementary General Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2013 Edition) and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemented, remain in full force and effect.

SGC 1.01 DEFINED TERMS

The terms used in these Supplementary Conditions, which are defined in the Standard General Conditions of the Construction Contract (C-700, 2013. Edition), have the meanings assigned to them in the General Conditions.

Owner shall mean the City of North St. Paul, 2400 Margaret Street, North St. Paul, MN 55109.

Engineer shall mean the City Engineer of the City of North St. Paul or the Engineer representing the Owner on the project.

Contractor shall mean the individual or entity with whom the Owner has entered into the Agreement.

SGC 2.01 DELIVERY OF BONDS AND EVIDENCE OF INSURANCE

Delete paragraph 2.01B and insert the following:

Before any work at the site is started, Contractor shall deliver to Owner, with a copy to Engineer, certificates (and other evidence of insurance requested by Owner) which Contractor is required to purchase and maintain in accordance with paragraphs 6.03.B and 6.04.

SGC 2.03 BEFORE STARTING CONSTRUCTION

Paragraph 2.03.A of the General Conditions shall be deleted in its entirety and replaced by the following paragraphs.

- B. Within ten (10) days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements) and before the preconstruction conference, Contractor shall submit to Engineer the following for its timely review.
 - 1. Project Schedule: The Contractor shall submit in writing to the Engineer for review a progress schedule indicating the order in which the Contractor proposes to perform the various stages of the Work, the dates on which the Contractor will start the various features thereof, and the contemplated dates for completing the same. This schedule shall be in the form of a bar chart of a suitable scale to indicate appropriately the percentage of work scheduled and completed by weekly schedules. The lack of a schedule shall be cause for withholding of progress payments and could result in a work stoppage. If the work is stopped, no credit of working days or payment of down time will be provided.

The Contractor shall not deviate from this schedule after once approved without the written permission of the Engineer. The progress schedule will be acceptable to the Engineer if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on the Engineer responsibility for the progress schedule of the Work nor interfere with or relieve the Contractor from the Contractor's full responsibility therefore.

2. Shop Drawings: The Contractor shall present to the Engineer six (6) copies of detailed, dimensioned manufacturer's drawings of all materials, apparatus and machinery, and for such fittings and devices as the Engineer may direct. The Engineer will keep two copies of each set and return the rest to the Contractor with the Engineer's approval or notations. In case of lack of approval, the Contractor shall submit new drawings, corrected as required by the Engineer. All such drawings shall be submitted to the Engineer with ample time allowance for consideration. Submittals shall be required for, but not limited to: Manhole Structures, Castings, Sewer Pipe, Water Main, Lift Stations, and Waterworks Brass.
3. The Engineer's approval of such drawings and progress schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications unless the Contractor has, in writing, called the Engineer's attention to such deviations at the time of submission, nor shall it relieve the Contractor from the responsibility for errors of any sort in shop drawings or progress schedules. No Work shall be started until the drawings and progress schedules have been approved by the Engineer.

SGC 2.04 PRECONSTRUCTION CONFERENCE

Add a new paragraph immediately after 2.04.A of the General Conditions and re-letter the current 2.04.B to 2.04.C. The new paragraph immediately after 2.04.A shall read as follows:

- B. The preconstruction meeting will be arranged by the Engineer. Representatives of the Engineer, Owner, Contractor, utility companies and other parties involved in the project shall be present at this meeting. The Contractor's project superintendent and foreman will be present at this meeting. The Contractor's project superintendent shall be familiar with all phases of the work to be executed and shall oversee the work during its progress. The project superintendent shall represent the Contractor in the Contractor's absence, and communications and directions given to the project superintendent shall be as binding as if given to the Contractor. The Contractor's work schedule and a list of subcontractors and suppliers shall be submitted and reviewed along with any other information necessary for the orderly execution of the work at the preconstruction conference.

SGC 2.05 INITIAL ACCEPTANCE OF SCHEDULES

Paragraph 2.05 of the General Conditions shall be deleted in its entirety.

SGC 3.02 REFERENCE STANDARDS

Add new paragraphs immediately after 3.02.A.2 of the General Conditions, which are to read as follows:

3. The work shall be performed in accordance with:
 - A. The 2016, or most current edition of the Minnesota Department of Transportation "Standard Specifications for Construction," (MnDOT Specifications) and any supplements or amendments thereto issued prior to the date of these Contract Documents.
 - B. The City of North St. Paul Utility and Street Construction Standard Specifications dated January 2016.
 - C. The 2013 Edition of the Standard Utilities Specifications for Water Main and Service Line Installation and Sanitary Sewer and Storm Sewer Installation as published by the City Engineers Association of Minnesota, St. Paul, Minnesota, and Standard Detail Plates; and
 - D. The Project Manual, which contain individual project Bidding Requirements, Proposal Form, Conditions of the Contract, Contract Forms, Specifications, and any other project-specific information in the form of appendices.

Traffic control shall be in accordance with the current edition of the Minnesota Manual on Uniform Traffic Control Devices (MMUTCD), including the current edition of the Field Manual for Temporary Traffic Control Zone Layouts.

The provisions for construction shall comply with the following precedence ("1" being the highest precedence, "3" being the lowest):

1. Individual Project Plan
2. Individual Project Manual
3. MnDOT Standard Specifications for Construction

Any conflicting requirements or language shall follow that stated in the highest precedence document of those listed above, unless directed in writing by the Engineer.

4. Coordination of Plans and Specifications shall be in accordance with the provisions of MnDOT Specification 1504, as modified by the following definitions:
 - A. Standard Specification: Refer in precedent order to the current Standard Utilities Specifications of the City Engineers Association, the current MnDOT Standard Specifications and the other specifications of ASTM, ANSI, AWWA, etc., as referenced and as published on the date of the bid advertisement.
 - B. Supplemental Specifications: Refer in precedent order to the Supplementary Conditions and the General Conditions as contained in these Contract Documents.

- C. Work under these Contract Documents shall be governed by all applicable federal, state, and local laws, regulations, codes and ordinances, and the Contract Documents, which are as follows:

General Conditions
Supplementary Conditions
General Requirements
Special Provisions
Addenda
Proposal
Contract Documents
Technical Specifications

Should the Contract Documents conflict with any of the regulations and standards mentioned in preceding paragraphs of these Supplementary Conditions, the regulations and standards shall take precedence. This shall not, however, be construed to relieve the Contractor from complying with the requirements of the Contract Documents, which are in excess of, but not contrary to, the regulations and standards.

SGC 4.03 REFERENCE POINTS

Add new paragraphs immediately after 4.03.A of the General Conditions, which are to read as follows:

- B. All property corner monuments and section corners known by the Engineer will be marked prior to construction. Any such monuments required to be removed by the proposed construction will be replaced at the Owner's expense. Any such monuments outside the proposed construction limits shall be protected by the Contractor. Should any monuments outside the proposed construction limits be disturbed, a Licensed Land Surveyor will reset them at the Contractor's expense.
- C. The Engineer will provide horizontal and vertical control construction stakes to allow the Contractor to construct the utilities as follows:
1. One set of hubs at fifty foot (50') intervals on street centerline to re-establish sub-grade.
 2. One set of offset cut and fill stakes placed at fifty-foot (50') intervals on each side of the street for fine grading and curb and gutter. A cut sheet showing hub elevations and benchmarks will be provided.
- D. The Contractor shall give the Engineer forty-eight (48) hour notice of need for the establishment of line and grade so that the Engineer may have time to provide them. No additional compensation shall be allowed by the Contractor for any claims of crews being held up because of lack of line and grade stakes. After lines and grades for any part of the work have been given by the Engineer, the Contractor will be held responsible for such lines and grades. It shall be the Contractor's total responsibility to accurately construct the streets and utilities in accordance with the construction stakes and bringing any discrepancies to the attention of the Engineer. All stakes or other marks given shall be protected and preserved by the Contractor until the Contractor is authorized to remove them. The Contractor shall be billed the cost of any re-staking due to their negligence. The Contractor shall, at their own expense, correct any mistakes that may be caused by the unauthorized disturbance or removal of line and grade stakes. The Engineer may require that work be suspended when, for any reason, such marks cannot be properly followed.

- E. The Contractor shall supply hubs and lath to the project site. The Contractor shall furnish and deliver to the construction site one-inch by two-inch by twelve-inch (1"x2"x12") pointed hubs and thirty-six inch (36") and forty-eight inch (48") pointed lath, prior to the start of the Project in sufficient numbers as directed by the Engineer. Furnishing and delivering the hubs and lath shall be considered incidental to the Project with no additional compensation allowed therefore.

SGC 4.04 PROGRESS SCHEDULE

Paragraph 4.04.A of the General Conditions shall be deleted in its entirety.

SGC 5.03 SUBSURFACE AND PHYSICAL CONDITIONS

Add new paragraphs immediately after 5.03.B of the General Conditions, which are to read as follows:

- C. Notwithstanding Paragraphs 5.03.A and 5.03.B, under no circumstances may the Contractor rely upon the accuracy of the "technical data" contained in reports of explorations or tests of the amounts, elevations, or locations of subsurface groundwater.

SGC 5.06 HAZARDOUS ENVIRONMENTAL CONDITIONS AT SITE

Paragraph 5.06.I of the General Conditions shall be deleted in its entirety.

SGC 6.03 CONTRACTOR'S LIABILITY INSURANCE

The following supplementary conditions are for City street and utility construction contracts.

Add the following new paragraph immediately after paragraph 6.03.B:

- C. The limits of liability for the insurance required by paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations. The intent is to require all Contractors to carry at least \$2,000,000 of coverage. These limits may be derived from the use of underlying coverage or Umbrella/Excess Insurance.
1. Contractors General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall also include completed operations and product liability coverage and eliminate the exclusion with respect to property under the care, custody and control of Contractor. The policy shall name the City of North St. Paul and WSB & Associates, Inc. as additional insureds on a primary and non-contributory basis. As additional insureds, the City of North St. Paul and WSB & Associates, Inc. shall be entitled to the limit required by this agreement or Contractor's actual policy limits, whichever is greater.

Contractor is required to provide the following endorsements: CG 20 10 07 04 or CG 20 10 04 13 and CG 20 37 07 04 or CG 20 37 04 13 or their equivalent.

General Liability:

Commercial General Liability	
Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000
(Explosion, Collapse, and Underground shall not be deleted)	
Personal and Advertising Injury (Per Person/Organization)	\$1,000,000
General Aggregate (Except Products – Completed Operations)	\$2,000,000
Product – Completed Operations Aggregate	\$1,000,000

Certificate of Insurance should indicate:

Contractual Liability is covered	Yes
Governmental Immunity is waived to the extent of insurance	Yes
Operations of subcontractor is covered	Yes

The intent is to ensure that the "per occurrence" limits and "product-completed operation" aggregates are at least \$2,000,000, but may be attained through the use of an Umbrella/Excess policy.

2. Automobile Liability:

Bodily Injury:

Each Person	\$1,000,000
Each Accident	\$1,000,000

Property Damage:

Each Accident	\$1,000,000
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or

Bodily Injury & Property Damage (Combined Single Limit)	\$2,000,000
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The intent is to ensure that the limits are at least \$2,000,000, but may be attained through the use of an Umbrella/Excess policy.

3. Umbrella/Excess Liability:

General Aggregate	\$1,000,000*
Each Occurrence	\$1,000,000

**The required minimum shall be \$1,000,000, or policy limits, whichever is greater.*

4. Worker's Compensation and related coverage under paragraphs 6.03 of the General Conditions.

Coverage A: Statutory

Coverage B: Employers Liability

Bodily Injury by Accident: Each Accident	\$500,000
Bodily Injury by Disease: Each Employee	\$500,000
Bodily Injury by Disease: Policy Limit	\$500,000

Coverage may be written at the State minimum limits but the difference must be supplemented through the use of an Umbrella/Excess policy.

The Contractor is also responsible for meeting all insurance requirements set by the County or MnDOT for any work on or under the right-of-way if applicable.

SGC 6.04 OWNER'S LIABILITY INSURANCE

Paragraph 6.04A of the General Conditions shall be deleted in its entirety.

SGC 6.05 PROPERTY INSURANCE

Delete paragraph 6.05 in its entirety and insert the following:

Builder's Risk Insurance: Before commencement of the Work, the Contractor shall provide Builder's Risk Insurance on a multiple peril form in the full amount of the total construction and material contract. Such insurance shall contain an appropriate rider to include as Additional Named Insureds, the Owner, the Engineer and his consultants, and each of their officers, employees and agents, all subcontractors, the equipment contractors and all of their subcontractors on the construction premises. Such insurance may have a deductible clause but

the deductible amount shall be borne by the Contractor and shall not exceed \$1,000.00.

The Builder's Risk Insurance required herein shall apply to projects involving construction of structures and building only. The requirements of this section shall be waived on projects involving only underground utilities, grading, street improvements and similar construction work, but any damage or loss to property shall be the sole responsibility of the Contractor until final acceptance of the Work.

SGC 6.06 WAIVER OF RIGHTS

Paragraph 6.06 of the General Conditions shall be deleted in its entirety.

SGC 7.02 LABOR; WORKING HOURS

Add the following to 6.02.B of the General Conditions to read as follows:

Working hours shall be restricted to the hours of 7:00 a.m. to 7:00 p.m. Monday through Friday and 9:00 a.m. to 5:00 p.m. on Saturday. Expansion of working hours, including Saturdays, Sundays and Federal Holidays, require authorization from the Engineer.

SGC 7.06 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS

At the end of the paragraph 7.06.O.2 add the following:

In accordance with Minnesota Statute 471.425, the Contractor shall pay any subcontractor within ten (10) days of the Contractor's receipt of payment from the municipality.

SGC 7.10 LAWS AND REGULATIONS

Add a new paragraph D immediately after 7.10.C of the General Conditions, which is to read as follows:

The Contractor must comply with the Minnesota Government Data Practices Act, Minnesota Statutes Chapter 13, as it applies to (1) all data provided by the Owner pursuant to this Agreement, and (2) all data, created, collected, received, stored, used, maintained, or disseminated by the Contractor pursuant to this Agreement. The Contractor is subject to all the provisions of the Minnesota Government Data Practices Act, including but not limited to the civil remedies of Minnesota Statutes Section 13.08, as if it were a government entity. In the event the Contractor receives a request to release data, the Contractor must immediately notify the Owner. The Owner will give the Contractor instructions concerning the release of the data to the requesting party before the data is released. Contractor agrees to defend, indemnify, and hold the Owner, its officials, officers, agents, employees, and volunteers harmless from any claims resulting from Contractor's officers', agents', owners', partners', employees', volunteers', assignees' or subcontractors' unlawful disclosure and/or use of protected data. The terms of this paragraph shall survive the cancellation or termination of this Agreement.

SGC 7.12 SAFETY AND PRECAUTION

Add a new paragraph immediately after 7.12.G of the General Conditions, which is to read as follows:

The Contractor shall provide all necessary temporary barricades, fences and other protection as required for the proper execution of the work and for the protection of his employees, employees of the Owner, other construction personnel, and the general public according to all Federal, State, and Local regulations. This may include increased signing as necessary. The Contractor may need to furnish, erect, and maintain lights to provide a safe work environment according to all state and federal codes. All utility trenches shall be backfilled at the end of each working day and driveway access provided to individual residences to the satisfaction of the Engineer. ***The Contractor shall immediately call "911" if a gas utility line is struck or damaged.***

SGC 7.18 INDEMNIFICATION

Add the following as a subparagraph of 7.18.C.2 of the General Conditions, which is to read as follows:

Provided, however, if the claim, damage, loss or expense referred to in Paragraph 7.18A results from failure of the Engineer to discover a condition or object which is underground or otherwise not reasonably observable by the Engineer, and if said failure to discover is apparent to the Contractor in that the said condition or object is omitted from the Engineer's maps, drawings, opinions, reports, surveys, change orders, designs or specifications, then the Contractor shall be liable for indemnification of Engineer under Paragraph 7.18 for damage resulting from said failure to discover unless Contractor shall have notified Engineer of the existence and location of such condition or object prior to the occurrence of such damage and in sufficient time of Engineer to have provision therefore. Further, in the event neither Engineer nor Contractor discover such condition or object, Contractor shall bear the burden of indemnification under Paragraph 7.18.

SGC 8.01 OTHER WORK

Add the following to 8.01.C of the General Conditions to read as follows:

The Contractor shall cooperate with all parties to facilitate the prompt completion of all contracts.

Add the following immediately after 8.01.D of the General Conditions, which is to read as follows:

- E. The Contractor is hereby advised that the following work may be performed on the site by others during the contract time.
 - 1. The individual lot owners or their agents may be site grading and/or constructing buildings on the lots adjacent to the proposed streets.
 - 2. Private utility companies may be installing and/or relocating underground facilities on or adjacent to the project.
- F. If Owner performs work for the Contractor, the Contractor must pay Owner for such work with no deduction in Contract amount.

SGC 9.11 EVIDENCE OF FINANCIAL ARRANGEMENTS

Paragraph 9.11 of the General Conditions shall be deleted in its entirety.

SGC 10.02 VISITS TO SITE

Add a new paragraph immediately after 10.02.B of the General Conditions, which is to read as follows:

- C. Throughout the construction phase, regular weekly meetings will be held by the Engineer on site to review progress and to discuss items necessary for an orderly completion of the project. The weekly construction meetings shall include the Owner, Engineer and Contractor. The Contractor's representative must be able to make decisions for the Contractor pertaining to the project. All project conflicts shall be brought to these meetings, including requests for additional payment. Meeting minutes will be provided to all participants as a record of the meeting.

SGC 10.08 LIMITATION ON ENGINEER'S AUTHORITY AND RESPONSIBILITIES

Add the following at the end of the first sentence of paragraph 10.08A:

Insofar as the subject matter of any pertinent claim, dispute, or other matter falls within the realm of the technical expertise of Engineer, Engineer shall not render any decision on any claims, disputes, or other matters the subject matter of which, at Engineer's sole discretion, requires legal, rather than technical interpretation.

SGC 12.01 CLAIMS

The first sentence of Paragraph 12.01.B of the General Conditions shall be deleted and the following inserted in its place:

Written notice stating the general nature of each claim, dispute, or other matter shall be delivered by the claimant to the Engineer and the other party to the Contract promptly but in no event later than ten (10) days after the start of the event giving rise thereto.

Add the following paragraphs to 12.01.F of the General Conditions:

Except as specifically authorized in writing by the Engineer at the time additional work is done beyond the original scope of the Contract Documents, the Contractor shall make no claims for additional compensation. The Contractor's plea of ignorance of foreseeable conditions which will create difficulties or hindrances in the execution of the work will not be acceptable to the Owner as an excuse for any failure of the Contractor to fulfill the requirements of the Contract Documents, and shall not be a basis for the Contractor's claim for additional compensation.

Any discrepancies in or conflicts between the items described in these Contract Documents must be submitted in writing to the Engineer for adjustment prior to proceeding with the work as any claims for additional compensation to achieve compliance with the requirements of those items will not be allowed or considered.

SGC 13.01B5F COST OF THE WORK

Paragraph 13.01B5F of the General Conditions shall be deleted in its entirety.

SGC 13.03 UNIT PRICE WORK

Delete paragraph 13.03.E in its entirety and insert the following in its place:

There will be no adjustment in unit price for increased or decreased quantities. In addition, the Owner reserves the right to reduce certain quantities or delete certain items from each section of the bids as the Owner sees fit, either before or after the Award of Contract. There will be no additional compensation due to remobilization of equipment as necessary to complete punch list items or other items not completed by the Contractor. There will be no additional compensation due to restocking charges for materials not used on the project.

SGC 14.02 TESTS AND INSPECTIONS

Add the following paragraphs to 14.02.A of the General Conditions, to read as follows:

The Contractor shall provide a minimum twenty-four (24) hour notice to the Observer for any testing that must be observed or accomplished by someone other than the Contractor's personnel. All final tests and inspections shall be performed under the observation of the Resident Project Observer.

All tests on material to be placed shall be completed prior to the placing of any material. Tests shall be made in accordance with the American Society for Testing and Materials (ASTM) standard and tentative specifications that apply, except as otherwise specified.

Signed copies of all reports on tests shall be sent at once to the Owner, Engineer and Contractor. Inspection and testing shall in no way relieve the Contractor or supplier from the responsibility of furnishing materials and workmanship in accordance with the plans and specifications.

SGC 15.01 PROGRESS PAYMENTS

Amend paragraph 15.01B.3 of the General Conditions to read as follows:

The amount of retainage with respect to all progress payments will be as follows:

Minnesota Contractors	5%
Exempt Non-Minnesota Contractors	5%
Non-Exempt Non-Minnesota Contractors	5% + 8%* = 13%
*State Surety Deposit	

Non-Minnesota Contractors are advised to file Form SDE with the Minnesota Department of Revenue to determine their exemption status.

No reduction in retainage will be allowed until final acceptance of entire project, unless approved by the Engineer.

Delete paragraph 15.01.D.1 in its entirety and replace with the following paragraphs:

1. Thirty (30) days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to the provision of paragraph 15.01.D) will become due and when due will be paid by Owner to Contractor, unless extenuating circumstances exist which would preclude such payment by Owner to Contractor. If such extenuating circumstances exist, then payment shall be made within forty-five (45) days after Owner receives presentation of the Application for Payment.
2. Pursuant to Minnesota Statute 471.25, Subdivision 4a, the Contractor must pay any subcontractor within ten (10) days of the Contractor's receipt of payment from the City for undisputed services provided by the subcontractor. The Contractor must pay interest of one and one-half percent (1 ½ %) per month or any part of a month to the subcontractor on any undisputed amount not paid on time to the subcontractor. The minimum monthly interest penalty payment for an unpaid balance of \$100.00 or more is \$10.00. For an unpaid balance of less than \$100.00, the Contractor shall pay the actual penalty due to the subcontractor. A subcontractor who prevails in a civil action to collect interest penalties from the Contractor shall be awarded its costs and disbursements, including attorney's fees, incurred in bringing the action.

SGC 15.05 FINAL INSPECTION

Add the following after the second sentence of paragraph 15.05.A of the General Conditions:

If, after such measures are taken, subsequent inspections by the Engineer reveal that any of the previously identified construction items remain incomplete or defective, the Engineer will again notify the Contractor in writing of the remaining construction items. All costs associated with any subsequent inspections in which said remaining particulars are revealed, will be documented by the Engineer and paid by the Contractor to the Owner.

SGC 15.06 FINAL PAYMENT

Add a new subparagraph immediately after paragraph 15.06.A.3 of the General Conditions, which is to read as follows:

4. Before final application for payment is made for the Work, the Contractor must make satisfactory showing of compliance with M.S.A. 290.92, which requires the withholding of state income taxes for wages paid to employees on this Project. Receipt by the Engineer of a Certificate of Compliance from the Commissioner of Taxation to the Owner will satisfy this requirement. The Contractor is advised that before such certificate can be issued, the Contractor must first place on file with the Commissioner of Taxation an affidavit that the Contractor has complied with the provisions of M.S.A. 290.92. The required affidavit form will be supplied by the Commissioner of Taxation, Centennial Building, St. Paul, Minnesota, on request.

Final payment will not be made until the Contractor shall have filed with the Engineer evidence in the form of an affidavit, or such other evidence as may be required, that all claims against him by reason of the Contract have been fully paid or satisfactorily secured. This shall be in the form of IC134 forms, paid-in-full final lien waivers from the Contractor, subcontractors, and major suppliers, and a Consent of Surety shall precede or accompany the final application for payment. In case such evidence is not furnished, the Owner may retain out of any monies due said Contractor sums sufficient to cover all lienable claims unpaid. In addition, a two (2) year maintenance bond is required from the Contractor. Said maintenance bond is to be dated to begin the date the City Council formally accepts the Project.

SGC 15.08 CORRECTION PERIOD

Delete paragraph 15.08.A in its entirety of the General Conditions and replace it with the following:

- A. If within two (2) years after the date of final acceptance of the Project by the City Council; or such longer period of time as may be prescribed by Laws or Regulations; or by the terms of any applicable special guarantee required by the Contract Documents; or by any specific provision of the Contract Documents, any Work that is found to be defective, or if the repair of any damages to the land or areas made available for the Contractor's use by the Owner or permitted by Laws and Regulations as contemplated is found to be defective, the Contractor shall promptly, without cost to the Owner, and in accordance with the Owner's written instructions:
 - (i) Repair such defective land or areas, or
 - (ii) Correct such defective Work or, if the defective Work has been rejected by the Owner, remove it from the Project and replace it with Work that is not defective, and
 - (iii) Satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting there from.

With regards to any surface concrete work, including but not limited to sidewalks, curb, gutter, and driveway aprons within the project area, the Contractor shall assume full responsibility for any warranty work unless written approval is provided by the Owner releasing the Contractor from the responsibility for damages.

The intent of this provision is to release the Contractor from accepting monetary losses for destruction of concrete sidewalk, curb, gutter, and driveway aprons due to damages and circumstances out of the control of the Contractor. At no point during the two-year (2) warranty period shall this relieve the Contractor's responsibility for correction of the defective work as stated in the preceding paragraph, or as caused by poor construction

and defective materials on the concrete sidewalk, curb, gutter, and driveway aprons within the project area. The Owner or Engineer shall make the final determination of what material is defective within the project area at any point within the two-year (2) warranty period.

SGC 17.01 METHODS AND PROCEDURES

Delete paragraph 17.01 of the General Conditions in its entirety and replace it with the following:

- A. In an effort to resolve any conflicts that arise during the design or construction of the project or following the completion of the Project, the Contractor and the Engineer agree that all disputes between them arising out of or relating to this Agreement shall be resolved, if possible, at the lowest possible staff level. If the dispute cannot be resolved between the Contractor and the Engineer staff, the presidents of the respective firms will meet to attempt to resolve the dispute(s). If resolution is not achieved, the dispute shall be submitted to non-binding mediation.

The rights and remedies available to the Contractor shall be limited to breach of Contract, and no other cause of action, including, without limitation, negligence, misrepresentation or other tort theory. The Owner or Contractor may assert any such breach of contract claim in any court of competent jurisdiction. Neither the Owner nor the Contractor shall be entitled to a jury trial in any such action. The right and remedies to the Owner hereunder shall be in addition to and shall not be constructed in any way as a limitation of any rights and remedies available to the Owner, which is otherwise available by law or contract, by special warranty or guarantee, or by other provision of the Contract documents. The provision of this paragraph shall be as effective as if repeated specifically in the contract documents in connection with each particular duty, obligation, right and remedy to which it may apply. All representations, warranties and guarantees made in the Contract documents shall survive final payment, termination or completion of this agreement.

No waiver or failure to enforce any part or provision of the Contract Documents, including but not limited to the change order process, shall be deemed to be waiver by the Owner of any subsequent default or breach of the same or any other part of provision contained herein, or right to enforce the same or any other part or provision contained herein.

DIVISION 1

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DIVISION 1

GENERAL REQUIREMENTS

1015 – PROJECT STORAGE AREA

The Contractor shall be responsible for identifying and providing a project storage area. Any disturbed area shall be cleaned up and fully restored to the preexisting condition prior to closing out this project. The Contractor shall be required to install protective fencing and silt fence around the storage area. The protection, cleanup and restoration of the project storage area shall be the Contractor's responsibility; no compensation will be made for this work.

1400 – QUALITY CONTROL

Any person representing federal or state agencies, the Engineer, or Owners shall have the right-of-entry to inspect the work being performed by the Contractor. If the case warrants, the Contractor shall provide proper facilities for such access and inspection.

The Contractor shall notify the resident observer anytime he anticipates working on this project. No work will be allowed without notifying the observer a minimum of twenty-four (24) hours beforehand.

Testing of materials and/or densities will be paid for by the Owner unless specified differently elsewhere. Any retesting due to failures shall be the expense of the Contractor.

The Owner will check construction of the sanitary sewer by closed circuit television before final acceptance and at any time within the warranty period. **Such inspection will be at the Contractor's expense unless a specific bid item is provided.**

1401 – REFERENCE SPECIFICATIONS

Where the Minnesota Department of Transportation specifications are referred to herein and where a reference to the word "State" is mentioned, it is understood that the word "Owner" is substituted. All reference to the word "Engineer" shall be interpreted as the Engineer for the Owner. Minnesota Department of Transportation (MnDOT) Specifications for Construction, 2016 Edition and latest revisions thereto shall apply except as noted herein. In no cases shall any part of Division I (General Requirements and Covenants) of the MnDOT Specifications apply to this contract unless specifically stated elsewhere in these specifications.

Utility construction shall be accomplished in accordance with applicable sections of the City Engineer's Association of Minnesota; Standard Utilities Specifications dated 2013 or most current revisions thereto. The Contractor shall be provided with the current "General Specifications and Standard Detail Plates for Street and Utility Construction" for the City to the winning bidder. The Contractor shall purchase additional specifications such that all representatives or subcontractors shall maintain a copy of the above specifications on site when performing work under this contract.

1402 – "OR EQUAL" CLAUSE

Whenever a material or article required is shown on the Plans or in the Specifications by using the name of a product or of a particular manufacturer, it is to be understood that other products or materials which will adequately perform the required function may be considered equal and satisfactory in the Engineer's opinion. A comparable product shall not be purchased or installed without the Engineer's approval. A "Contract Change Order" shall be used if the Contract is to be modified.

1507 – UTILITY PROPERTY AND SERVICE

The Contractor shall coordinate his/her activities with the activities of all utility owners present within the project limits. This includes delays associated with scheduling conflicts, fees charge by utility owners for construction services, and all time necessary to communicate and work with utility owners within the project limits.

The plans show only known underground utilities, public and private, and the locations are approximate. No assurance is given that additional underground facilities do not exist. The Contractor shall make his own investigation to determine to what extent existing utilities shall affect his work.

The location, protection, maintenance and/or repair, if damaged, of all in-place utilities shall be the responsibility of the Contractor. Where construction operations require the interruption of service of a utility, the Contractor shall notify that utility at least forty-eight (48) hours in advance of the work.

1508 – STRUCTURE MARKERS

All manholes, gate valves, and storm sewer aprons that are not located within the surfaced right-of-way shall be marked with marker signs. Payment for the sign shall be included in the unit price bid for the structure requiring the marker sign. (See City Standard Plates.)

1546 – PROTECT EXISTING UTILITIES

Prior to commencing construction, the Contractor shall check all existing manholes, catch basins, gate valve boxes, stop boxes, culverts and storm sewer lines in the construction zones to determine their condition. Failure to report deficiencies in writing, and have such deficiencies acknowledged in writing by the Engineer, will be cause for any required repairs and/or cleaning to be charged to this Contractor.

Plans shall contain information depicting the relative location of existing utilities to the extent this information is available from the respective utility companies. The Owner does not, however, guarantee the locations as shown on the plans, and it is the Contractor's responsibility to ascertain the final location of these utilities and to notify the utility companies prior to commencing construction. The Contractor shall be responsible for the coordination of utility locates.

It may be necessary to relocate existing private utilities to facilitate construction. It is the Contractor's responsibility to coordinate his work with the non-municipal utility companies and preserve the existing condition of said utilities. The Owner will not be responsible for any delay that the Contractor may encounter due to the utility company involved failing to promptly do their necessary work. All crossings shall be thoroughly backfilled and compacted, using mechanical tampers to prevent any displacement or settlement of the utility lines.

Protection of existing utilities shall be considered incidental to the overall project. No compensation will be provided for this work.

State law requires that the CONTRACTOR contact Gopher State One Call (811) for utility locations before doing any underground excavation.

1547 – PROTECT EXISTING PAVEMENTS

The Contractor shall provide and use only rubber-tired dozers, front-end loaders and other necessary equipment on all work where street pavements or portions of pavements are undisturbed for the protection of the pavements or in such locations as the Engineer may direct. Rock construction entrances shall be installed per City Standard Plate. These entrances are considered incidental unless there is a bid item.

No compensation will be allowed the Contractor for replacement of damaged utilities and resurfacing or replacing damaged pavements.

1603 – MATERIALS TESTING

Testing for field work done in this contract shall be completed to assure quality of materials and/or workmanship. The Contractor will provide the Engineer forty-eight (48) hour notice prior to any material testing. The Engineer will coordinate and order the tests to be performed.

Copies of all test results, either passing or failing, shall be provided to the Construction Observer, Public Works Director, and WSB & Associates, Inc. Failing test results shall be retested to confirm compliance with the project specifications. All costs associated with retesting shall be at the Contractor's expense. A City representative shall be present at the time the test is performed.

Test reports shall include the following:

- Project name
- City project number
- WSB project number
- Location/client
- Street name
- Street location per plan stationing
- Depth below finished grade and/or elevation
- Results of test performed
- Comparison of the test results to project specifications.
- If failing, retest results to confirm compliance with project specifications.
- Certification by a MnDOT certified tester or registered professional engineer

The following material tests shall be performed:

Testing Specifications for North St. Paul

TRENCH BACK FILL DENSITY			
Location/Depth	Proctor Type	Min % Comp.	Density Frequency
Green Areas	Standard	95%	1 per 12" lift per 1000 LF
0' to 3'	Standard	100%	1 per 6" lift per 1000 LF
3' and Below	Standard	95%	1 per 12" lift per 1000 LF

SUB-GRADE/SELECT GRANULAR TESTING			
Test	Density Max/Min	Density Frequency	Sample Frequency
Gradation	N/A	N/A	1 per 1500 ton, 2 minimum
In-place Density and Moisture	100%	1 per 500 LF	N/A
Roll Test	N/A	N/A	Yes

Test	Density Max/Min	Density Frequency	Sample Frequency
Gradation	N/A	N/A	1 per 1500, 2 minimum
Inplace Density and Moisture	100%	1 per 500 LF	N/A
Roll Test	N/A	N/A	Yes

CONCRETE TESTING							
Construction Item	Cylinder Size	# of Cylinders	Test Frequency (All Tests Same Freq)	Min PSI @ 28 days	Max Slump	Air (Min/Max)	Temperature Requirement
Sidewalk/Driveway Aprons	4x8	3	1/25 for 1st 25 CY - 1/50 after	3900	4" (3A32)	4.5% to 8%	50° to 90° F
Curb & Gutter	4x8	3	1/25 for 1st 25 CY - 1/50 after	3900	2" (3A22)	4.5% to 8%	50° to 90° F

ASPHALT TESTING								
Pavement Type	Density Test Type	Density Frequency	% Min Density	% Voids Min/Max	Asphalt Content	Extract. Grad.	Max Density Test	Cores
SP Wear, SP Non-wear	Nuclear	Min 3 per lift - 1/500 LF	93%	Min 1 per lift - 3% to 7%	1/500 ton	1/500 ton	1/500 ton Marshall	Mn/DOT only

The rates of testing to be completed may be adjusted as determined by the City Engineer. MnDOT's "Schedule of Materials Control" will be followed on all State-aid projects.

The Contractor shall make an earnest effort to dry soils that exceed the optimum moisture content requirements as specified in MnDOT 2105.3F1. This work is incidental to the project bid and shall include, but is not limited to, "farming" the soils with a disc or blade to allow natural drying, and/or mixing or replacement of the wet soil with dry soil from another area of the site.

The requirements for subgrade testing are as follows: the required density shall be one-hundred percent (100%) Standard Proctor Density in the upper 3 feet of the subgrade material. The density will be tested by an Engineer approved testing laboratory. A minimum of one (1) test per five (5) road stations will be taken as shown in the above testing schedule. The location of the test will be at the direction of the Engineer. The Owner shall bear the initial cost of the testing. If, however, sections of the roadway fail and retesting is required, the cost of this additional testing shall be at the Contractor's expense.

Subject to prior approval by the Engineer, the Contractor may exceed the maximum slump requirements only with the addition of a water reducing agent (super plasticizer). The use of water to exceed the maximum slump requirements is not allowed. The use of plasticizers and/or water reducers shall be at the Contractor's expense.

1606 – STORAGE OF MATERIALS

The provisions of MnDOT 1606 are hereby supplemented with the following:

The Contractor is hereby advised that the only materials that will be allowed to be stockpiled within Project Limits are materials which will be incorporated into the Project and then only in the quantity needed. Materials cannot be stockpiled which are for use on other projects. This specification applies to manufactured and natural materials (including material stockpiled for crushing). If the Contractor elects to crush excavated materials within the Project Limits, the quantity of crushed material will be limited to only those found within the Project Limits, unless approved in writing by the Engineer. The Contractor will not be allowed to remove crushed material from the Project Limits, unless approved in writing by the Engineer.

1706 – TEMPORARY SANITARY FACILITIES

The Contractor, at their own expense, shall provide and maintain temporary toilet facilities at the site during the construction period. The Contractor and Engineer shall agree to the location of the temporary toilet facilities.

1707 – MAIL SERVICE

1. The Contractor shall be required to accommodate mail service while the project is under construction. If required for construction the contractor will carefully remove each existing mailbox and post as necessary for construction. The mailbox and post shall be delivered to the homeowner for storage during construction. During construction, the Contractor shall furnish temporary mailboxes at an accessible location for interim mail delivery as approved by the Postmaster. Each box shall be clearly labeled and mounted on a stable standard. Upon completion of construction, the Contractor shall be required to reinstall the original box and standard as directed by the Engineer. Unless the proposal includes an item for mail service, this item shall be considered incidental to the project cost.
2. In the event that the existing standard is in such a condition that removal and reinstallation is not feasible, the homeowner shall be provided a new mailbox and standard for installation by the Contractor or homeowner as directed by the Engineer. Or, the Contractor shall be relieved of their responsibility for reinstallation by the Engineer.

3. The design (size, color, material, etc.) of new mailbox(es) and posts shall be approved by the City and Post Office prior to installation.
4. In rural areas when addresses are removed with mailboxes, or in any situation when temporary addresses are required, the contractor shall provide reflective address labels visible for emergency vehicles.
5. The Contractor shall notify the Local Postmaster two weeks prior to any disruption of service.

1707 – GARBAGE SERVICE

The Contractor shall be required to accommodate garbage pickup while the project is under construction. This coordination shall include contact with the garbage companies serving the area and maintaining access to the individual residences. In the event that garbage pickup is not accommodated, the Contractor shall be responsible for contracting independently to have the garbage removed at no cost to the project.

Unless the proposal includes an item for garbage service, this item shall be considered incidental to the project cost.

1707 – MAINTENANCE OF SERVICE

Installation of the sanitary sewer and watermain improvements may disrupt the operation of existing utility systems. The Contractor shall be responsible for providing and maintaining temporary service until the new utilities are installed, tested and available for connections. The Contractor will submit a plan to the Engineer for temporary sewer and water service prior to disconnection.

Maintenance of service will be considered incidental to the overall project. No separate measurement or payment will be made for this work unless a specific bid item is provided.

1710 – TRAFFIC CONTROL

All traffic control devices shall conform and be installed in accordance to the "Minnesota Manual on Uniform Traffic Control Devices" (MN MUTCD) and Part 6, "Field Manual for Temporary Traffic Control Zone Layouts", the "Guide to Establishing Speed Limits in Highway Work Zones", the Minnesota Flagging Handbook, the provisions of MnDOT 1404 and 1710, the Minnesota Standard Signs Manual, the Traffic Engineering Manual, the Traffic Control Layouts/Typical Traffic Control Layouts in the Plans, and these Special Provisions.

The Contractor shall furnish, erect and maintain warning lights and barricades as required by the Engineer to adequately warn and protect the public from hazardous protrusions, materials, excavations, etc., resulting directly or indirectly from the construction. All signs, barricades, and warning lights shall conform to the requirements of the Minnesota Manual on Uniform Traffic Control Devices (MMUTCD).

All temporary traffic cones or other traffic barricades placed on adjusted structures, such as manholes, catch basins, and valve boxes, shall be considered incidental for each structure adjusted during initial and final bituminous paving.

Traffic control devices include, but are not limited to, barricades, warning signs, trailers, flashers, cones, drums, pavement markings, flaggers as required, and sufficient barricade weights to maintain barricade stability.

Traffic Control

- (A) The Contractor shall be responsible for the immediate repair or replacement of all traffic control devices that become damaged, moved, or destroyed; of all lights that cease to function properly; and of all barricade weights that are damaged, destroyed, or otherwise fail to stabilize the barricades. The Contractor shall further provide sufficient surveillance of all traffic control devices at least once every twenty four (24) hours.

The Contractor shall furnish names, addresses, and phone numbers of at least three (3) individuals responsible for the placement and maintenance of traffic control devices. These individuals shall be "on call" twenty-four (24) hours per day, seven (7) days per week during the times any traffic control devices, furnished and installed by the Contractor, are in place. The required information shall be submitted to the Engineer at the Pre-construction Conference.

- (B) If traffic control layouts are not present in the Plan, or the Contractor modifies the layout or sequence from the Plan, the Contractor shall submit the proposed traffic control layout to the Engineer, for approval, at least fourteen (14) days prior to the start of construction. At least twenty-four (24) hours prior to placement, all traffic control devices shall be available on the Project for inspection by the Engineer. The Contractor shall modify his/her proposed traffic control layout and/or devices as deemed necessary by the Engineer.
- (C) The Contractor shall notify the Engineer in writing at least seventy-two (72) hours prior to the start of any construction operation that will necessitate lane closure or internal traffic control signing.
- (D) The Contractor shall inspect on a daily basis all traffic control devices which the Contractor has furnished and installed, and verify that the devices are placed in accordance with **the Traffic Control Layouts**, these Special Provisions, and/or the MN MUTCD. Any discrepancy between the placement and the required placement shall be immediately corrected. The Contractor shall be required to respond immediately to any call from the Engineer or his designated representative concerning any request for improving or correcting traffic control devices.
- (E) The person performing the inspection in paragraph (D) above shall be required to make a daily log. This log shall also include the date and time any changes in the stages, phases, or portions thereof go into effect. The log shall identify the location and verify that the devices are placed as directed or corrected in accordance with the Plan. All entries in the log shall include the date and time of the entry and be signed by the person making the inspection. The Engineer reserves the right to request copies of the logs as he deems necessary.
- (F) The third sentence of paragraph 2 in MnDOT 1404.7 (Winter Suspension) is hereby revised as follows: "In the event that any Contractor-owned traffic control devices are damaged or destroyed making them ineffective for their intended use, the Contractor will receive payment in the amount of the value of the traffic control device as determined by the Engineer."

(G) Measurement and Payment:

Traffic Control will be measured and paid for as follows:

Payment for furnishing, installing, maintaining, relocating and subsequently removing traffic control devices (including flag persons) as required will be made as a lump sum under Item 2563.601 (Traffic Control) and according to the following schedule:

- (1) When five percent (5%) of the Contract amount is earned, fifty percent (50%) of the amount bid for traffic control will be paid.
- (2) When ten percent (10%), or more, of the Contract amount is earned, an additional twenty percent (20%) of the amount bid for traffic control will be paid.
- (3) When fifty percent (50%), or more, of the Contract amount is earned, an additional twenty percent (20%) of the amount bid for traffic control will be paid.
- (4) The remaining five percent (5%) bid for traffic control will be paid when all work has been completed and accepted.

In all items above, the original Contract amount shall be the total value of all Contract Items including the traffic control item, but the percentage earned in each case shall be exclusive of the traffic control item.

If no bid item for traffic control is provided, traffic control is considered incidental to the contract.

General Requirements

- (A) All portable sign assemblies shall be perpendicular to the ground. No traffic control device (signs, channelizing devices, arrow boards, etc.) shall be weighted so they become hazardous to motorists and workers. The approved ballast system for devices mounted on temporary portable supports is sandbags, unless it is designed, crash tested, and approved for the specific device.
- (B) During freezing conditions, the sand for bags shall be mixed with a de-icer to prevent the sand from freezing. The sandbags shall be placed and maintained at the base of the traffic control device to the satisfaction of the Engineer.
- (C) When signs will remain in the same location for more than thirty (30) consecutive days the signs shall be post mounted. This would not include portable signs that are set up and taken down at the beginning and end of each work shift. The signs must be post mounted according to the Typical Temporary Sign Framing and Installation Detail Sheet found in the Plan or in these Special Provisions.
- (D) When signs are installed, they shall be mounted on posts driven into the ground at the proper height and lateral offset as detailed in the MN MUTCD. When signs are removed, the sign posts and stub posts shall also be removed from the Right-of-Way within two (2) weeks.
- (E) The Contractor shall be required to cover or remove all traffic control devices, which may be inconsistent with traffic patterns during all traffic switches. See Maintenance and Staging of Traffic Control.
- (F) Open excavation adjacent to the existing pavement will not be permitted on opposite sides of the roadway at the same time.
- (G) The Contractor shall provide protective devices necessary to protect traffic from excavations, drop-offs, falling objects, splatter or other hazards that may exist during construction. This work shall be an incidental cost to the Contractor.

- (H) The Contractor will not be permitted to park vehicles or construction equipment so as to obstruct any traffic control device. The parking of workers' private vehicles will not be allowed within the Project limits unless so approved by the Engineer.
- (I) The Contractor will not be allowed to store materials or equipment within 30 feet of through traffic unless approved by the Engineer. If materials or equipment must be stored within 30 feet of through traffic, the Contractor shall provide Type B channelizers, barricades or barriers, placed near the object to warn and protect traffic.
- (J) All personnel working within the Right-of-Way shall wear reflectorized safety vests. All personnel shall adhere to the following HIGH VISIBILITY PERSONAL PROTECTIVE EQUIPMENT SPECIFICATION.
- (K) Each worker exposed to or working adjacent to moving motor vehicles as part of the workers assigned job shall be provided with and required to wear a high visibility warning vest or other high visibility garment. A high visibility garment is defined as being a Class 2 garment or greater as specified by ANSI/ISEA Standard 107-1999.
- (L) If the high visibility personal protective equipment becomes faded, torn, dirty, worn, or defaced, reducing the equipment's performance below the manufacturer's recommendations, the high visibility personal equipment shall be immediately removed from service and replaced.
- (M) The Contractor shall store at least four (4) extra Type III barricades and extra ten (10) retroreflective drums, at a convenient location within the Project limits, to be used at the discretion of the Engineer. No direct compensation will be made to the Contractor for furnishing and erecting these traffic control devices.
- (N) When work will be performed between the official hours of sunset and sunrise, all appropriate practices for night work will apply.
- (O) The Contractor shall provide sufficient numbers of light plants to adequately illuminate the work area as determined by the Engineer. All costs incurred to provide such light plants shall be incidental to the lump sum traffic control.
- (P) All Contractor's personnel, except operators who will remain in their vehicles at all times, shall wear reflectively striped (approximately 33 feet of striping), highly visible, short sleeved one (1) or two (2) piece coveralls (color and striping pattern to be determined by the District Traffic Engineer), at all times while working on the Project. These coveralls shall be considered an incidental expense for which no direct compensation will be made. Any Contractor's employee found on the Project not wearing the prescribed reflective coveralls will be immediately ordered off the Project by the Engineer.
- (Q) The Contractor shall provide a sufficient amount of two-inch-wide (2" wide) highly reflective vehicle marking tape to be applied to Contractor vehicles and equipment, as directed by the Engineer, and as provided by the manufacturer's instructions. Tape shall be considered incidental and shall be on the qualified products list for Conspicuity Vehicle Sign Sheeting found at: <http://www.dot.state.mn.us/trafficeng/qpl/Signing.pdf>. Vehicle examples to be marked with tape are Contractor rollers, paver, millers and other equipment found in the lane closure.

- (R) All temporary rigid orange warning and rigid orange guide signs shall be fabricated with either Type HP FLO (High Performance Fluorescent Sign Sheeting for Rigid Temporary or Permanent Signs) or Sign Sheeting for Rigid Temporary Fluorescent Orange Signs, and Markers (Type IX FLO). All rigid signs installed, other than those with orange backgrounds, on a temporary basis shall be fabricated with Type HP (High Performance Sheeting for Rigid Permanent Signs) or Sign Sheeting for Rigid Permanent Signs, Delineators, and Markers (Type IX). In-place signs that still apply during temporary operations may remain in place with no change in sign sheeting required. The retro-reflective sheeting types and qualified products used for temporary signs and barricades can be found at:
<http://www.dot.state.mn.us/trafficeng/products/MnDOTapprovedproductlist.xls>.

Maintenance and Staging of Traffic Control

- (A) All signs installed on roads open to traffic that are not consistent with traffic operations shall be covered as directed by the Engineer. The cover should be a plate of solid material covering the entire legend or all of that part of the legend that is inappropriate. This cover shall be bolted to the sign and shall use a minimum of 1/8 inch plastic washers between the sign face and the cover. See Figures 8.2A, 8.2B and 8.3C of the Traffic Engineering Manual for details.
- (B) No access to or from any public road will be permitted for the Contractor's equipment, material deliveries, the hauling of excavated materials of any kind, or employees' private vehicles, except at in place public road intersections, or at locations and in such manner as approved by the Engineer.
- (C) As each road is completed, the Contractor shall install the final signing and pavement markings required to safely open that road to traffic. This work shall be completed on or before the date of opening as approved by the Engineer. Overhead signs may be temporarily ground mounted at the Contractor's expense.
- (D) Street identification signage shall be maintained at all times. Where the only existing signs are small city or county signs located at the intersection, street names and address numbers shall be maintained by temporary installations as required by the Engineer. This is necessary to maintain the 911 emergency system.

1712 – PROTECT EXISTING SURFACE IMPROVEMENTS

It shall be the Contractor's responsibility to protect, and/or remove and reinstall all fences, street signs, retaining walls, and other items required to construct the proposed improvements. The work associated with protecting, and/or removing and reinstalling all fences, street signs, lawn irrigation systems, and other items shall be considered incidental to the project unless specific bid items are provided or called out differently on plans.

1712 – PROTECTION OF ADJACENT PROPERTIES

The Contractor shall take whatever steps necessary to protect adjoining properties and structures from hazards in connection with his performance of the work. The Contractor is responsible for any and all damages to properties and structures that occur as a result of his operations. All labor and materials necessary to comply with the provisions of this section are incidental, and no payment shall be made.

1712 – PROJECT ACCESS AND ACCESS TO PROPERTIES

The Contractor shall limit the roadways utilized for delivery of equipment and hauling operations.
Hauling operations will not be permitted to take place on residential roadways except for the roadway segment under construction.

The Contractor shall protect his work from traffic during the curing period of the concrete. Adequate signage, barricades, and appropriate deterrents shall be placed to prohibit traffic from entering the work area during non-working hours and prior to the acceptance of substantial completion. Damage to the work by traffic will not be accepted and will be corrected at the Contractor's expense.

1712 – EROSION CONTROL

Erosion control shall be placed and maintained by the Contractor and as directed by the Engineer. The Contractor shall use the appropriate means of control for individual situations. The erosion control types may include silt fence, erosion control blanket, rock construction entrances, diversion ditches, and biorolls, all of which will be considered incidental to the project cost unless there is a bid item. Failure to maintain the erosion control will be sufficient cause to withhold further payments on the project until the maintenance is complete.

The Contractor shall become a co-permittee with the Owner to ensure compliance with the National Pollutant Discharge Elimination System (NPDES) General Storm Water Permit for construction activity (MNR 100001) required by the Minnesota Pollution Control Agency (MPCA). This permit establishes conditions for discharging storm water to waters of the State from construction activity disturbing one (1) or more acres of total land area.

The Contractor shall be required to sign the NPDES permit forty-eight (48) hours prior to beginning construction operations and shall abide by all permit requirements until the site has undergone final stabilization and a notice of termination (NOT) has been submitted to the MPCA. The Contractor shall cooperate with the Owner to implement a fully-documented inspection and maintenance program for all temporary erosion and sediment control measures as required by the NPDES permit.

All erosion control shall be installed prior to the commencement of construction.

All manholes shall be protected from surface water drainage. All storm sewer systems, including downstream ponding areas, shall be protected from sedimentation. The protection of storm sewer systems and catch basins from sedimentation shall be incidental to the project. The use of the WIMCO system or approved other is mandatory and shall be incidental unless there is a bid item (see City Standard Detail Plate).

Prior to final acceptance of the project or the end of the warranty period, the Contractor shall remove all erosion control items.

The Contractor shall maintain access to all areas for residents and commercial traffic, and emergency vehicles at all times.

The Contractor shall salvage aggregate or haul approved aggregate material to the project site at no additional cost to the Owner for use in the roadway and ramping the driveways to maintain access.

Access to Properties: The Contractor shall maintain residential driveway accesses during construction at all times unless utilities are being installed directly in front of said access. If a driveway access must be closed, the Contractor shall notify the residents a minimum of twenty four (24) hours in advance of the time the access will not be available. In the event that an access is temporarily closed, the Contractor shall install the proper traffic control to barricade the access at no additional cost to the Owner.

1712 – CLEANUP

During the progress of the work, the area affected shall be kept clean and free of all rubbish and surplus materials. All unneeded construction equipment shall be removed from the site and all damage repaired so that the public and adjacent property owners are inconvenienced as little as possible.

Where materials or debris have washed or flowed into or have been placed in water courses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations, such material or debris shall be removed and satisfactorily disposed of during progress of work. All ditches, channels, drains, etc. shall be kept in a clean and neat condition. Street sweeping adjacent areas affected by construction will be required periodically as directed by the Engineer.

It is expected that the existing streets and private properties adjacent to the project will remain clean and free of soil and debris throughout the duration of the project. All roadways, driveways, parking areas, lawns, etc. should be inspected on a minimum daily basis to prevent soil and debris from building up. Any soils or debris shall be removed immediately upon discovery. If, in the opinion of the Engineer, the areas adjacent to the construction area are not being sufficiently cleaned, the Engineer shall arrange to have the work completed by a separate Contractor. All costs associated with cleaning the area shall be deducted from the monies due the Contractor.

On or before the completion of work, the Contractor shall, unless otherwise directed in writing, remove all temporary works, tools and machinery or other construction equipment placed by the Contractor. The Contractor shall remove all rubbish from any grounds which the Contractor has occupied and shall leave all of the premises and adjacent properties affected by the operation in a neat and restored condition satisfactory to the Engineer.

Sweeping of streets and parking lots that are impacted by the construction shall be the responsibility of the Contractor. The Contractor shall provide street and parking lot sweeping when requested by the Engineer. The sweeper shall be a pick up style sweeper.

Silt fence shall be removed by the Contractor prior to the end of the warranty period or as directed by the Engineer. Removal shall be incidental with no additional compensation made.

Unless the proposal includes a contract bid item for cleanup, cleanup shall be incidental to the contract.

1717 – NOISE CONTROL

The Contractor shall comply with local and state ordinances on noise abatement. All equipment shall have effective mufflers on engine exhaust systems. Equipment will not be started until 7:00 a.m., deliveries will not be before 7:00 a.m., and refueling will not begin before 7:00 a.m.

1717 – DUST CONTROL

The Contractor shall be responsible for dust control. Water is available to per the appropriate section in the Supplementary General Conditions. Dust control will be considered incidental to project cost, unless there is a bid item for dust control.

The Contractor will be responsible for developing a dust control plan that shall include, but not be limited to, the following dust control measures:

1. Minimize period of exposed or graded areas.
2. Spraying construction areas and haul roads with water or calcium chloride.
3. Minimize use of vehicles on unpaved surfaces.
4. Covering or spraying material piles and trucks.
5. Street sweeping.
6. Using natural or artificial wind breaks.

The Owner has the right to perform this work out at the Contractor's expense if the work is not completed in a timely manner according to the Engineer.

1801 – SUBLETTING OF CONTRACT

The provisions of MnDOT 1801 are modified and/or supplemented with the following:

The Contractor shall perform work amounting to not less than fifty (50) percent of the total original Contract cost.

1807 – LIQUIDATED DAMAGES

The provisions of MnDOT 1807.2, Assessment of Liquidated Damages, are hereby deleted and replaced with the following:

The liquidated damages shall be Five Hundred Dollars (\$500.00) per calendar day for the project, as well as for any intermediate completion dates.

Section 1807.3, Waiver of Liquidated Damages, is amended by eliminating the second paragraph in its entirety.

In the event the Owner is fined by the Minnesota Pollution Control Agency, Environmental Protection Agency or Minnesota Department of Health as a result of the Contractor's actions or lack of actions, the Owner will deduct from payment due the Contractor corresponding amounts to cover the cost of such fines, including the costs of related Engineering and legal fees.

1903 – COMPENSATION FOR INCREASED OR DECREASED QUANTITIES

The provisions of MnDOT 1903 shall be deleted in its entirety and replaced with the following:

There will be no adjustment in unit price for an under-run or over-run of the estimated quantity. There will be no adjustment in unit price for increased or decreased quantities. In addition, the City reserves the right to reduce certain quantities or delete certain items from each section of the bids as the City sees fit, either before or after the Award of Contract. There will be no additional compensation due to remobilization of equipment as necessary to complete punch list items or other items not completed by the CONTRACTOR. There will be no additional compensation due to restocking charges for materials not used on the project.

1908 – WARRANTY

The Contractor for this work shall guarantee and maintain the stability of all his work, equipment and materials for a period of two (2) year from date of final acceptance, consistent with the Supplementary General Conditions. The two (2) year maintenance guarantee shall be included in and be a part of the Contractor Security (Performance Bond) previously specified or a separate Warranty Bond. The provisions of this paragraph shall not be construed as restricting Contractor's liability for breach of contract by reason of non-conformance with the specification for defects or faulty workmanship.

The Contractor shall immediately repair or replace, without additional compensation, any defective workmanship or material during the construction period, or within two years after the date of final acceptance of the work, regardless of prior inspections and approvals.

1910 – FUEL ESCALATION CLAUSE

The Provisions of MnDOT 1910 in the MnDOT Special Provisions shall not apply. No additional compensation shall be made for costs associated with increased fuel prices.

2105 – DEWATERING

The Contractor shall provide excavation dewatering as necessary, to allow for construction on a stable foundation, all at the expense of the Contractor. Dewatering operations may be controlled by permit from the DNR or other agencies. The Contractor is responsible for application for any necessary permits and compliance with all conditions of permits. The work potentially involves the drawdown of the water table, placement of temporary barriers or other satisfactory types of water control to allow construction and to protect the work. Groundwater elevations shown on borings are those encountered at the time borings were completed. Since elevations are dependent upon hydrologic conditions, the Contractor shall perform the necessary dewatering operations, irrespective of the actual water table surface water elevation which prevails at the time the work is accomplished. All pipes shall be constructed in a dry trench as specified in the most up to date version of the CEAM specification.

Dewatering systems will be necessary to maintain the ground water table a minimum of two feet (2') below the excavation invert. Prior to starting the project, the Contractor shall submit a complete dewatering plan for the entire project to the Engineer for information purposes only. Special precautions shall be taken adjacent to structures so dewatering does not create any structural damage.

Dewatering systems and excavations must remain inside construction limits.

The dewatering system plan must show in plan and profile view the proposed dewatering operations and include a Contractor's estimate regarding the time required from start of dewatering to a soil condition such that successful construction can occur. Should the Contractor propose a dewatering operation that requires wells or headers placed below existing surface elevations, the dewatering plan shall include measures proposed, including trenching and backfill of dewatering components, to minimize disruption to an impact on areas abutting the project. A dewatering operation that significantly disrupts private property usage in advance of actual construction operations shall not be permitted. Any additional costs related to utility work or project disturbance and restoration caused by the dewatering operation shall be incidental to other work items.

For all utility work, granular foundation material may be used in conjunction with or in lieu of dewatering. Any use of granular foundation material or other material to maintain a dry trench or improve the pipe foundation shall be considered incidental to dewatering or pipe installation unless specified.

The Contractor shall install at his expense the necessary trench support to meet the varying soil conditions and to protect existing structures and property.

2130 – CONSTRUCTION WATER

Water for new construction purposes may be obtained from the City Public Works Department. The Contractor shall make suitable arrangements with the Director of Public Works for the location where water may be obtained. Contact the Director of Public Works for current water rates. The City must be notified 24 hours in advance of any water usage.

The Contractor will need to obtain a meter from the City and is responsible to reimburse the city for all water used.

Payment for dewatering shall be considered incidental unless the item is included in the individual project proposal form.

CONTRACTOR'S USE OF PREMISES

GENERAL

Based on personal examination of the site, the Contractor must satisfy himself as to all local conditions affecting the performance of the contract. The Contractor is considered to accept such conditions as found to exist.

METHODS OF OPERATION

The Contractor shall inform the Engineer in advance concerning his plans for carrying out each part of the work, but the Contractor alone shall be responsible for the safety, adequacy, and efficiency of his plan, equipment, and methods.

Any method of work suggested by the Owner, Engineer, or Engineer's subconsultant but not specified, shall be used at the risk and responsibility of the Contractor. The Owner, Engineer, or Engineer's subconsultant, will assume no responsibility for the Contractor's means and methods.

Review by Owner, Engineer, or Engineer's subconsultant of any plan or method of work proposed by the Contractor shall not relieve the Contractor of any responsibility for the plan. Plan review shall not be considered as an assumption of any risk or liability by the Owner, Engineer, or Engineer's subconsultant, or any officer, agent or employee thereof. The Contractor shall have no claim because of the failure or inefficiency of any plan or method so reviewed.

CONDUCT OF WORK

The Contractor shall observe that the Owner reserves the right to do other work in connection with the project or adjacent to the project, by contract or otherwise. Contractor shall conduct his work to impose no hardship on the Owner or others engaged in other work.

The Contractor shall be responsible to others engaged in the work or work adjacent to this project for all damage or injury to work, to persons or property, or for loss caused by failure to finish the work within the specified time for completion. The Contractor shall adjust and coordinate his work with the work of others so that no discrepancies shall result in the overall project.

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DIVISION 2

SPECIAL PROVISIONS

2101 – CLEARING AND GRUBBING

The provisions of MnDOT 2101 are modified and/or supplemented with the following:

2101.3 – CONSTRUCTION REQUIREMENTS

Paragraph D5 is hereby deleted and replaced with the following:

No trees shall be removed unless approved by the Engineer.

All timber and debris shall be removed from the project area to a disposal area to be selected and provided for by the Contractor. **No burying of debris will be permitted.** Dumping receipts or written verification of disposal location are required and shall be given to the Engineer.

2104 – REMOVING PAVEMENT AND MISCELLANEOUS STRUCTURES

The provisions of MnDOT 2104 are modified and/or supplemented with the following:

2104.3 – CONSTRUCTION REQUIREMENTS

Paragraphs C and C2 are modified with the following:

1. Section C sentence 2 of paragraph 1 is hereby deleted.
2. Section C2 Disposal within Right of Way is hereby deleted.

Paragraph C is supplemented with the following:

Materials and debris removed from the project site shall be disposed of at a site selected by the Contractor. Such disposal areas shall be approved landfills or property under the direct control of the Contractor, in accordance with State and local rules and regulations. No burning or burying of debris on the project site will be permitted.

Abandon Pipe: Pipe that is intended to be abandoned in-place shall be blown full of sand and have each end bulkheaded.

Abandon Manhole: Any manholes to be abandoned in-place shall have the castings and top section removed and shall be filled with sand and then covered up as directed by the Engineer. Castings shall be disposed of by the contractor.

Mill Bituminous Pavement: The Contractor shall be responsible for the riding surface quality of any milled surface open to traffic during the project. The Contractor shall schedule construction operations so as to minimize traffic exposure to uneven lanes, milled edges, and edge drop-offs. Any drop-off where traffic will cross from or to the in place surface, or from or to the milled surface, shall be tapered and/or chamfered so as to provide for the safe passage of traffic. Work necessary by the Contractor to maintain a passable riding surface during construction shall be considered **incidental** to the cost of bituminous pavement milling.

The Contractor shall not mill any notches for surfacing tapers until immediately prior to paving, except that with the Engineer's permission, the Contractor may mill the notches and install and maintain temporary bituminous tapers to provide for the safe passage of traffic until the surfacing taper is installed.

Remove Curb And Gutter: All curb and gutter scheduled for removal and marked by the Engineer in the field shall first be sawcut at any match points with existing curb and gutter, and then removed. The Contractor shall be responsible for protecting all curb and gutter within the project that is to remain in place. Any damage to existing curb and gutter shall be the responsibility of the Contractor, and shall be repaired or replaced as directed by the Engineer with no additional compensation thereto.

2104.5 – BASIS OF PAYMENT

The last paragraph is supplemented with the following:

If the proposal does not include bid items for signs, mailboxes, posts, etc. the removal, care of, and replacement of signs, mailboxes, posts, etc. shall be done at the Contractor's expense without any direct compensation made therefore.

Payment for removal shall be at the unit prices bid and shall be compensation in full for removal, repair and/or replacement of damaged or lost items as required, hauling of material and debris to a disposal area selected by the Contractor, complete compaction of trenches and depressions, and cleanup of the area.

2105 – EXCAVATION AND EMBANKMENT

The provisions of MnDOT 2105 are modified and/or supplemented with the following:

2105.2 – MATERIALS

Paragraph A1 is hereby deleted and replaced with the following:

Common Excavation shall consist of all excavation of all materials to construct the grading operations to the elevations required by the plans that are not classified otherwise as rock, muck, common channel, or rock channel excavation, and shall include topsoil stripping, stockpiling, and spreading. Common Excavation shall also consist of all excavations to the top of the subgrade elevation as shown on the plans, excluding the in-place bituminous pavement.

Paragraph A4 is hereby deleted and replaced with the following:

Subgrade Excavation shall consist of the excavation of any unstable or unsuitable materials below the subgrade elevation as shown on the plans or as determined by the Engineer.

2105.3 – CONSTRUCTION REQUIREMENTS

Paragraph C is supplemented with the following:

Prior to the commencement of the excavations, topsoil shall be stripped and stockpiled for spreading upon the graded area.

Mining of materials for removal from the project area and replacement with less desirable materials by the Contractor shall not be permitted.

Subgrade Excavations shall be performed for the removal of any unstable or unsuitable materials which may be encountered. Such excavations shall be backfilled with suitable excess common excavation material, common borrow material, or granular borrow material as directed by the Engineer. If the Contractor proceeds without the approval from the Engineer, all work and material required in restoring the roadbed to the proposed grade shall be at the Contractor's expense.

Excavated material that is unsuitable for embankment shall be placed in locations as directed by the Engineer. No unsuitable material shall be placed under roadway surfaces, sidewalks, or pathways. All unsuitable excavated material in excess of that placed as previously described shall be disposed of by the Contractor, at no additional expense to the Owner.
Paragraph G is supplemented with the following:

Topsoil borrow shall be used only when specifically authorized by the Engineer. It shall only be used when there is not sufficient in place topsoil to restore the area. This work shall not be substituted for the work required of the Contractor to salvage and replace existing topsoil. Salvaging, stockpiling, and spreading of topsoil shall be considered incidental to common excavation. The minimum depth of topsoil is six inches (6") in all areas where topsoil is required unless specified elsewhere.

2105.4 – METHOD OF MEASUREMENT

The third paragraph is supplemented with the following:

The Contractor's representative and the resident project representative shall be present during the measurement of the work for payment.

Paragraph B is hereby deleted and replaced with the following:

The Engineer will measure borrow material by volume according to MnDOT 1901 and as specified in the contract.

Granular Borrow: Granular borrow shall be measured by compacted volume unless otherwise specified in the contract.

Select Granular Borrow: Select granular borrow shall be measured by compacted volume unless otherwise specified in the contract.

Topsoil Borrow: Topsoil borrow shall be measured by the cubic yard, loose volume measurement unless otherwise specified in the contract.

2105.5 – BASIS OF PAYMENT

The third paragraph is supplemented with the following:

Payment for Common Excavation shall be compensation in full for stripping topsoil, excavation, preparing the excavation and embankment areas, loading, hauling, placing and compacting fill, stockpiling material, spreading topsoil, and disposal of material as required. Payment for Common Excavation shall not include the volume of items paid for separately as removals (e.g. bituminous removal). The volume of these items shall be subtracted from the Common Excavation quantity.

Payment for Subgrade Excavation shall be compensation in full for excavation, hauling, stockpiling, and embankment or disposal, of unsuitable material. This work shall also include the replacement and compaction of suitable material within the excavated area, unless it is directed by the Engineer that borrow material be used to replace the excavated material volume.

2111 – TEST ROLLING

The provisions of MnDOT 2111 are modified and/or supplemented with the following:

2111.1 – DESCRIPTION

The first paragraph shall be supplemented with the following:

This work shall consist of test rolling the finished subgrade prior to placement of aggregate base and test rolling the aggregate base before placement of pavement. In the event of failure, the Contractor shall repair the area(s) without compensation. Additional test rolling shall be required following the repair of the failed area(s). Approval of the test roll does not constitute acceptance of the street and does not relieve the Contractor of warranty issues.

2111.2 – EQUIPMENT

MnDOT 2111.2 is hereby deleted and replaced with the following:

A loaded dump truck delivering a 9-ton axle load shall be used as test rolling equipment and shall be supplied by the Contractor. A 10-ton axle load shall be provided by the Contractor where the roadway design loading is designated as such.

2111.3 – CONSTRUCTION REQUIREMENTS

The first paragraph shall be supplemented with the following:

A representative of the Owner, Engineer, and Contractor shall be present during test rolling.

The fifth paragraph is hereby deleted and replaced with the following:

The subgrade prior to the placement of the aggregate base shall be considered unstable if, under the operation of the test rolling equipment, the surface shows rutting (at the time the test rolling equipment passes over the grade) of more than two inches (2") measured from the top of the constructed grade to the bottom of the rut. The subgrade prior to the placement of the aggregate base shall also be considered unstable if, under the operation of the test rolling equipment, the surface shows deflection or yielding of more than one inch (1") (at the time of the test rolling equipment passes over the subgrade).

The aggregate base shall be considered unstable if, under the operation of the test rolling equipment, the surface shows rutting, deflection or yielding. In addition, the subgrade or aggregate base material shall not roll under the weight of the vehicle.

2111.5 – BASIS OF PAYMENT

Test rolling of the subgrade, granular borrow, and aggregate base (including all repairs to unstable sections and retesting) will be considered **incidental** work and no direct compensation will be made thereof.

2112 – SUBGRADE PREPARATION

The provisions of MnDOT 2112 are modified and/or supplemented with the following:

2112.1 – DESCRIPTION

The first paragraph is hereby deleted and replaced with the following:

This work shall consist of shaping and compacting the subgrade after the completion of the utility work and prior to the placement of the aggregate base.

2112.3 – CONSTRUCTION REQUIREMENTS

The second paragraph is supplemented with the following:

Any excess granular material from the grading operations should be used first in areas where the subgrade is low, as backfill behind the curb, or other areas as approved by the Engineer. If there is still excess material after these operations are completed, the material shall become the property of the Contractor for proper disposal.

The fourth paragraph is supplemented with the following:

Upon completion of the subgrade preparation and test rolling, the Observer will review the grades with the Contractor's representative by the string line method. When the subgrade is being prepared for placement of an aggregate base course, the elevation of the finished surface at the time the next layer is placed, shall not vary by more than 15 mm (0.05 foot) above or 30 mm (0.05 foot) below the prescribed elevation at any point where measurement is made. The Contractor will furnish the string line and perform the string line grade check with the Observer.

2112.5 – BASIS OF PAYMENT

The provisions of MnDOT 2112.5 is hereby deleted and replaced with the following:

Payment for subgrade preparation shall be compensation in full for all labor, materials and equipment necessary to complete the work as specified and shall include disposal of excess material.

2123 – EQUIPMENT RENTAL

The provisions of MnDOT 2123 are modified and/or supplemented with the following:

2123.1 – DESCRIPTION

The first paragraph is supplemented with the following:

Prior to the placement of the final lift of bituminous, all streets shall be swept and cleaned. Throughout construction, constructed streets and roadways adjacent to the project shall be swept and cleaned as directed by the Engineer, and shall be in conformance with the NPDES permit.

Prior to the placement of the final lift of bituminous, all streets shall be swept and cleaned. This is ***incidental*** to the paving of the bituminous wearing course.

2123.3 – SPECIFIC REQUIREMENTS

The provisions of MnDOT 2123.3 are to be supplemented with the following:

Removal shall be accomplished with self-propelled street sweeping equipment with a **pick-up broom**. All materials shall be collected and retained within the sweeping equipment as they are swept. Disposal of the swept material shall be in accordance with MnDOT 2104.3C.

2123.4 – METHOD OF MEASUREMENT

The first paragraph is supplemented with the following:

No payment shall be made for sweeping that is normally required to construct the project, including, but not limited to, removal of bituminous millings, sweeping between bituminous lifts, and sweeping prior to placement of bituminous pavement markings. No payment will be made under this item for sweeping done by "kickoff brooms."

2130 – APPLICATION OF WATER

The provisions of MnDOT 2130 are modified and/or supplemented with the following:

2130.2 – MATERIALS

The first paragraph is supplemented with the following:

Water for construction purposes may be obtained from the City. The City may charge for construction water and the Contractor shall understand and be familiar with the fees charged for water. The Contractor shall pay any fee accrued for construction water directly to the City. Water shall not be taken from ponds, wetlands, or any other surface water sources.

2130.5 – BASIS OF PAYMENT

The application of water will only be paid as a dust control measure, as directed by the Engineer. No direct compensation will be paid for water applied during tolerancing activities.

2131 – APPLICATION OF CALCIUM CHLORIDE

The provisions of MnDOT 2131 are modified and/or supplemented with the following:

2131.1 – DESCRIPTION

This item shall be used as dust control at the discretion of the Engineer and is intended for use where the roadway is installed to the aggregate base. It is anticipated that water will be used for dust control at the discretion of the Engineer, where the application of calcium chloride is not feasible.

Liquid calcium chloride shall be thirty-eight percent (38%) chloride by mass and the application rate for calcium chloride shall be 0.3 gallons per square yard.

2131.5 – BASIS OF PAYMENT

Payment shall be by the gallon and shall include all labor, materials, and equipment required for dust control. Water required for the dilution and application of calcium chloride shall be *incidental* to this bid item.

2211 – AGGREGATE BASE

The provisions of MnDOT 2211 are supplemented with the following:

2211.2 – MATERIALS

The first paragraph shall be supplemented with the following:

Unless otherwise specified aggregate base shall be 100% crushed quarry rock (limestone or dolostone) Class 5 as specified in MnDOT 3138 or salvaged/recycled aggregate mixtures in accordance with MnDOT 3138.2C. Before any aggregate base is placed, the Contractor shall submit an aggregate gradation from an approved testing laboratory certifying that the materials to be incorporated into the work meet these specifications with no exceptions. All costs associated with testing and certification shall be borne by the Contractor and considered incidental to the project with no additional compensation allowed therefore.

2211.3 – CONSTRUCTION REQUIREMENTS

Paragraph A is supplemented with the following:

General: The subgrade shall be inspected, checked, test rolled and approved by the Engineer prior to placement of aggregate base.

The Contractor shall install the aggregate base immediately, no more than forty-eight hours after completion and approval of the subgrade. If placement of the aggregate base is done forty-eight (48) hours or more after the initial roll test a second roll test will be required and paid for by the Contractor. The Contractor shall be responsible to maintain the aggregate base until completion of bituminous surfacing as incidental to the work, with no direct payment therefore. Additional aggregate base required due to erosion, washouts, trench settlements or other similar causes shall be replaced by the Contractor without additional compensation therefore.

If aggregate base material is being wasted or placed excessively thick, the Engineer reserves the right to deduct quantities that are in excess of plan thickness. Said quantities shall be based on aggregate material weighing 105 pounds per square yard of area per inch of thickness.

Paragraph C is supplemented with the following:

Spreading and Compacting: Compaction shall be obtained by the Specified Density Method to a minimum of 100% of the Standard Proctor Density. The density will be tested by an Engineer approved testing laboratory. A minimum of one (1) test per five (5) road stations will be taken. The location of the test will be at the direction of the Engineer. The Owner shall bear the initial cost of the testing. If however, sections of the roadway fail and retesting is required, the cost of this additional testing shall be at the Contractor's expense.

Paragraph D is supplemented with the following:

Workmanship and Quality: Upon completion of the aggregate base installation and test rolling, the resident project representative will review the grades with the Contractor's representative by the string line method. The Contractor will furnish the string line and perform the string line grade check. The Contractor will certify that the aggregate base is to proper grade prior to the placement of the bituminous base.

The Contractor shall remove, replace and test roll any portion of the aggregate base that becomes contaminated after placement.

2211.5 – BASIS OF PAYMENT

The first paragraph is supplemented with the following:

No claim may be made for aggregate not finished or placed. This shall be payment in full for all costs incidental to construction including water added and compaction. Original load tickets from a certified scale shall be provided to the construction Observer by the end of each day's haul.

2215 – BITUMINOUS PAVEMENT RECLAMATION

The provisions of MnDOT 2215 are modified and/or supplemented with the following:

2215.1 – DESCRIPTION

The provisions herein shall be applicable to all work necessary to complete pulverizing and blending the in-place bituminous pavement and a portion of the underlying aggregate material to produce a homogenous, dense graded reclaimed aggregate material.

This work shall include reclamation of the bituminous material, removal, and temporarily stockpiling of the blended material from the roadway to accommodate utility construction and the placement of geotextile fabric, select granular material within the street section, spreading, watering, compacting, shaping, and maintaining the blended reclaim material to the specified profile and cross-section or as directed by the Engineer.

The full-depth aggregate base recycling method will consist of reclaiming below the existing bituminous pavement and creating a recycled Class 5 aggregate base in a single operation in place. The Contractor will perform a test strip to ensure that the Class 5 material has the correct gradation required under MnDOT 3135.2.B. The reclaimed material shall then be salvaged for reuse under proposed bituminous typical section. Excess reclaim material from one street area shall be delivered to other street areas where shortages are estimated to occur. Excess reclaim material may only be used as utility trench backfill when approved by the Engineer.

All excess bituminous millings and excess reclaim material not required for the project shall become the property of the Contractor and shall be removed from the project site at no additional compensation. Temporary storage of excess reclaim material at the potential staging area adjacent to the project area will be permitted.

Priorities for the use of reclaimed aggregate material shall be determined in the field by the Engineer. Typical priorities include:

1. roadway aggregate base
2. subgrade correction
3. trench backfill

When reclaiming operations are not feasible as determined by the Engineer due to a lack of existing gravel base or other suitable subgrade material, the Contractor shall suspend reclaiming operations and remove and salvage the existing pavement by milling. Whichever method is used, the work shall be measured on the square yard basis and paid for at the bid unit price for bituminous pavement reclamation. All associated work items shall be considered **incidental**.

The Contractor must follow the current (2215) Full Depth Reclamation (FDR) specification in MnDOT Standard Specifications. The Contractor must design the FDR for a fifty/fifty (50/50) blend of bituminous pavement and aggregate base with the final blend to be no more than three percent (3.0 %) bitumen content. The FDR must come from the contract project, no other sources are allowed.

2215.2 – MATERIALS

A. Gradation Requirements

The reclaim material shall meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing (by weight)</u>
[3.0 inch]	100%
[2.0 inch]	98-100%
[No. 200]*	10% max.

- * (The No. 200 sieve requirement will be applied only when there is no aggregate base immediately beneath the bituminous pavement.)

If it is necessary to add aggregate base material in order to meet the established gradeline and cross-section, the aggregate material shall consist of either Class 5 or Class 7 aggregate base that meets the provisions of MnDOT 3138.

B. Quality Control

The Contractor shall be responsible for Quality Control (QC) testing, and shall test the reclaim material at a rate of one test per 6,000 square yards. The Contractor is responsible for adjusting production to maintain gradation control. The Contractor must produce acceptable material prior to completion of the next 500 feet of production from the site of the failing test.

The Contractor's Quality Control tester shall be certified by MnDOT. The Contractor's test equipment shall be calibrated in accordance with the latest version of the MnDOT Laboratory Manual, at the beginning of each construction season and as needed.

The project owner will provide Quality Assurance (QA) testing.

Reclaimed material that fails to meet the gradation requirements shall be subject to corrective action or the Engineer may allow (in the best interest of the Agency) the Contractor to accept a price reduction in lieu of corrective action. Acceptance for non-complying material will be made in accordance with Table 2331-1.

**Table 2331-1
FULL DEPTH RECLAMATION PAYMENT SCHEDULE
(Individual Test)**

2" & 3" Sieve % Passing Outside Specified Limits	Price Reduction Schedule
2%	Substantial Compliance
3%	5%
4%	10%
5%	15%
> 5%	Corrective Action
Price reductions for more than one failing sieve size shall be cumulative.	
The compensation due to the Contractor for the quantity of material represented by the failing test results shall be reduced by the sum of the respective percentages; however, the reduction will not exceed fifty percent (50%).	
Substantial Compliance is to be applied to occasional failure. Material that consistently fails to meet specification requirements shall be subject to a price reduction or corrective action, as determined by the Engineer.	

2215.3 – CONSTRUCTION REQUIREMENTS

A. Equipment Requirements

A1. Pulverizing Machine

The pulverizing machine shall be self-propelled and capable of effectively pulverizing the in-place bituminous pavement structure and blending a portion of the underlying aggregate base material to the depths shown on the Plans. The machine shall have either, an upward or downward rotational cutting head and controls to maintain a constant cutting depth so as to produce a uniformly blended aggregate mixture. The machine shall be approved by the Engineer prior to the start of the pulverizing operation.

A2. Rollers

The following requirements shall apply:

(a) Pneumatic-Tired Roller

Pneumatic-tired roller shall be self-propelled, mass [weight] a minimum twenty-five (25) tons. The tire arrangement shall be such that compaction will be obtained over the full width of the roller with each pass.

(b) Pads Foot Vibratory Roller

The pad foot roller shall weigh at least twenty-five thousand (25,000) pounds.

(c) Vibratory Rollers

Vibratory rollers will be allowed for use on a performance basis in accordance with MnDOT 1805.

B. Pulverizing Operation

Prior to the start of pulverization, all sod and/or topsoil that is adjacent to the existing surface (mainline or shoulder) that is to be reclaimed shall be bladed off and removed so that it does not become incorporated into and contaminate the reclaim material and this work shall be **incidental** to the Bituminous Pavement Reclamation pay item. Existing bituminous and/or aggregate base materials in the shoulder section may be bladed onto the mainline pavement prior to pulverization when approved by the Engineer. These materials shall be uniformly spread across the pavement surface. In narrow pavement situations, the remaining shoulder may be trenched for increasing the pavement width and placement of the pulverized blended mixture as shown in the typical cross sections.

The existing pavement and base material (mainline and shoulder material as specified) shall be pulverized and blended to the width and depth shown on the Plans in one or more passes so that the entire mass of material is uniformly blended/mixed. The blended material shall meet the specified gradation requirements on aggregate samples obtained after reclamation but prior to compaction.

The Contractor shall not pulverize any more pavement than that which can be spread, shaped and compacted to a drivable surface condition and approved by the Engineer by the end of each work day.

The Contractor shall be responsible for damaging any existing drainage or utility structures on the Project. Any damage resulting from the Contractor's operation shall be repaired by the Contractor at no expense to the Owner.

Any bituminous pieces larger than three inches (3") shall be removed from the reclaimed material. The Engineer will require corrective action when there are excessive oversize bituminous pieces (> three inches (3")), which may include a second pass with the reclaim machine at no additional compensation.

Disposal of the oversize bituminous pieces, within the right-of-way, will not be permitted. Any oversize bituminous pieces found in the right-of-way shall be removed by the Contractor and at the Contractors expense.

No direct compensation will be made for variations in bituminous pavement thickness.

C. Spreading and Compaction

The reclaimed material shall be spread and compacted to the grade, width and slope shown on the Plans and typical cross-sections or as directed by the Engineer.

Where subsurface utility installation work is to occur, the Contractor shall remove and stockpile the reclaimed material prior to performing the utility work. The reclaimed material shall then be placed upon an approved subgrade. Any contaminated reclaimed material shall be removed and replaced as directed by the Engineer, with no additional compensation provided to the Contractor.

In the event that additional aggregate material is required to attain the Plan grade and/or cross-section, the materials used shall meet the previously stated requirements. The added Class 5 material shall be blended into the reclaimed aggregate to obtain a reasonably uniform mixture.

Compaction of each layer of the reclaimed mixture shall be by the Quality Compaction Method (MnDOT 2211.3C2).

Water shall be added prior to and during compaction as required, and shall be incidental to the reclamation operation, unless a designated bid item is provided.

A minimum 22.7 metric ton [25 ton] pneumatic-tired roller or 11,300 kg [25,000 pound] pads foot vibratory roller shall be used for the initial rolling and a vibratory or static smooth steel-wheeled roller for intermediate and/or finished rolling.

The maximum reclaimed layer thickness for compaction shall be 150 mm [6 inches]. If the layer thickness is greater than 150 mm [6 inches], the portion of the reclaimed material in excess of 150 mm [6 inches] shall be bladed to one side of the roadway and the remaining in-place material shall be compacted. The material, which was bladed to the side, shall be spread back and compacted before the end of the working day.

Each 150 mm [6 inch] layer of reclaimed material shall be of uniform thickness and compacted until there is no evidence of further consolidation.

Each individual lift of the reclaim material shall be of uniform thickness. When additional aggregate material is required to attain the Plan profile and/or cross-section, this material shall be incorporated during the reclamation process to produce a uniform reclaim mixture.

D. Workmanship and Quality

Upon completion of the final shaping and compaction, the finished surface of reclaimed aggregate base course shall be smooth and not vary more than +/- 0.05 feet from the elevation prescribed for that point as determined from the grade staked by the engineers and the typical sections shown in the Plans. If any area(s) is found to lack the required smoothness and/or out of tolerance, such areas(s) shall be reshaped and re-compacted until the required smoothness and tolerance is obtained.

When fine grading operations are required on the finished base prior to constructing the pavement thereon, the surface elevation tolerance shall be met at the time of the completion of the fine grading operation. Any excess materials that are contaminated to the extent that it does not meet the specification requirements for use as aggregate base, class 7, shall become the property of the Contractor and shall be removed and disposed off the Right-of-Way in accordance with MnDOT 2104.3C3, and as directed by the Engineer. If the material meets specification for other material within the project, such as for select granular material or granular pipe bedding material, the Contractor may be allowed to reuse the material with approval from the Engineer.

The Contractor shall be responsible for maintaining the finished surface of the aggregate base course in a smooth, compacted condition, free of ruts and distortions, and to the grade and cross-section tolerances previously stated until the first bituminous course required by Contract is placed thereon. The application of water may be required to maintain the compacted surface. Unless a specific bid item is provided, the necessary maintenance of the reclaimed surface shall be performed at no additional cost to the Owner.

In the event that an area of unstable subgrade is encountered during the reclamation process, this area(s) shall be corrected at the direction of the Engineer. Measurement and payment for the correction(s) will be in accordance with section (2105) EXCAVATION AND EMBANKMENT of these Supplementary Special Provisions and MnDOT 2105.

2215.4 – METHOD OF MEASUREMENT

Payment for additional aggregate material will be made only for quantities specified in the plans or ordered by the Engineer on a per ton basis.

2215.5 – BASIS OF PAYMENT

Payment for bituminous pavement reclamation shall be made at the Contract price on a square yard basis and shall be compensation in full for all labor, equipment, and material costs required to construct the aggregate base course as specified including the costs of trenching, scarifying, pulverizing, grading, shaping, rolling and compacting of reclaimed material and aggregate base course.

Also included in the Bituminous Pavement Reclamation payment item is the cost associated with moving and stockpiling of the reclaimed material, as well as hauling and disposing of excess reclaimed material not utilized on the project.

2232 – MILL BITUMINOUS SURFACE

The provisions of MnDOT 2232 are modified and/or supplemented with the following:

2232.3 – CONSTRUCTION REQUIREMENTS

All millings from the project areas shall be removed from the project site by the contractor as **incidental** to this item.

Paragraph B is supplemented with the following:

The Contractor shall be responsible for the riding surface quality of any milled surface open to traffic during the project. The Contractor shall schedule construction operations so as to minimize traffic exposure to uneven lanes, milled edges, and edge drop-offs. Any drop-off where traffic will cross from or to the in place surface, or from or to the milled surface, shall be tapered and/or chamfered so as to provide for the safe passage of traffic. Work necessary by the Contractor to maintain a passable riding surface during construction shall be considered **incidental** to the cost of bituminous pavement milling.

The Contractor shall be responsible for marking and verifying the condition of existing structures within the roadway prior to beginning pavement milling. The Contractor shall protect all existing structures from damage and will be responsible for any damage to in-place structures or castings that result from milling operations. Known structure locations are shown on the Plans.

The Contractor shall not mill any notches for surfacing tapers until immediately prior to paving, except that with the Engineer's permission, the Contractor may mill the notches and install and maintain temporary bituminous tapers to provide for the safe passage of traffic until the surfacing taper is installed.

The Contractor shall remove all milled bituminous material from all traveled roadways immediately following milling operations. **All milled surfaces shall be paved within forty-eight (48) hours of completing milling operations except for delays caused by inclement weather or as specified in the project manual.** The Contractor shall be responsible for supplying all traffic control devices for traffic being directed onto milled surfaces, including, but not limited to, advance warning signs, "Grooved Pavement," "Bump," "Advisory Speed" signs, and lane delineation markings or reflective drum barrels, as directed by the Engineer.

2232.4 – METHOD OF MEASUREMENT

Additional depth of milling as directed by the Engineer shall be **incidental** to the bid item "Mill Bituminous Surface".

2357 – BITUMINOUS TACK COAT

MnDOT 2357 is hereby supplemented by the following:

2357.2 – MATERIALS

Bituminous material for the tack coat shall be MC250,800 as per MnDOT Specification 3151.

2357.5 – BASIS OF PAYMENT

The first paragraph is supplemented with the following:

The unit price bid for tack coat shall include sweeping, cleaning of all debris and dirt from the previous bituminous courses prior to placement of tack coat.

2360 – PLANT MIXED ASPHALT PAVEMENT

The provisions of MnDOT 2350/2360 are modified and/or supplemented with the following:

No bid price adjustments or additional compensation will be provided for paving preformed within the timeframe of the contract.

Cold Weather Paving

The provisions of MnDOT 2360 are modified and/or supplemented with the following:

Paving of the base course where temperatures are less than forty degrees (40°) and rising will not be allowed unless approved by the Engineer. Paving of the wear course where temperatures are less than fifty degrees (50°) and rising will not be allowed unless approved by the Engineer

2500 – EXCAVATED MATERIALS

2500.1 – DESCRIPTION

All references to the disposal of surplus excavated materials in all 2500 series specifications are modified as follows:

All surplus excavated materials not required for backfill shall be disposed of by the CONTRACTOR at no expense to the OWNER and as directed by the ENGINEER. All costs associated with the disposal of the surplus excavated materials shall be considered incidental to the pay item.

2502 – SUBSURFACE DRAINS

The provisions of MnDOT 2502 are modified and/or supplemented with the following:

2502.1 – DESCRIPTION

The first paragraph is supplemented with the following:

The location and alignment of the subsurface drains and outlets are shown in a general manner on the Plans. Exact location and alignment shall be as determined by the Engineer in the field to ensure that the drain properly collects groundwater and infiltration water that may accumulate in the bottom of granular base material.

2502.2 – MATERIALS

The provisions of MnDOT 2502.3A is supplemented with the following:

The Contractor may choose either of two options for the construction of these drains; Option 1, thermoplastic pipe may be placed in the bottom corner of the sub-cut and then the sub-cut backfilled; Option 2, the sub-cut is first backfilled and then PE pipe is placed by machine trencher.

Perforated drain pipe shall be six-inch (6") perforated Thermoplastic (TP) Pipe, MnDOT 3245 for Option 1 and six-inch (6") perforated Corrugated Polyethylene (PE) Tubing, MnDOT 3278 for Option 2. All perforated pipe shall be wrapped with Geotextile, MnDOT 3733, Type 1.

For the subsurface drains that are to discharge to ditches via headwalls, the discharge pipe and connection(s) shall be six-inch (6") non-perforated rigid Thermoplastic (TP) Pipe, MnDOT 3245. The subsurface drain shall be connected to the six-inch (6") diameter X twelve-inch (12") straight length of (TP) pipe with a (TP) connector. The connection between the twelve-inch (12") length of (TP) pipe and the variable length straight (TP) discharge pipe shall be made with a ninety degree (90°), solvent-weld, Bell by Spigot elbow with a minimum radius of approximately twelve (12) inches. Configurations other than the above may be approved by the Engineer to the extent that size, radius and pipe quality are similar.

2502.3 – CONSTRUCTION REQUIREMENTS

The first sentence of paragraph 2502.3B is hereby deleted and replaced with the following:

All perforated pipe drains shall be bedded on coarse filter aggregate meeting MnDOT 3149.2H, placed to a minimum thickness of one pipe diameter below the bottom of the pipe, and extending upwards under the haunches, for the full width and length of the trench, to such elevation as will permit the specified foundation preparations.

The provisions of MnDOT 2502.3B is supplemented with the following:

Unless otherwise noted in the plans, drain grades shall not be less than two-tenths percent (0.2%). The Contractor shall supply and use laser grade control equipment when placing all TP pipe and for PE pipe when pipe grades do not follow working grades at a constant depth.

The Contractor shall place six-inch (6") perforated Thermoplastic (TP) Pipe in the bottom of the sub-cut according to the design typical. At least twelve (12) inches of sub-cut backfill shall be placed above the pipe before any compactive effort is applied.

Pipe may be furnished with either bell and spigot or sleeve couplings and either gasket or solvent joints. All solvent joints shall be left un-cemented unless cement is specifically requested by the Engineer. The ends shall be appropriately marked showing the depth of the bell or sleeve, so that both the Engineer and workers can easily ascertain that the joint has been fully coupled. Perforations shall be laid down. Connections to drainage structures shall be composed of angel fittings not to exceed twenty-two and one-half degrees ($22\frac{1}{2}^{\circ}$).

The Contractor shall place six-inch (6") perforated Corrugated Polyethylene (PE) Tubing after the sub-cut is partially or totally backfilled.

Drains shall be placed by machine trencher capable of cutting the trench, shaping the trench bottom to cradle the lower one-third ($\frac{1}{3}$) of the pipe, laying the pipe, and backfilling with filter aggregate in one simultaneous and continuous operation. Plowing will not be permitted. The trenching head shall be equipped with a shield to prevent adjacent material from caving. Trench width shall be one inch (1") minimum, ten inches (10") maximum, with pipe being centered therein.

The trench shall be backfilled with Filter Aggregate. Filter aggregate shall be free flowing and receive vibratory compaction to the satisfaction of the Engineer. In addition to the required trench compaction, at least one (1) pass of general compaction, as directed by the Engineer, shall be made over the trench prior to placing the overlying required pavement structure.

The trenching operation may be performed any time after at least two feet (2') of sub-cut backfill has been placed and compacted. If the trenching is not done until the sub-cut is completely backfilled, only the lowermost two feet (2') of the trench need be backfilled with Filter Aggregate. The remaining trench fill shall be similar to that required for the sub-cut and care must be taken to achieve satisfactory density.

Perforated pie drains shall be connected directly to permanent drainage structures via non-perforated discharge pipes which shall be constructed concurrently with the drains and be laid at roughly right angles to the roadway centerline. A twelve-inch (12") straight length of (TP) connecting pipe shall be provided to connect (PE) subsurface drains to structures. This connector pipe shall be attached to the (PE) edge drain to provide easy entry (alignment) for probes, cleaners or video cameras.

Discharge pipes shall be connected to the drainage structures at a height of approximately one foot (1'), but not less than six inches (6"), above the top of the structure invert. The connection method shall be approved by the Engineer.

Perforated PE pipe drains shall be placed according to the details shown on the plans or as directed by the Engineer. The pipe drains shall be connected to drainage structures as shown on the plans and details.

Pipe drains shall outlet to either storm sewer drainage structures or to the ditch via a discharge pipe and headwall as noted in the plans or as directed by the Engineer.

2502.4 – METHOD OF MEASUREMENT

The first paragraph is supplemented with the following:

Connection of pipe drains to drainage structures and terminal points shall be incidental to the construction of subsurface drains.

2502.5 – BASIS OF PAYMENT

The first and third paragraph is hereby deleted and replaced with the following:

Payment for subsurface drains and outlets of each size, type, kind and strength class, at the appropriate Contract prices per unit of measure will be compensation in full for all costs of furnishing and installing the item as specified including labor, materials, equipment, excavation, geotextile, fittings, and aggregates as specified, except as otherwise provided herein.

Payment for Perforated (TP) (PE) Pipe Drain at the contract unit price per linear foot shall be full compensation for fabric wrapped pipe, furnished and installed as specified, filter aggregate backfill and compaction, end caps, connecting the pipe drains into the drainage structures, and all other associated work required to install the perforated pipe drains as detailed, specified, and as directed by the Engineer.

The non-perforated connecting pipe length and coupling(s) shall be included for payment with the discharge footage. Payment for (TP) Pipe Drain at the contract unit price per linear foot shall be full compensation for trenching, furnishing and placing non-perforated (TP) discharge pipe, wyes, tees, connectors, other connectors as necessary, connecting the discharge pipe into the drainage structure, backfill and compaction, and all other associated work required to install the non-perforated discharge pipes between the outlet drainage structures and the perforated pipe drains.

2503 – STEEL CASING PIPE

The provisions of MnDOT 2503 are modified and/or supplemented with the following:

2503.1 – DESCRIPTION

The first paragraph is supplemented with the following:

Steel casing pipes, both jacked and not-jacked, will be placed to allow for the construction of sanitary sewer, water main, and storm sewer under roads and through the existing earth structure as may be required by the individual project plans or as permitted by the Engineer.

See CEAM 2600.2C1 of this specification for pipe jacking and boring specifications.

2503.2 – MATERIALS

The provisions of MnDOT 2503.2 are supplemented with the following:

Steel Casing Pipe: The casing pipe shall be welded steel pipe (new material) conforming to ASTM Designation A252, Grade 2 or ASTM Designation A139, Grade B, with a minimum yield strength of 35,000 psi. No recycled steel casing pipe shall be allowed. The wall thickness shall be shown in the individual project plans in inches.

Pipe Skid (Spacer) Assemblies: Skid (spacer) assemblies shall be placed around the sanitary sewer, water main, and storm sewer pipe and shall each consist of four (4), two-inch (2") (min) by four-inch (4") by three-foot (3') long pressure treated wood (or approved equal) skids equally spaced around the pipe diameter. These shall be fastened to the pipe with a minimum of two (2) (per skid) - 20 gauge stainless steel one-inch (1") wide bands and stainless steel nuts, bolts and washers. There shall be a minimum of two (2) sets of skid assemblies per length of pipe spaced evenly to carry the pipe loading.

2503.4 – METHOD OF MEASUREMENT

The provisions of MnDOT 2503.4 are supplemented with the following:

Measurement will be made by the length of steel casing pipe installed as specified.

2503.5 – BASIS OF PAYMENT

The provisions of MnDOT 2503.5 are supplemented with the following:

Payment for steel casing pipe shall be at the contract bid price per linear foot, and shall be compensation in full for all costs incidental thereto, including the concrete bulkheads, filling with sand, grouting outside the casing pipe, pipe skid (spacer) assemblies and dewatering (if necessary) as specified in the plan. Payment for pipe extending through the casing pipe will be paid for at the unit price bid for the size of pipe specified.

2505 – COORDINATION

2505.1 – DESCRIPTION

Utility Coordination: The CONTRACTOR shall coordinate his/her activities with the activities of all utility owners present within the project limits. This includes delays associated with scheduling conflicts, fees charge by utility owners for construction services, and all time necessary to communicate and work with utility owners within the project limits.

The plans show only known underground utilities, public and private, and the locations are approximate. No assurance is given that additional underground facilities do not exist. The CONTRACTOR shall make his/her own investigation to determine to what extent existing utilities shall affect his work.

The location, protection, maintenance and/or repair, if damaged, of all in-place utilities shall be the responsibility of the CONTRACTOR.

Where construction operations require the interruption of service of a utility, the CONTRACTOR shall notify that utility at least forty-eight (48) hours before the interruption and shall advise him of the probable time when the service will be restored.

A utility coordination meeting was held during project design process. Plans for relocations or improvements to the City's knowledge are included in this bid package.

2505.5 – BASIS OF PAYMENT

Payment for utility coordination shall be at the Contract lump sum price, and will be compensation in full for all labor and materials necessary to perform the work as required. Payment will be paid fifty percent (50%) at the time all utilities have been installed and approved. The remaining fifty percent (50%) will be paid at the time all the curb and gutter has been installed and approved.

2506 – MANHOLES, CATCH BASINS AND VALVE BOXES

2506.1 – DESCRIPTION

This work consists of the adjustment of manholes, catch basins and valve boxes to meet either interim or final grades. Construction of manholes, catch basins and valve boxes shall be accomplished in accordance with applicable sections of the City Engineers Association of Minnesota, Standard Utility Specifications, Supplementary Standard Utilities Specification, and Standard Detail Plates. The construction of manholes, catch basins and valve boxes shall be accomplished in accordance with applicable sections of the City of North St. Paul General Specifications, except as modified below.

2506.3 – CONSTRUCTION REQUIREMENTS

Adjusting Frame and Ring Castings or Valve Boxes: The Contractor shall raise all castings and valve boxes to base course grade prior to base course paving. The Contractor shall also raise castings and valve boxes multiple times with metal adjustment rings if multiple lifts of base course are specified and if there will be more than forty-eight (48) hours between lifts. Casting adjustments with metal adjustment rings and valve box adjustments with adjustment rings shall then be made to final grade prior to wear course paving.

Casting adjustments for wear course paving and multiple lifts of base course paving shall be completed either with cast iron or ductile iron adjustment riser rings as manufactured by Neenah Foundry or Engineer approved equal. The riser ring installation shall be as per manufacturer's recommendations.

The Contractor has forty-eight (48) hours to complete wear course paving after adjusting structures to final grade, this time frame includes overlay projects. During the interim period between adjusting the structures for the wear course paving and installing the wear course paving, the Contractor shall place traffic cones or other traffic barricades on the adjusted structures.

On bituminous overlay projects the use of manhole risers is REQUIRED. Structures shall be adjusted such that they conform to the following requirements:

- a. New construction manholes and catch basins shall have no more than five (5) nor less than two (2) concrete adjusting rings and the maximum height of adjusting rings and mortar shall not exceed twelve (12) inches. The maximum or minimum height of adjustment rings, as previously stated do not apply to the adjustment of existing manholes and catch basins. However, the adjustment of existing structures shall be to the satisfaction of the ENGINEER. In no case shall additional compensation be made for adjusting rings and mortar exceeding twelve (12) inches in height for existing structures. Concrete adjusting rings shall be a standard, two (2) inch thick, reinforced ring manufactured for this specific purpose. The diameter or rectangular dimension shall conform to the type of casting on the structure. Plastic HDPE adjusting rings MAY BE substituted for concrete adjusting rings.
- b. Frame and ring castings shall be set to the designated elevation in a full bed of mortar. Mortar between the rings shall be no less than one-third ($1/3$) inch or greater than one-half ($1/2$) inch. No less than one-half ($1/2$) inch thickness of mortar shall be plastered around the outside of the rings to encase the rings of structures (this does not apply to catch basins within curbs, which shall be encased in concrete). No shims of any type shall be used to set the rings.
- c. Catch basin castings and adjusting rings shall be encased in a minimum of four (4) inches of concrete when installed in curbing in accordance with the Standard Detail Plates. Rim elevations shall be set to correspond with the depressed curb as illustrated in the Standard Detail Plates.
- d. Valve boxes shall be set to have six-inches (6") of adjustment up and down from finished grade. Adjustment of gate valves should include additional riser sections as needed to meet the above requirements.
- e. The final rim surface elevation of the manhole or valve box casting shall be one-half ($1/2$) inch below the adjacent pavement elevation and at grade in turf.
- f. ***All sanitary sewer manholes shall include an Infi-Shield or ENGINEER approved equivalent external manhole chimney seal at no additional compensation.***

2506.4 – METHOD OF MEASUREMENT

Casting Adjustment: No measurement or payment shall be made for casting adjustment for new or reconstructed structures, including multiple adjustments to suit blacktop lifts. Adjustments of existing structures shall be measured on a unit basis for each casting adjustment. This unit shall include all materials, labor and equipment required to adjust the existing casting to the required elevation for new pavement surface. No measurement or payment shall be made for casting adjustment for structures receiving new castings; payment for furnish and install casting assembly shall include compensation in full to set the new casting at the required elevation, including multiple adjustments to suit blacktop lifts.

2506.5 – BASIS OF PAYMENT

Adjust Casting: Payment for structure adjustment shall be made at the unit price bid for each casting adjusted including sanitary sewer manhole castings, storm sewer manhole castings, and catch basin castings. Payment shall be in full for all labor, material and equipment required to adjust and reset the structure to the street grade as specified herein and shown on the individual project plans. Interim adjustments, including multiple riser rings, shall be included within this item.

Adjust Gate Valve & Box: Payment shall be at the unit price bid for each gate valve box adjusted.

Construct Drainage Structure Design Special (2'x3' CB): Payment shall be paid at the unit price bid for each structure installed, and shall include compensation in full for furnishing and installing the casting.

Construct Drainage Structure Design G: Payment shall be paid at either the unit price bid for each structure installed or per linear foot structure installed as detailed in the project proposal. Payment on an 'each' basis shall include compensation in full for furnishing and installing the casting.

Chimney Seals: Chimney seals shall be considered incidental unless a separate pay item has been included in the individual project proposal.

2511 – RIPRAP

The provisions of MnDOT 2511 are modified and/or supplemented with the following:

2511.1 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2511.3D are hereby deleted and replaced with the following:

All grouted riprap shall be Class IV unless noted otherwise in the individual project plans. Grouted riprap for flared end structures that are twenty-one inches (21") in diameter or greater shall be hand placed and grouted so that the riprap is firmly embedded in the grout. The grouted riprap shall be placed after the grout has been constructed to a uniform depth. The surface finish of the riprap should be swept so that the grout is not exposed on the surface of the riprap. Grouted riprap should be placed along the sides of the flared-end sections to prevent erosion and washouts around the flared-end.

2521 – WALKS

The provisions of MnDOT 2521 are modified and/or supplemented with the following:

2521.2 – MATERIALS

The provisions of MnDOT 2521.2A are supplemented with the following:

Concrete: The air content of the concrete shall be four and one-half percent (4.5%) to eight percent (8%). Concrete mix shall be 3A32 where forms are placed and 3A22 where slip form machine placement is used.

The provisions of MnDOT 2521.2G are supplemented with the following:

Granular Materials for Concrete Walk: Base for concrete walk shall meet the requirements of MnDOT 3149.2-B1, granular borrow, except that one hundred percent (100%) of the material shall pass a one and one-half inch (1½") sieve. Existing on site materials may be used if approved by the Engineer.

Granular Materials for Bituminous Walk: Base for bituminous walk shall meet requirements of Section 2211, Aggregate Base. The aggregate base course shall be Class 5 (crushed quarry rock), or Class 7 (reclaimed bituminous). If allowed by the Engineer, crushed concrete shall meet the requirements of MnDOT 3149.

2521.3 – CONSTRUCTION REQUIREMENTS

The provisions of MDOT 2521.3 are supplemented with the following:

When the compressive strength of the concrete test cylinders is less than 3,900 PSI at the twenty-eight (28) day test break, the Owner will decide whether or not the defective concrete must be removed and replaced on a case by case basis. The removal and replacement costs shall be the responsibility of the Contractor. If the Owner decides to allow the concrete to be left in place, the Contractor shall receive no compensation for that section that is determined to be of deficient strength.

In new developments where private utilities are to be installed within the public right of way and drainage and utility easements, and are on the same side as the walk, the private utility work shall be coordinated with all applicable private utility companies such that all construction of private utilities will be completed prior to construction of the walk. The Contractor shall be responsible for coordination with the developer, private utilities, Engineer, and Owner to ensure that the private utilities are constructed prior to the walk. The Contractor shall give a minimum of two weeks notification to private utilities for the estimated completion date of curb, gutter, grading, and erosion control stabilization. Coordination with private utilities shall be considered incidental. No additional compensation from the Owner shall be provided to the Contractor for any claims of crews being delayed because of scheduling issues with private utility companies as a result of inadequate notification of curb, gutter, grading, and erosion control completion dates.

The provisions of MnDOT 2521.3C1 are supplemented with the following:

Placing and Finishing Concrete: Each concrete batch shall be tested for air content prior to placement. Any batch not meeting the air requirements will be rejected.

The testing will be done by an approved testing laboratory. The Owner shall bear the initial cost of the testing. If, however, sections of the walk fail and retesting is required, the cost of this additional testing shall be at the Contractor's expense.

Slip form machine placement will be allowed and shall conform to MnDOT 2531.3F requirements.

The provisions of MnDOT 2521.3C2 are supplemented with the following:

Joint Construction: Expansion joints shall be placed at locations where a fixed object or structures extend through the walk, at pedestrian ramps and where thicknesses may vary. Spacing of contraction joints shall equal the width of the walk or not to exceed the maximum of sixty feet (60') apart.

The provisions of MnDOT 2521.3C3b are supplemented with the following:

Membrane and Extreme Service Membrane Curing Method: Membrane curing method in accordance with MnDOT 3754 will be allowed with the minimum rate of application being one (1) gallon per one-hundred twenty-four (124) square feet of exposed surface area. The furnished material shall be Type 2, Class B and conforming to ASTM C 309.

The provisions of MnDOT 2521.3D are supplemented with the following:

Bituminous: Construction shall be in accordance with requirements of Section 2340, Plant Mixed Bituminous Pavement Quality Assurance (Q/A).

Signing for "Walk Closed" signs, during reconstruction or repair of sidewalks and bituminous paths shall be considered incidental. Placement shall be at the beginning and end of each block segment or as directed by the Engineer.

2521.5 – BASIS OF PAYMENT

The provisions of MnDOT 2521.5 are hereby deleted and replaced with the following:

Two inch (2") Bituminous Path: Payment shall be at the unit price bid per square yard of two inch (2") bituminous path, and shall include all excavation, grading, aggregate base, placement of granular borrow as required, materials, labor, and equipment required to complete the path in-place in accordance with the individual plan. Surface tolerances will be verified prior to payment.

Four inch (4") Concrete Walk: Payment shall be at the unit price bid per square foot of four inch (4") concrete walk, and shall include all excavation, grading, granular borrow, materials, labor, and equipment required to complete the walk in-place in accordance with the individual plan. Surface tolerances will be verified prior to payment.

2531 – CONCRETE PAVEMENT

The provisions of MnDOT 2531 are modified and/or supplemented with the following:

2531.2 – MATERIALS

The provisions of MnDOT 2531.2A are supplemented with the following:

Concrete: The air content of the concrete shall be four and one-half percent (4.5%) to eight percent (8%). Concrete mix shall be 3A32 where forms are placed and 3A22 where slip form machine placement is used.

2531.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2531.3 are supplemented with the following:

When the compressive strength of the concrete test cylinders is less than 3,900 PSI at the twenty-eight (28) day test break, the Owner will decide whether or not the defective concrete must be removed and replaced on a case to case basis. All removal and replacement shall be the Contractors responsibility. If the Owner decides to allow the concrete to be left in place, the Contractor shall receive no compensation for the section that is determined to be of deficient strength.

The provisions of MnDOT 2531.3C are supplemented with the following:

Joint Construction: Expansion joints shall be placed at intervals of not more than sixty feet (60') for manual placement and not more than 200 feet for slip-form placement. Joint sealing shall not be required.

The provisions of MnDOT 2531.3E are supplemented with the following:

Placing and Finishing Concrete: Each concrete batch shall be tested for air content prior to placement. Any batch not meeting the air requirements will be rejected. The Engineer will take samples as deemed necessary to determine the quality of the concrete. The Contractor shall provide for suitable storage on site for concrete test cylinders.

The testing will be done by an approved testing laboratory. The Owner shall bear the initial cost of the testing and transporting of cylinders. If, however, sections of the curb and gutter fail and retesting is required, the cost of this additional testing shall be at the Contractor's expense.

B618 curb and gutter shall be installed at all intersection radii and catch basins as per Standard Detail Plates and the Individual project plans.

The provisions of MnDOT 2531.3G2 are supplemented with the following:

Membrane and Extreme Service Membrane Curing Method: Membrane curing method in accordance with MnDOT 3754 will be allowed with the minimum rate of application being one (1) gallon per 124 square feet of exposed surface area. The curing material shall be Type 2, Class B and conform to ASTM C 309.

The provisions of MnDOT 2531.3J are supplemented with the following:

Backfill Construction: Backfilling of the curb and gutter shall be completed within forty-eight (48) hours after the curing period (three (3) to seven (7) days as determined by the Engineer and prior to bituminous surfacing of the roadway. Extreme care must be exercised by the Contractor during this operation to prevent horizontal displacement of the curb and gutter. Backfilling shall be considered incidental to the construction. Only topsoil shall be placed within four inches (4") of the finished grade.

The provisions of MnDOT 2531.3K are supplemented with the following:

Workmanship and Finish: Unacceptable work shall be removed and replaced with acceptable work as ordered by the Engineer. Cracking at areas other than joints may at the discretion of the Engineer, be saw cut and sealed with an approved sealant or removed and replaced.

2531.4 – METHOD OF MEASUREMENT

The provisions of MnDOT 2531.4 are supplemented with the following:

Curb & Gutter: Curb drops for alleys, private entrances, driveway entrances, and pedestrian curb ramps shall be included in the length measurement of the curb and gutter.

Seven inch (7") Valley Gutter: Valley gutter shall be measured per square yard installed. Measurement shall also include any apron space necessary to connect the valley gutter to the adjacent curb and gutter.

Six inch (6") Driveway Pavement: Driveway pavement shall be measured per square yard installed.

2531.5 – BASIS OF PAYMENT

The provisions of MnDOT 2531.5 are supplemented with the following:

Curb & Gutter: The unit price bid for concrete curb and gutter shall include all necessary excavation, joints, protective coating, and mechanically tamped backfill, curb drop work and B618 curb and gutter work at intersection radii and catch basins. Payment shall be limited to eighty percent (80%) of the actual footage installed until all curbing has been backfilled and the topsoil placed.

Seven inch (7") Valley Gutter: The unit price for valley gutter shall include all necessary excavation, joints, protective coating, reinforcement, and form work necessary to complete the valley gutter installation.

Six inch (6") Driveway Pavement: The unit price for driveway pavement shall include all necessary excavation, joints, protective coating, reinforcement, and form work necessary to complete the driveway installation.

2563 – TRAFFIC CONTROL

The provisions of MnDOT 2563 are supplemented with the following:

2563.1 – DESCRIPTION

The work under this section shall be done in accordance with the provisions of the City Specifications. All traffic control devices shall conform and be installed in accordance to the "Minnesota Manual on Uniform Traffic Control Devices" (MMUTCD), the "Field Manual for Temporary Traffic Control Zone Layouts," the "Guide to Establishing Speed Limits in Highway Work Zones," the Minnesota Flagging Handbook, the provisions of MnDOT 1404 and MnDOT 1710, the Minnesota Standard Signs Manual Parts I, II, and III, the Traffic Engineering Manual Chapter 8 Appendices 8-8.02 and 8-8.03, the Construction Staging & Traffic Control in the Plans, and these Special Provisions.

The Contractor shall furnish, install, maintain, and remove all traffic control devices required to provide safe movement of vehicular traffic through the Project during the duration of the Contract, from the start of Contract operations to the final completion thereof. The Engineer will have the right to modify the requirements for the traffic control as deemed necessary due to existing field conditions.

Prior to the start of construction, the Contractor shall furnish a traffic control and project staging plan to the Engineer for approval. This plan shall include, at a minimum:

- Utility construction shall be phased to allow a means of ingress and egress from each of the reconstructed areas at all times.
- The Contractor shall give the Engineer a forty-eight (48) hour notice prior to restricting access to any street or property.
- All roads shall be re-opened to traffic at the end of each work day.

Work performed within the limits of County or MnDOT or County Right-of-Way will require additional traffic control including but not limited to flagging operations, concrete jersey barriers, lane delineation, and advanced notice signage. The Contractor will be responsible for providing all traffic control required by MnDOT or the County.

2563.2 – MATERIALS

All traffic control devices shall conform to the latest MMUTCD. Traffic control devices include, but are not limited to, barricades, warning signs, trailers, flashers, cones, drums, pavement markings, and flagmen as required and sufficient barricade weights to maintain barricade stability.

In addition this work shall consist of furnishing, installing, maintaining, and removing construction signs with special messages in accordance with the provisions of MnDOT 2564, and other Contract provisions, as directed by the Engineer. All materials required to furnish and install the special construction signs shall remain the property of the Contractor.

2563.3 – CONSTRUCTION REQUIREMENTS

The Contractor shall provide all traffic control.

The Contractor shall provide a traffic control supervisor who shall review the traffic control on a daily basis and provide necessary maintenance of traffic control devices.

2564 – TRAFFIC SIGNS AND DEVICES

The provisions of MnDOT 2564 are modified and/or supplemented with the following:

2564.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2564.3 are supplemented with the following:

General: The signing Contractor shall submit all street sign names to the Owner for review following the preconstruction conference prior to ordering the materials.

2564.4 – METHOD OF MEASUREMENT

The provisions of MnDOT 2564.4 are supplemented with the following:

Sign Type C: Regardless of measurement type, the cost for the signs shall be for the complete unit (sign and post(s)) furnished and installed.

Sign Type D: Type D street sign has two sides, and is considered ONE (1) sign. Two (2) Type D signs (on one post) are generally installed at each intersection.

2564.5 – BASIS OF PAYMENT

The provisions of MnDOT 2564.5 are supplemented with the following:

Sign Panels Type C: Payment shall be compensation in full for all costs of fabricating and erecting panels as specified. Payment for Type C sign panels will include compensation for furnishing and installing the sign posts, stringers, brackets, and attachment angles or strap mounting hardware on which the sign panels are attached. Contractor shall confirm with public works the current standard of sign post prior to installation. Screening and installing fabrication stickers and installing warning stickers will be incidental to furnishing and installing Type C sign panels.

Furnish and Install Sign Panels Type D: Payment shall be made at the contract price for each Type D sign fabricated, furnished, and installed on posts. Payment for furnishing and installing the sign panel will include brackets, attachment angle or strap mounting hardware. Screening and installing fabrication stickers and installing warning stickers will be incidental to furnishing and installing Type D sign panels.

2545 – NON-METALLIC CONDUIT

The provisions of MnDOT 2545 are modified and/or supplemented with the following:

2545.1 – DESCRIPTION

The provisions of MnDOT 2545.1 are supplemented with the following:

This item consists of the installation of non-metallic conduit (NMC) utility crossings for the private utility companies.

2545.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2545.3 are supplemented with the following:

In new developments, the individual private utility companies are asked to provide the NMC pipe for installation and copies of location maps for the Contractor and Observer at the pre-construction conference. The depths typically do not exceed three (3) feet to five (5) feet. These utility crossings are not always shown on the individual project plan, but will be coordinated in the field with the private utility companies. The Contractor shall install the four-inch (4") NMC before the concrete curb is installed.

2545.4 – METHOD OF MEASUREMENT

The provisions of MnDOT 2545.4 are supplemented with the following:

The excavation length will be measured in linear feet regardless of the number of NMC conduits bundled at the same crossing location. The excavation length will be measured along the longest conduit at the same crossing location.

2545.5 – BASIS OF PAYMENT

The provisions of MnDOT 2545.5 are supplemented with the following:

Payment shall be compensation in full for all labor, excavation, compaction and restoration required to complete the installation.

2571 – PLANT INSTALLATION

The provisions of MnDOT 2571 are modified and/or supplemented with the following:

2571.1 – DESCRIPTION

This work shall consist of furnishing and installing shrubs and trees on the project as directed by the Engineer.

2571.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2571.3 are supplemented with the following:

Planting Soil Preparation: Topsoil, soil conditioners, humus and fertilizer shall be included to assure good growth.

The provisions of MnDOT 2571.3M1 are hereby deleted and replaced with the following:

Plant Establishment Period: Shall be two years and match the two-year guarantee period of the Contract.

2572 – PROTECTION AND RESTORATION OF VEGETATION

The provisions of MnDOT 2572 are modified and/or supplemented with the following:

2572.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2572.3A are supplemented with the following:

Protecting and Preserving: No trees shall be removed without permission of the Engineer. No compensation will be paid for cutting down, removing and disposing of shrubs. Any trees or shrubs deemed savable will be field located by the Engineer and shall be fully protected by the Contractor during construction. Any trees or shrubs removed or damaged by the Contractor, which were deemed savable by the Engineer, will be replaced at the Contractor's expense.

The following procedures shall be adhered to when constructing utilities near trees:

- a. Cut roots cleanly.
- b. Paint cut root ends with asphalt base paint.
- c. Backfill trench as soon as possible; do not leave the roots exposed to air.
- d. No equipment or construction materials shall be stored beneath a tree's drip line.
- e. Clean up around trees immediately after construction.

The provisions of MnDOT 2572.3A7 are supplemented with the following:

Pruning: All pruning of trees has to be approved by the Engineer. All trees damaged during construction shall be pruned and repaired. All wounds on trees shall be treated with an asphalt varnish containing an antiseptic. If an antiseptic asphalt varnish is not available, a plain asphalt varnish can be used if the wound is swabbed with alcohol or coated with shellac. Wounds shall be painted as soon as possible after the area is dry.

2571.5 – BASIS OF PAYMENT

The provisions of MnDOT 2572.5 are supplemented with the following:

All work under protection and restoration of vegetation shall be considered incidental to the contract with no additional compensation allowed unless provided for in the bid proposal form.

2573 – TEMPORARY EROSION CONTROL

The provisions of MnDOT 2573 are modified and/or supplemented with the following:

2573.1 – DESCRIPTION

The provisions of MnDOT 2573.1 are supplemented with the following:

Regardless of whether this project requires a National Pollutant Discharge Elimination System (NPDES) Phase I or Phase II General Storm Water Permit or not, the Contractor will be required to comply with NPDES regulations in order to prevent erodible materials from leaving the site.

2573.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2573.3 are supplemented with the following:

The Contractor shall be responsible for the maintenance of all-temporary erosion and sediment control measures. These measures shall be repaired, replaced, or supplemented as set forth in the NPDES General Storm Water Permit, which is summarized below for reference:

EROSION & SEDIMENT CONTROL MEASURE	FAILURE CRITERIA	TIME FRAME FOR REPLACING, REPAIRING, OR SUPPLEMENTING
Silt Fence, Biorolls and Straw Bales	Sediment depth reaches one-third (1/3) height	Within twenty-four (24) hours of discovery (or as soon as field conditions allow)
Sedimentation Basins	Sediment volume reaches half (1/2) basin volume	Within seventy-two (72) hours of discovery (or as soon as field conditions allow)
Stabilized Drainage Ditches	Sediment in drainage ditch, storm sewer, or a water/wetland of the State.	Within seven (7) days of discovery or within seven (7) days of obtaining access
Stabilized Construction Site - Vehicle Exit Locations	Sediment is being tracked off-site	Within twenty-four (24) hours of discovery (sediment that does not drain back to site must be removed)

EROSION & SEDIMENT CONTROL MEASURE	FAILURE CRITERIA	TIME FRAME FOR REPLACING, REPAIRING, OR SUPPLEMENTING
Solid Waste	Sediment, asphalt, concrete millings, construction debris, plastic, paper, and other waste not disposed of properly	Within twenty-four (24) hours of discovery
Inlet / Catch Basin Protection	Sediment volume reaches half (1/2) full	Within twenty-four (24) hours of discovery

If the Contractor fails to provide maintenance of the temporary erosion control measures, within the above time frames, the Engineer shall have the authority under the terms of this contract to hire the work done and deduct the costs incurred from the amounts due to the Contractor.

The Contractor shall be assessed liquidated damages of two-hundred dollars (\$200) per day for each specified area for which the Contractor has not installed or repaired erosion control devices (including sod) within forty-eight (48) hours after receiving written notice.

Temporary seeding may be necessary to meet the requirements of the NPDES or watershed permit based on the Contractor's schedule. Any temporary seeding or stabilization will be considered *incidental* to the contract.

2571.5 – BASIS OF PAYMENT

The provisions of MnDOT 2573.5B1 are hereby deleted and replaced with the following:

Payment shall be limited to fifty percent (50%) of the actual quantities installed until fifty percent (50%) of the Contract Work including any Change Orders has been completed. At that point in time, payment shall be increased but limited to eighty percent (80%) of the actual quantities installed until all temporary erosion control measures have been removed from the project site.

2575 – TURF ESTABLISHMENT

The provisions of MnDOT 2575 are modified and/or supplemented with the following:

2575.1 – DESCRIPTION

The provisions of MnDOT 2575.1 are supplemented with the following:

All disturbed areas within the project shall be either seeded or sodded to an equal or better condition to that which was in place prior to construction and as directed by the Engineer. All exposed areas of the site will receive seed and mulch, sod or erosion control blanket within two (2) weeks after final grade on slopes flatter than 3:1 and one (1) week on slopes steeper than 3:1. **Once the bituminous base is placed and driveways are poured turf establishment shall be installed within two (2) weeks** unless impeded due to fence, wall, or other specialty construction item.

2575.2 – MATERIALS

The provisions of MnDOT 2575.2A are supplemented with the following:

Seeding: The seed mixture shall be MnDOT Mixture 25-151 at a rate of one-hundred twenty pounds per acre (120 lbs/acre) or as specified in the construction documents.

The provisions of MnDOT 2575.2C are supplemented with the following:

Sod: Sod shall meet the requirements of MnDOT 3878. The sod type shall be Mineral or Highland. No Peat sod allowed.

The provisions of MnDOT 2575.2H are supplemented with the following:

Erosion Control Blanket: The erosion control blanket shall be MnDOT Category 3.

The provisions of MnDOT 2575.2E are supplemented with the following:

Fertilizer: The fertilizer shall be a zero (0) phosphorus commercial grade.

Topsoil: Topsoil shall meet MnDOT topsoil borrow requirements as outlined in section 3877.

2575.3 – CONSTRUCTION REQUIREMENTS

The provisions of MnDOT 2575.3A are supplemented with the following:

General: The Contractor is cautioned to salvage all available and suitable topsoil from the project site for spreading on areas to be restored.

The provisions of MnDOT 2575.2C are supplemented with the following:

Applying Fertilizer: Fertilizer shall be applied at a rate approved by the Engineer over all seeded areas.

The provisions of MnDOT 2575.2D are supplemented with the following:

Seeding: Seeding shall be done within two (2) weeks after finish grading has been completed.

The provisions of MnDOT 2575.2F are supplemented with the following:

Mulch: Mulch shall be applied on all seeded areas.

The provisions of MnDOT 2575.2H are supplemented with the following:

Disk Anchoring: The Contractor shall disk anchor mulch Types 1, 7, and 8. The anchoring equipment shall be operated in a general direction at right angles to the direction of surface drainage wherever practical.

The provisions of MnDOT 2575.2J are supplemented with the following:

Placing Sod: The sodding of areas behind the curb; could occur prior to the completion of work by private utility companies. The Contractor shall place sod within two (2) weeks following the completion of curb construction. In areas where there will be sidewalk construction, two strips of sod shall be placed behind the curb within two (2) weeks following the completion of curb construction. The remainder of the sod shall be placed within two (2) weeks following sidewalk construction and the completion of private utility work. No additional compensation will be allowed for the additional mobilization required to complete the work as specified. All sod shall be placed and maintained according to these specifications. If additional sod is required to repair damage caused by the private utility companies, it shall be paid for at the unit price in the individual project proposal with no allowances made for additional mobilization costs.

During the course of laying or immediately after completing the sod placement on each area, the sod shall be watered and compressed into the underlying soil by rolling in accordance with MnDOT 2575. If, after rolling, the surface of the sod is not free of bumps or depressions, the Contractor shall make suitable corrections to the topsoil and/or subgrade, replace the sod and roll the sod at no additional cost to the Owner.

No sod will be installed later than September 30th unless directed by the Engineer.

The provisions of MnDOT 2575.2L are supplemented with the following:

Maintenance: The Contractor shall be solely responsible for replacement and/or repair of any seeded area that may wash out, erode, or fail to grow prior to acceptance with no additional compensation therefore. The Contractor shall be responsible for maintaining sod for a period of thirty (30) days. The Contractor is responsible for successful establishment of the seed and shall replace all unsuccessful seeding until adequate turf is established.

APPENDIX A
STANDARD UTILITIES SPECIFICATIONS (CEAM)
2013 EDITION



CITY ENGINEERS ASSOCIATION OF MINNESOTA
Engineering Our Cities' Futures

CITY ENGINEERS ASSOCIATION OF MINNESOTA

STANDARD SPECIFICATIONS

2600 Trench Excavation and Backfill/Surface Restoration

2611 Watermain and Service Line Installation

2621 Sanitary Sewer and Storm Sewer Installation

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

2641 – Pipeline Rehabilitation - Pipe Bursting Method

2013 Edition

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

2600.1 DESCRIPTION

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

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

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

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

2600.2 MATERIALS

A Granular Materials

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

A1 Granular Material Gradation Classifications

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

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

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

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

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

A2 Granular Material Use Designations

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

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

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

B Insulation

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

C Geotextile Fabric

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

2600.3 CONSTRUCTION REQUIREMENTS

A General Provisions

A1 Maintenance of Traffic

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

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

A2 Establishing Line and Grade

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

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

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

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

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

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

Watermain and services located near sewer forcemains:

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

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

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

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

Watermain and services located near gravity sanitary and storm sewers:

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

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

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

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

Watermain and services crossing gravity sanitary and storm sewers:

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

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

Watermain above-water crossings:

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

Watermain underwater crossings:

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

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

A3 Protection of Surface Structures

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

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

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

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

A4 Interference of Underground Structures

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

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

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

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

A5 Removal of Surface Improvements

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

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

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

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

A6 Temporary Service Measures

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

B Excavation and Preparation of Trench

B1 Operational Limitations and Requirements

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

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

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

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

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

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

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

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

B2 Classification and Disposition of Materials

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

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

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

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

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

B3 Excavation Limitations and Requirements

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

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

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

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

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

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

B4 Sheet piling and Bracing Excavations

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

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

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

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

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

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

B5 Preparation and Maintenance of Foundations

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

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

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

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

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

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

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

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

B6 Contaminated Materials and Regulated Wastes

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

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

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

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

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

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

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

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

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

C Trenchless Pipe Installation

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

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

C1 Jacking/Boring

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

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

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

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

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

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

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

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

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

The Contractor shall take the following precautions when boring:

- Extend casing through entire distance bored.

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

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

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

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

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

The Contractor shall take the following precautions when jacking:

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

- Progressively push carrier pipe through completed casing.

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

Center carrier pipe in casing at all times.

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

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

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

C2 Directional Boring

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

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

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

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

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

D Placement of Insulation

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

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

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

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

E Pipeline Backfilling Operations

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

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

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

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

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

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

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

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

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

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

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

F Restoration of Surface Improvements

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

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

G Maintenance and Final Cleanup

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

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

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

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

2600.4 METHOD OF MEASUREMENT

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

A Rock Excavation

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

B Granular Materials

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

C Geotextile Fabric

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

D Insulation

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

2600.5 BASIS OF PAYMENT

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

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

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

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

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

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

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

SECTION 2611 – STANDARD SPECIFICATIONS FOR WATERMAIN AND SERVICE LINE INSTALLATION

2611.1 DESCRIPTION

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

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

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

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

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

C104 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

C105 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids

C111 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

C115 American National Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges

C116 AWWA Standard for Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings

C150 American National Standard for Thickness Design of Ductile-Iron Pipe

C151 American National Standard for Ductile-Iron Pipe, Centrifugally Case, for Water or Other Liquids

C153 American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service

C301 AWWA Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids

C304 AWWA Standard for Design of Prestressed Concrete Cylinder Pipe 26

C500 AWWA Standard for Metal-Seated Gate Valves for Water Supply Service (Includes addendum C500a-95.)

C502 AWWA Standard for Dry-Barrel Fire Hydrants (Includes addendum C502a-95.)

C504 AWWA Standard for Rubber-Seated Butterfly Valves

C509 AWWA Standard for Resilient-Seated Gate Valves for Water Supply Service (Includes addendum C509a-95.)

C515 AWWA Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
 C550 AWWA Standard for Protective Interior Coatings for Valves and Hydrants
 C600 AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
 C605 AWWA Standard for Underground Installation of Polyvinyl Chloride (PVC and PVCO) Pressure Pipe and Fittings for Water
 C651 AWWA Standard for Disinfecting Water Mains
 C800 AWWA Standard for Underground Service Line Valves and Fittings
 C900 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Transmission and Distribution (Includes addendum C900a-92.)
 C901 AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service
 C904 AWWA Standard for Cross-Linked Polyethylene (PEX) Pressure Pipes, 1/2 In. (12 mm) Through 3 In. (76 mm) for Water Service
 C905 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., (350mm Through 1,200mm), for Water Transmission and Distribution
 C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution and Transmission
 C907 AWWA Standard for Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 In. Through 8 In. (100mm Through 200mm) for Water, Wastewater, and Reclaim Water Service
 AWWA C908 Standard for PVC Self-Tapping Saddle Tees for Use on PVC Pipe
 ASTM A48 Standard Specification for Gray Iron Castings
 ASTM A536 Standard Specification for Ductile Iron Castings
 ASTM B88 Standard Specification for Seamless Copper Water Tube
 ASTM C270 Standard Specification for Mortar for Unit Masonry
 ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
 ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
 ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
 ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
 ASTM D2446 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
 ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Controlled Outside Diameter
 ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
 ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
 ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
 ASTM F594 Standard Specification for Stainless Steel Nuts
 ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
 ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing

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

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

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

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

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

2611.2 MATERIALS

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

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

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

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

A Water Pipe Materials

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

A1 Ductile Iron Pipe and Ductile Iron and Gray Iron Fittings

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

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

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

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

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

A2 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

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

A3 Polyethylene (PE) Pressure Pipe and Fittings

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

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

B Fire Hydrants

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

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

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

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

C Valves and Valve Housing

C1 Valve Housings

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

C2 Gate Valves

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

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

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

C3 Butterfly Valves

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

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

D Water Service Pipe and Fittings

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

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

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

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

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

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

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

E Polyethylene Encasement Material

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

F Mechanical Joint Restraints

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

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

G Mortar

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

H Concrete

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

I Tracer Wire for Non-Conductive Pipe

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

2611.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

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

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

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

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

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

A1 Inspection and Handling

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

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

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

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

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

A2 Pipe Laying Operations

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

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

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

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

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

A3 Aligning and Fitting of Pipe

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

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

A4 Blocking and Anchoring of Pipe

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

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

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

(4) Hardwood blocking shall not be used.

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

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

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

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

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

A5 Polyethylene Encasement of Pipeline

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

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

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

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

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

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

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

B Connection and Assembly of Joints

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

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

B1 Ductile Iron Pressure Pipe and Fitting Joints

B1a Push-On Joints

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

B1b Mechanical Joints

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

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

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

B1c Flanged Joints

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

B2 Polyvinyl Chloride Pipe Joints

B2a Push-On Joints

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

B3 Polyethylene Pipe Joints

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

B4 Tracer Wire for Non-conductive Pipe

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

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

C Water Service Installations

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

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

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

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

C1 Tee Branch Service Lines

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

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

C2 Tapped Service Lines

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

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

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

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

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

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

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

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

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

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

D Setting Valves, Hydrants, Fittings and Specials

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

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

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

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

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

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

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

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

E Disinfection of Watermains

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

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

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

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

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

F Electrical Conductivity Test

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

G Hydrostatic Testing of Watermains

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

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

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

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

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

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

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

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

H Operational Inspection

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

2611.4 METHOD OF MEASUREMENT

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

A Water Pipe

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

B Valves

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

C Corporation Stops

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

D Curb Stops

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

E Hydrants

Hydrants will be measured by the number of units installed.

F Air Vents

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

G Polyethylene Encasement

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

H Ductile and Gray Iron Fittings

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

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

I Polyvinyl Chloride or Polyethylene

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

J Access Structures

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

2611.5 BASIS OF PAYMENT

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

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

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

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

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

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

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

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

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

2621.1 DESCRIPTION

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

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

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

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

The following specifications have been referenced in this Specification:

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

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

ASTM A48 Standard Specification for Gray Iron Castings

ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings

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

ASTM C12 Standard Practice for Installing Vitrified Clay Pipe Lines

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

ASTM C270 Standard Specification for Mortar for Unit Masonry

ASTM C301 Standard Test Methods for Vitrified Clay Pipe

ASTM C361 Standard Specification for Reinforced Concrete Low Head Pressure Pipe

ASTM C425 Standard Specification for Compression Joints for VCP and Fittings

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

ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections

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

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

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

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

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

ASTM D2751 Standard Specification for ABS Pipe and Fittings

ASTM D3034 Standard Specification for PVC Sewer Pipe and Fittings

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

2621.2 MATERIALS

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

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

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

A Sewer Pipe and Service Line Materials

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

A1 Vitrified Clay Pipe and Fittings

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

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

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

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

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

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

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

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

A3 Reinforced Concrete Pipe and Fittings

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

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

A4 Corrugated Steel Pipe and Fittings

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

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

A5 Polyvinyl Chloride Pipe and Fittings

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

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

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

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

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

A6 Cast Iron Soil Pipe

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

A7 Acrylonitrile-Butadiene-Styrene Pipe

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

A8 Corrugated Polyethylene Pipe

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

A9 Solid Wall High Density Polyethylene Pipe

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

A10 Fiberglass Reinforced Pipe

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

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

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

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

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

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

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

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

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

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

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

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

A11 Polypropylene Pipe

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

A12 Tracer Wire for Non-conductive Pipe

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

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

B Metal Sewer Castings

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

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

C Precast Concrete Manhole and Catch Basin Sections

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

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

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

D Mortar

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

E Concrete

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

2621.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

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

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

A1 Inspection and Handling

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

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

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

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

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

A2 Pipe Laying Operations

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

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

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

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

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

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

A3 Connection and Assembly of Joints

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

A4 Bulkheading Open Pipe Ends

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

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

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

B Appurtenance Installations

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

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

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

C Sewer Service Installations

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

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

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

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

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

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

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

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

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

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

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

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

D Manhole and Catch Basin Structures

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

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

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

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

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

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

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

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

E Sanitary Sewer Leakage Testing

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

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

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

E1 Air Test Method

E1a Gravity Sewers

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

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

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

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

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

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

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

FORMULA

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

Calculate all test times by the following formula:

$$T = 0.085 DK/Q$$

where:

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

K = 0.000419 DL but not less than 1.0,

Q = leak rate = 0.0015 CFM/SF,

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

L = length of test section, ft.

E2 Hydrostatic Test Method

E2a Gravity Sewers

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

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

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

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

E2b Pressure Sewers

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

E3 Test Failure and Remedy

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

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

F Deflection Test

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

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

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

F1 Test Failure and Remedy

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

G Televising

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

2621.4 METHOD OF MEASUREMENT

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

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

A Sewer Pipe

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

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

B Manholes

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

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

C Catch Basins

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

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

D Outside Drop Connection

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

E Service Connection

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

F Service Pipe

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

G Special Pipe Fittings

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

H Appurtenant Items

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

2621.5 BASIS OF PAYMENT

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

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

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

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

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

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

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

2631.1 CIPPS DESCRIPTION

A General

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

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

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

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

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

The following specifications have been referenced in this Specification:

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

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

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

ASTM - D638 Standard Test Method for Tensile Properties of Plastics

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

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

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

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

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

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

B Qualifications

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

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

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

B1 Manufactured Products and Installation

Contractors must meet all of the following criteria:

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

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

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

2631.2 CIPPS MATERIALS

A General

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

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

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

A1 CIPPS Fabric Tube

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

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

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

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

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

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

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

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

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

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

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

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

A2 CIPPS Structural Requirements

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

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

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

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

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

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

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

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

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

A3 Material Testing Requirements

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

2631.3 CIPPS CONSTRUCTION REQUIREMENTS

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

A Installation of CIPPS

A1 Access

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

A2 Water Usage

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

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

A3 Cleaning of Sewer Lines

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

A4 Bypassing Wastewater

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

A5 Inspection of Pipelines

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

A6 Line Obstructions

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

inversion process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, if directed by the Owner, the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.

A7 Public Notification

The Contractor shall make every effort to maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be eight (8) hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:

1. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any problem which could arise.
2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP.

A8 Liner Installation

CIPP installation shall be in accordance with the applicable ASTM standards with the following modifications:

1. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction.
2. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
3. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles. The manufacturer's recommended cure schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.

4. The Contractor shall remove protruding taps to the inside wall of the pipe. In no case shall the pipe be less than ninety five percent (95%) open to flow.

A9 Resin Impregnation

The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To insure a through wet-out, the point of vacuum shall be no further than twenty five feet (25') from the point of initial resin introductions. After vacuum in the tube is established, the vacuum points shall be no further than seventy five feet (75') from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular to the longitudinal axis of the tube as possible. A roller system shall be used to uniformly distribute tie resin throughout the tube. If the Installer proposes an alternate method of resin impregnation, the method must produce the same results and the method approved by the Engineer.

A10 Cool Down

The Contractor shall cool the CIPP in accordance with the manufacturer's recommendations. Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP System manufacturer's recommendations.

A11 Finishing Operations

The installed CIPP shall be continuous over the entire length of a sewer line section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe. Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense. The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal. If any of the service connections leak water between the host pipe and the installed liner, the connection mainline interface shall be sealed to provide a watertight connection. If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacture of the CIPP system.

At all points where the liner pipe has been exposed (such as service connection fittings, or other points where the old pipe must be removed), the liner pipe and fittings shall be encased in cement-stabilized sand or other high density material as specified by the Engineer to prevent deflection due to difference in subsidence. After the encasement material is in place and accepted by the Engineer, backfill is placed and compacted to require finish grade in accordance with the specifications. Particular care should be taken to ensure compaction of earth beneath the lateral/service pipe in order to reduce subsidence and resultant bending at the lateral connection at the sewer main.

A12 Manhole Connections

A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole walls in accordance with the CIPP System manufacturer's recommendations.

A13 Reconnections of Existing Services

Services shall be identified by the Contractor prior to lining work. After the pipe has been reconstructed and tested, the service connections shall be reconnected. It is the Contractor's responsibility to make sure that all service connections are reconnected, unless otherwise directed by the Engineer. A CCTV camera and remote cutting tool shall be used for internal reconnections. The machined opening shall be at least ninety five percent (95%) of the service connection opening and the bottom of both openings must match. The opening shall not be more than one hundred percent (100%) of the service connection opening.

The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris. In the event that service reinstatements result in openings that are greater than one hundred percent (100%) of the service connection opening, the Contractor shall install a CIPP type repair, sufficiently in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of over-cut service connections. Discs of pipe material resulting from service tap cutting shall be collected at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Discs shall not be allowed to pass through the system.

A14 CIPP Short-Liner

The CIPP short-liner shall meet the requirements of the full length CIPP liner and the following:

1. The Short-Liner shall be inserted into the existing sewer line with a power winch and steel cable attached to the end of the liner by use of an appropriate pulling head. Length of the liner to be inserted at any one time shall be governed by the length of the section in need of repair or the maximum length of the installation equipment considering the size and condition of the sewer.
2. A mobile installation unit shall be brought to the site ready to process the liner. The installation unit shall contain heat generating equipment, CCTV facility and other auxiliary miscellaneous equipment necessary for controlling processing of the Short-Liner pipe. The equipment shall be positioned next to the point of entry with minimum obstruction to the other side activities and shall be operated by trained personnel only.
3. The pressure shall be increased to compensate for the heating-cooling transition and it shall be maintained until the temperature at the lowest critical point is 100° F (38° C). This shall constitute completion of the Short-Liner pipe processing. The pipe within the pipe shall be tight fitting and adapted to the existing sewer pipe.

B TESTING AND INSPECTION

B1 Testing

CIPP samples shall be prepared and tested in accordance with ASTM F1216, Section 8.1, using either method proposed. Leakage testing of the CIPP shall be accomplished during cure while under a positive head. CIPP products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g., a removable bladder) must be tested by an alternative method approved by the Engineer.

B2 Inspection

Visual inspection of the CIPP shall be in accordance with ASTM F1216, Section 8.4. The relined pipe shall be continuous without joints through the entire pipe length. The liner shall be free of all visible defects except those resulting from pre-lined conditions which the Contractor has noted prior to lining. There shall be no pits, pinholes, cracks, or crazing, and the surface shall be smooth and free of waviness throughout the pipe. Any defects shall be repaired by the Contractor with no expense to the Owner. Where leakage is observed through the wall of the pipe, the contractor shall institute additional testing including but not limited to air testing, localized testing and any other testing that will verify the leak proof integrity of the installed CIPP to the satisfaction of the Owner.

B3 Televising

Prior to final acceptance of any sanitary sewer relining including short-liners, the Contractor shall inspect by means of remote closed circuit television equipment the entire segment of sanitary sewer, manhole-to manhole. Sewer shall be cleaned prior to inspection. A videotape of the inspection shall be furnished to the City. The following conditions shall apply to the sewer acceptance TV inspection:

1. The videotape shall be in a format to be decided by the Owner, that creates high quality picture and sound and shall be recorded in color.
2. The TV camera shall be pulled through the sewer at a maximum rate of thirty five feet (35') per minute.
3. The camera shall be pulled downstream in all cases.
4. The lens of the camera shall be cleaned at each manhole or when directed by the Owner.
5. The recording shall have an on-screen display showing the following:
 - a. Upstream and downstream manhole numbers
 - b. Footage from the upstream manhole
 - c. Inspection date
6. Sewers shall not be televised within forty eight (48) hours of a rainfall event greater than one half inch ($\frac{1}{2}$ ").
7. The CIPPS shall be re-televised one (1) month prior to expiration of the one-year warranty. A videotape and written report shall be supplied to the City.

2631.4 CIPPS METHOD OF MEASUREMENT

Measurement for CIPP Lining shall be on a linear foot basis, to the nearest whole foot, measured from center of manhole to center of manhole.

2631.5 CIPPS BASIS OF PAYMENT

The proposal form shall cover all work shown on the contract drawings, specifications, and Special Provisions. All costs associated with the work including furnishing of all materials, providing all construction and equipment, and performing all necessary labor, coordination, supervision, and management to fully complete the work, shall be included in the unit or lump sum prices quoted in the proposal form. This work shall include restoration of all surfaces to their original condition or better. Reconnection of all existing services shall be considered incidental to the CIPPS. All work not specifically set forth as a pay item in the proposal form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the amounts and prices submitted in the proposal form.

The following methods of measurement for payment will be used to derive the quantities installed:

1. Site Protection and Restoration
 - a) No separate payment will be made for protection and restoration of roadway surfaces, curb and gutter, landscaping, and other site features unless otherwise specified.
2. Spot Repair to existing pipe
 - a) Bid items have been provided in the proposal for removal and replacement of pipe as Spot or Point Repairs. No additional compensation will be granted for repairs.
3. Cured-in-Place Pipe System (CIPPS)
 - a) Payment shall be made at the unit price as listed on the proposal. All work related to the cleaning, installation and acceptance of the system as a whole shall be considered incidental to CIPPS installation.
 - b) Payment for re-instatement of services shall be at the unit price listed on the proposal per each service, and shall be compensation in full for all materials, labor, equipment, and maintenance necessary to complete the work as required by the plans or required by the Engineer.
 - c) Payment for Short-Liner installations shall be made at the unit price listed on the proposal and shall be compensation in full for all materials, labor, equipment, and maintenance necessary to complete the work as required by the plans or required by the Engineer.

SECTION 2641 – STANDARD SPECIFICATIONS FOR PIPELINE REHABILITATION BY PIPE BURSTING

2641.1 DESCRIPTION

A General

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

This specification shall cover the rehabilitation of existing gravity and pressure utility pipelines using pipe bursting methods. Pipe bursting is a process by which the bursting unit fractures the existing pipe while simultaneously installing a new pipe of the same size or larger size pipe in the place of the existing pipe. Existing lateral and service connections are disconnected prior to mainline pipe bursting to reduce lateral pipe/service pipe damage, then reconnected after testing and disinfection of the new pipe as applicable is approved, television inspection of the new pipe is performed, and the installation is completed in accordance with the contract documents.

2641.2 QUALIFICATIONS

The Contractor shall be certified by the particular Pipe Bursting System Manufacturer as a fully trained installer of the pipe bursting system. The Contractor shall provide certifications of training and proficiency in the use of the equipment. Only the Contractor’s employees that are trained and certified shall operate the equipment.

The Contractor shall have a minimum of five (5) years’ experience using the pipe-bursting method proposed and shall have installed no less than 50,000 feet by this method.

2641.3 MATERIALS

Pipe materials meet the requirements described in Sections 2611.2 and 2621.2 of these specifications, and as provided in the Special Provisions and the following:

1. Sizes of the new pipe insertions shall be such to renew the pipe mainline to greater than the original flow capacity.
2. All pipe and fittings shall be made of virgin material. No rework except that obtained from the manufacturer’s own production of the same formulation shall be used.
3. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
4. Tensile strength of the pipe shall be in accordance with manufacturer’s recommendation for the specified purpose and method of installation.
5. Material color shall be as specified with interior of pipe having a light reflective color to allow for viewing for television inspection. The fused pipe joints shall be de-beaded to reduce collection of sediment and allow a camera to pass during inspection.

6. The Contractor shall consult with the selected pipe bursting equipment manufacturer regarding recommendations for the installation of pipe materials specified.

2641.4 SUBMITTALS

The Contractor shall submit the following:

1. Tests for compliance with this specification shall be made as specified herein and in accordance with the applicable ASTM Specification. A certificate from the manufacturer indicating the materials furnished meet the requirements of these specifications.
2. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.
3. Certification of Contractor and assigned personnel training for installing pipe.
4. Detailed submittal of the procedures and method proposed by the Contractor to burst the existing pipe and insert the new pipe.
5. Television inspection reports and video made of the existing pipe and after new pipe installation.

2641.5 DELIVERY, STORAGE, AND HANDLING

The Contractor shall transport, handle, and store pipe and fittings as recommended by the manufacturer. If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Engineer at the Contractor's expense, before proceeding further. Deliver, store and handle other materials as required to prevent damage.

2641.6 LICENSE AGREEMENTS

The Contractor shall submit evidence acceptable to the Owner, such as a certified copy of a license or agreement that it has the authority to use the proposed method from the patent holder and licensed manufacturer. The Contractor agrees to defend, indemnify, and hold harmless the Owner and the Engineer against all claims, suits, and actions or other damages as a result of negligence of any person or property arising out of patent infringement by the Contractor or the Contractor's employee's, agents, the suppliers, or any tier of subcontractors involved in the work.

2641.7 CONSTRUCTION REQUIREMENTS

Before excavation is started, it will be the responsibility of the Contractor to check with the various utility companies and determine the location and depth of the existing utilities in the vicinity of the work area.

Damage to utilities and the resulting repair, temporary service cost, etc., shall be borne by the Contractor. Access pits shall be backfilled in accordance with Section 2600, Trench Excavation and Backfill.

All excavations shall be properly sheeted/shored in accordance with relevant specifications for trench safety systems. Any damage resulting from improperly shored excavations shall be corrected to the satisfaction of the Engineer with no compensation to the Contractor.

All open excavations shall be kept secure at all times by the use of barricades and fencing with appropriate lights and signs, construction tape, covering with steel plates, etc., or as directed by the Engineer.

All lateral and service connections shall be identified, located and excavated prior to the pipe insertion to expedite reconnection. The Contractor shall use excavation methods that will not create a rise or sag at the service or lateral connection for gravity sewers. A rise or sag in the sewer will be repaired by the contractor at no expense to the Owner, in a manner approved by the Engineer.

The location and number of insertion and receiving excavations shall be planned by the Contractor and submitted in writing for approval by the Engineer at least ten (10) days prior to excavation.

One (1) or more receiving pits shall be excavated at the end(s) of the pipe to be replaced or at appropriate points within the length of the existing pipe. Pit shall be centered over the existing pipe. The number of pits for machine and pipe insertion shall be the minimum necessary to most efficiently accomplish the work. The Contractor shall give consideration to the use of excavation required for other purposes such as for sanitary sewer service reconnections and manhole replacement.

Where manholes are used as machine or new pipe insertion pits, the Contractor shall identify such manholes and replace them at no additional cost to the Owner if damaged. Any manhole modification or replacement required shall be considered incidental to the installation of the new pipe. Equipment used to perform the work shall be located away from buildings so as not to create noise impact. Provide a silent engine compartment to reduce machine noise as required to meet local requirements.

The Contractor shall install all pulleys, rollers, bumpers, alignment control devices, and other equipment required to protect existing manholes and pipe components not intended for removal/replacement, and to protect the new pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. If lubrication is used for insertion, the Contractor shall ensure that the lubricant does not backfill existing services. Under no circumstances will the pipe be stressed beyond eighty percent (80%) of its elastic limit as published and recommended by the manufacturer.

Pipe insertion shall be continuous and without interruption from manhole to manhole for sewers, or junction to junction for watermain, except as approved by the Engineer. Upon completion of insertion of the new pipe, and after the relaxation period, the Contractor shall expedite the reconnection of laterals and services so as to minimize any inconvenience to customers. Connection of services shall be in accordance with Sections 2611 and 2621 of these specifications and as provided in the Special Provisions.

The installed pipe shall be allowed the manufacturer's recommended amount of time, but not less than four (4) hours, for cooling and relaxation due to tensile stressing prior to any reconnection of service lines, sealing of the annulus or backfilling of the insertion pit. Sufficient

excess length of new pipe, but not less than four inches (4"), shall be allowed to protrude into manholes. Restraint of pipe ends shall be achieved by means of electrofusion couplings. The electrofusion couplings shall be slipped over pipe ends against manhole wall and fused in place. Installation of electrofusion couplings shall be done in accordance with the manufacturers recommended procedures.

Following the relaxation period, the annular space at the manhole shall be sealed. Sealing shall be made with material approved by the Engineer and shall extend a minimum of eight inches (8") into the manhole wall in such a manner as to form a smooth, uniform, watertight joint.

Fused pipe joints shall be de-beaded to create a smooth flow line. There shall be no ridges or burrs from the fusion method exposed on the interior of the pipe following installation.

Tracer wire shall be installed with the pipe in accordance with 2611 and 2621.

Equipment: The pipe bursting tool shall increase the external dimensions sufficiently, causing breakage of the existing pipe at the same time expanding the surrounding ground. Simultaneously, the new pipe, directly attached to the expander, shall also move forward. See manufacturer's specifications for what size tool should be used in what diameter of pipe, as well as parameters of what size tool for percentage of upsize allowed.

The bursting head shall incorporate a shield/expander to prevent collapse of the hole ahead of the pipe insertion.

Bypass Pumping: The Contractor, when and where required for sanitary sewer replacement, shall provide diversion for the pipe bursting/replacement process. The pumps and by-pass lines shall be of adequate capacity and size to handle all flows. All costs for by-pass pumping required during installation of the pipe shall be incidental to the installation of the pipe, unless otherwise provided in the Special Provisions.

Temporary Water: The Contractor when and where required for watermain replacement, shall provide all labor, materials, and equipment associated with managing, constructing, and maintaining a temporary potable water distribution system for all existing water users which must be taken out of service for a period exceeding eight (8) hours, or as required at the discretion of the Engineer. All costs to provide temporary water required during installation of the pipe shall be incidental to the installation of the pipe, unless otherwise provided in the Special Provisions.

2641.8 TESTING AND INSPECTION

Testing: Tests for compliance with this specification shall be made as described herein and in accordance with the applicable ASTM Specification. A certificate with this specification shall be furnished, upon request, by the manufacturer for all material furnished under this specification.

Inspection: Video inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit color television. Video inspection shall include the following:

- Two (2) copies of the DVD's in mpeg4 format (post) to be submitted to the Owner before final invoice.

- DVD's are to remain property of the Owner; Contractor to retain second copy.
- All flows tributary to reach of sewer being inspected are to be completely by-passed around the reach during inspection if necessary and required by the Owner.
- Pre-construction video of the existing pipe and post construction video inspection upon completion of reconstruction of each reach of pipe, with the voice description, with stationing of services indicated. Data and stationing to be on video.
- Should any portion of the video inspection be of inadequate quality or coverage, as determined by the Owner the Contractor will have the portion re-inspected and video recorded at no additional expense to the Owner.

2641.9 METHOD OF MEASUREMENT

Measurement for pipe bursting shall be on a linear foot basis, to the nearest whole foot, measured from center of manhole to center of manhole or junction point to junction point as indicated on the plans.

2641.10 BASIS OF PAYMENT

Pipe Bursting: The work performed as prescribed by this item will be paid for by the linear foot at the unit price bid for the pipe bursting/replacement at the specified pipe diameter and location which price shall be full compensation for the installation of the new pipe, furnishing and placing of all materials, labor, tools, equipment, cleaning, and preparation of the existing pipe to receive the new pipe, tracer wire, pipe bedding, backfill material, annulus sealing material and launching pits, and video inspection of final installed pipe, bypass pumping, temporary water distribution, traffic control, sealing at manholes, locating, excavating, disconnecting, testing in accordance with the Contract Documents, and all else incidental thereto for which separate payment is not provided under other Items in the Bid Form.

APPENDIX B

CITY OF NORTH ST. PAUL STANDARD DETAIL PLATES

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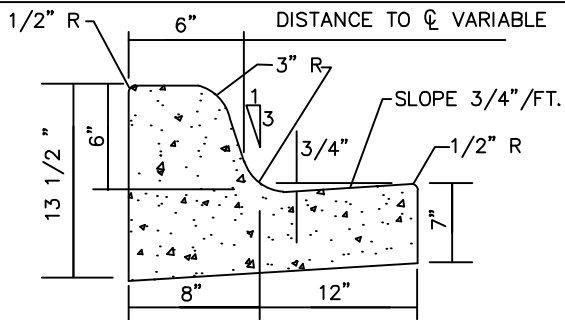
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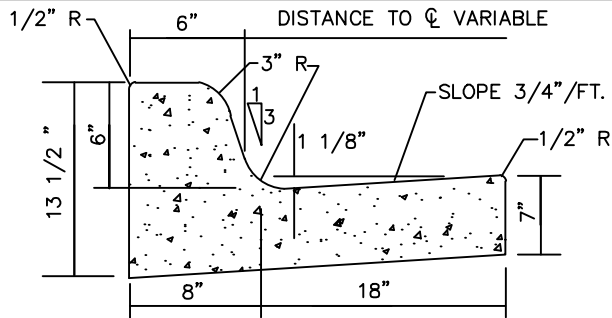
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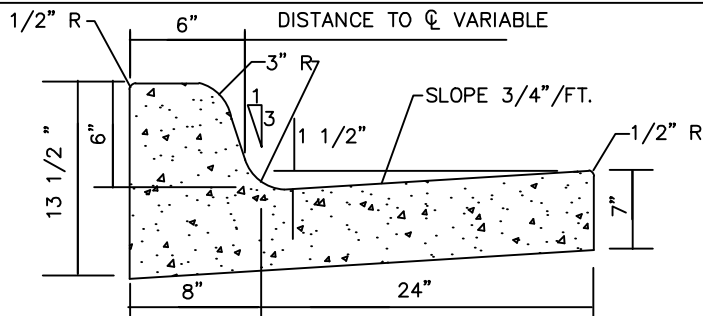
MnDOT B 612

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LIN. FT. PER CY OF CONCRETE = 21.1



MnDOT B 618

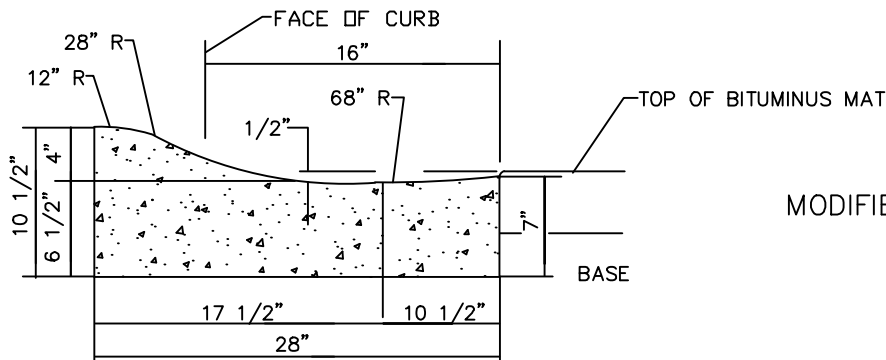
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LIN. FT. PER CY OF CONCRETE = 17.2



MnDOT B 624

CY CONCRETE PER
LIN. FT = 0.0690

LIN. FT. PER CY
OF CONCRETE = 14.5



MODIFIED 'S' DESIGN

NOTES:

2. PLACE A "W" AND/OR "S" STAMP PER CITY PLATE ST-2 ON FACE OF CURB WHERE CURB & GUTTER CROSSES AT WATER AND/OR SANITARY SERVICE. STAMPING OF SERVICE LOCATIONS SHALL BE CONSIDERED INCIDENTAL TO THE PRICE OF THE CURB.
3. MINIMUM OF 3" CLASS 5 AGGREGATE BASE UNDER ALL CURB AND GUTTER
4. 2-#4 REINFORCING RODS AT CATCH BASINS, 20 FEET LENGTH, CENTERED ON THE STRUCTURE.
5. CONTROL JOINTS SHALL CONFORM WITH MNDOT SPEC

NO SCALE



**NORTH
ST. PAUL**

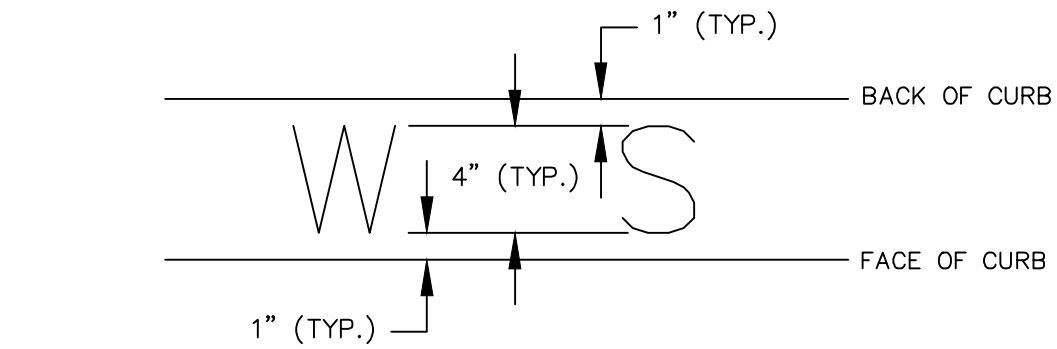
**CONCRETE CURB
AND GUTTER**

SPECIAL DETAILS

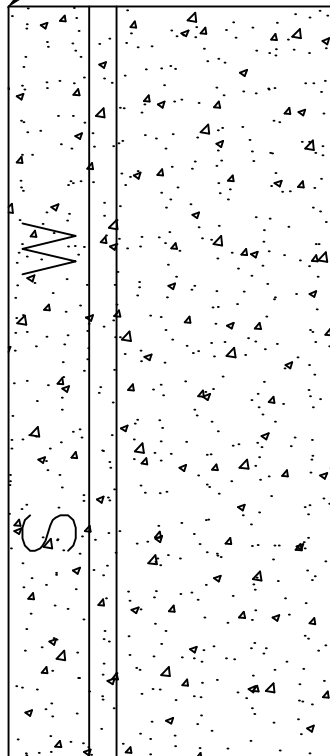
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Revised:

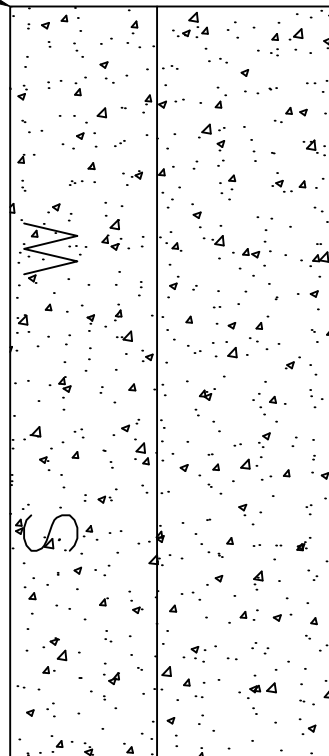
ST-1



BACK OF CURB



B612 & B618



D412 & D418



NORTH
ST. PAUL

UTILITY SERVICE
CURB STAMPS

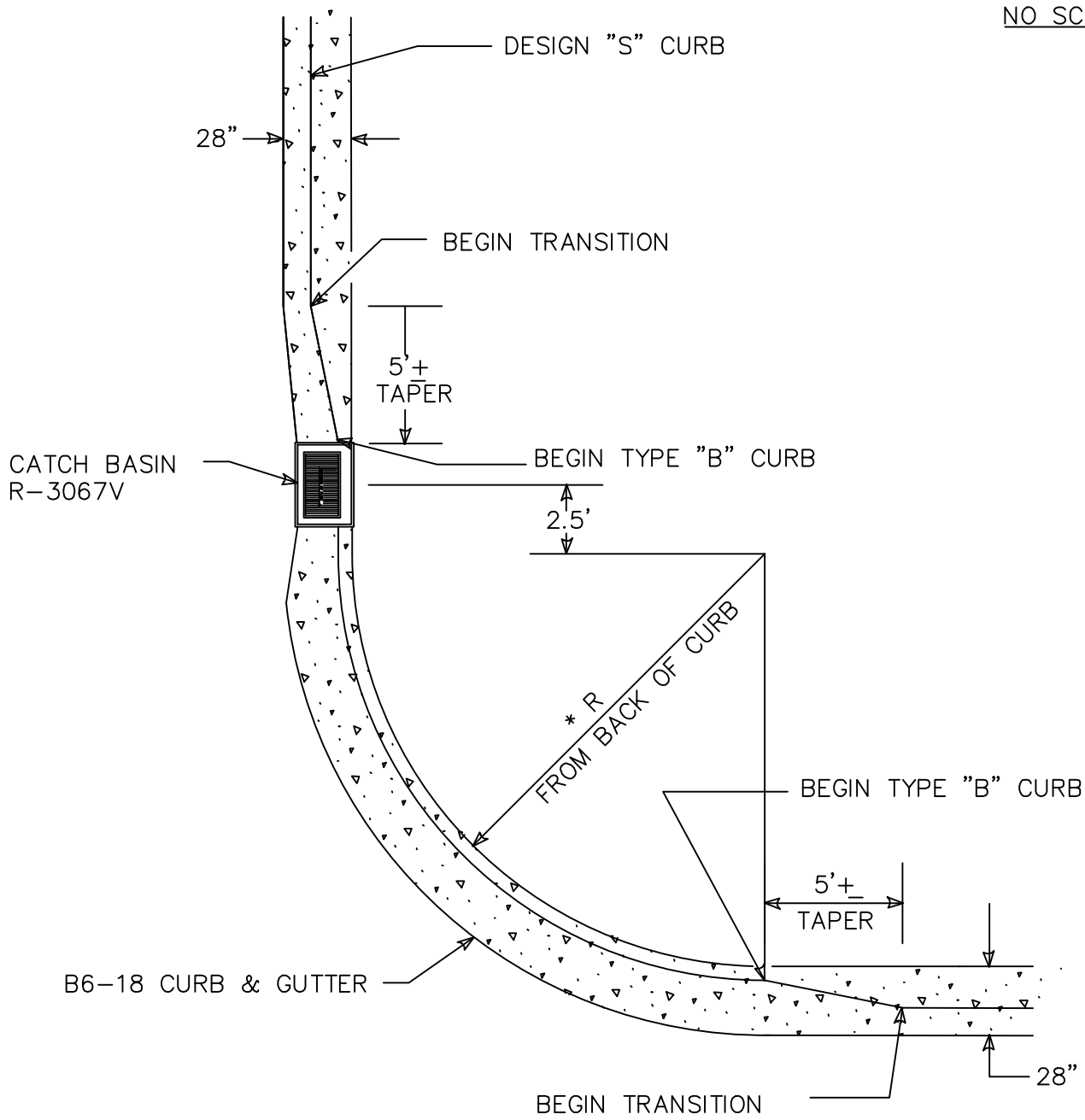
SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-2

NO SCALE



NOTES:

1. SEE STANDARD DETAIL PLATE FOR CONCRETE CURB AND GUTTER DETAILS



NORTH
ST. PAUL

STANDARD STREET RADIUS
FOR CONCRETE CURB
AND GUTTER

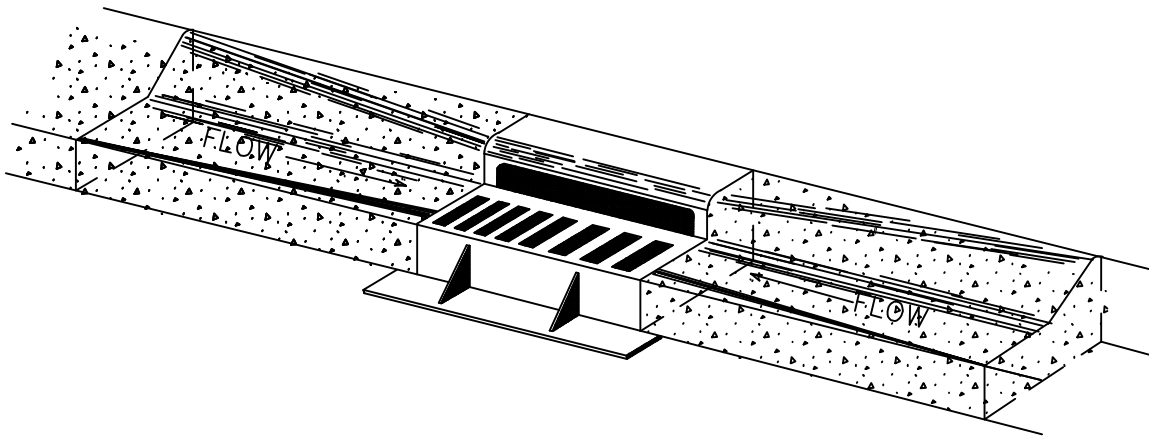
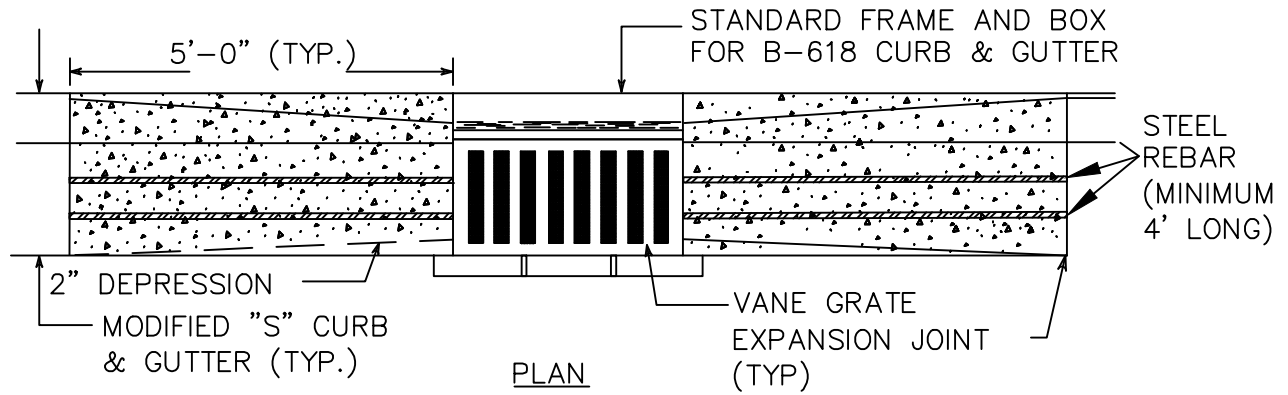
SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-3

NO SCALE



NOTES:

1. MODIFIED "S" CURB AND GUTTER TO BE FORMED INTO B618 TYPE CURB AT CATCH BASIN CASTING.



NORTH
ST. PAUL

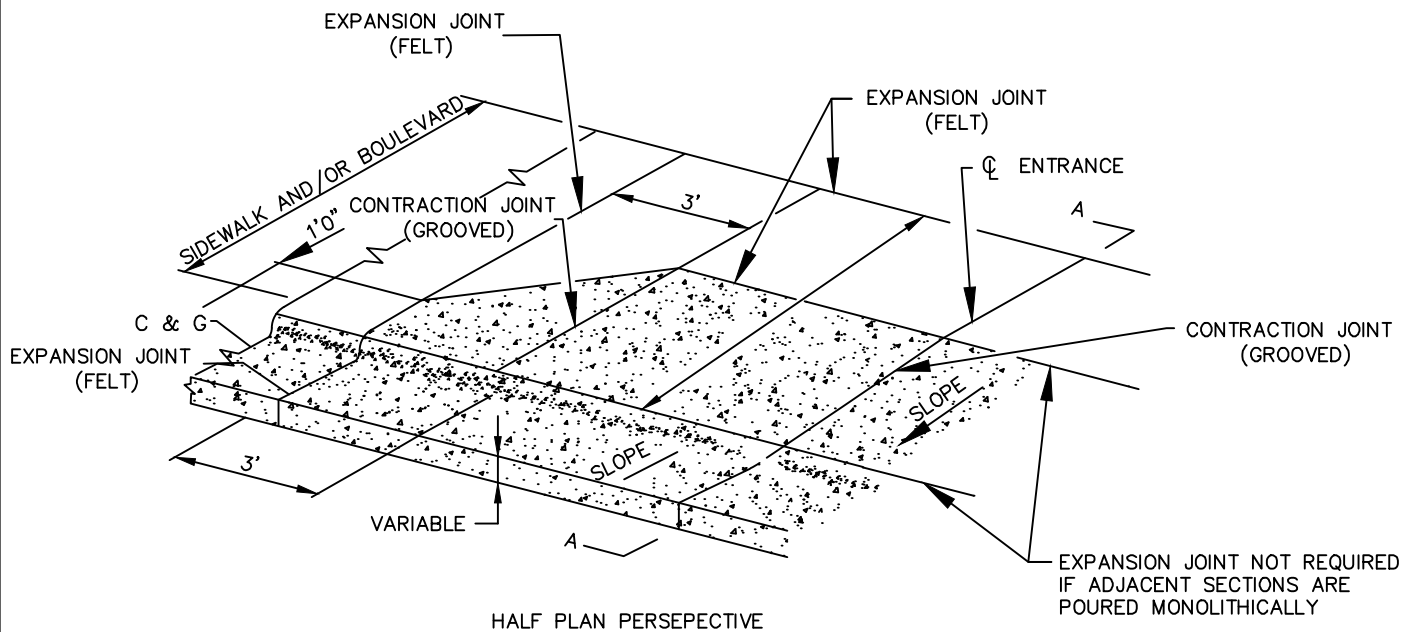
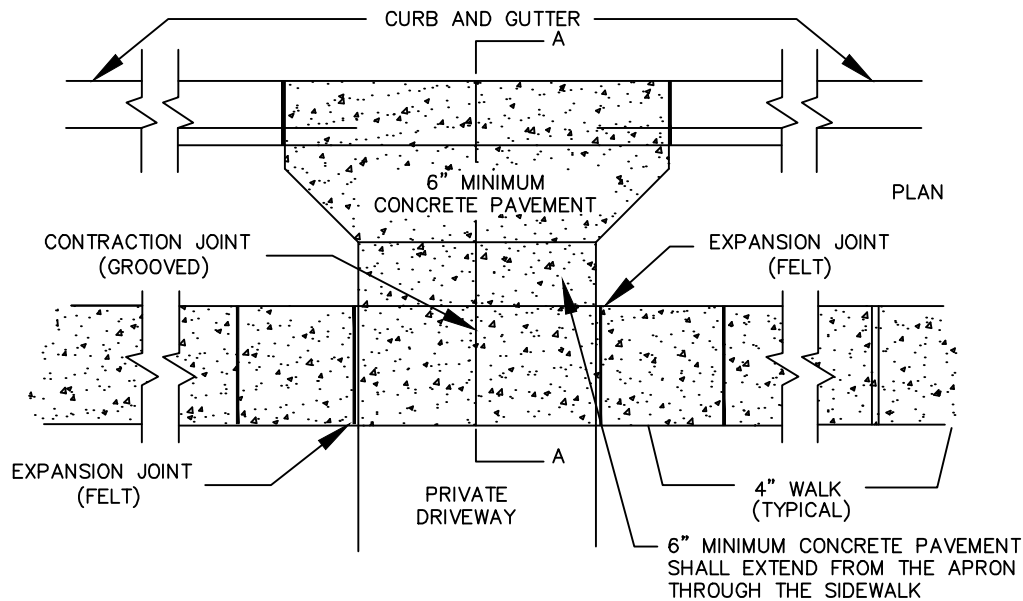
SURMOUNTABLE CURB &
GUTTER AT CATCH BASIN

SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-4



NOTES:

1. DRIVEWAYS WITH GRADE GREATER THAN 10% MUST OBTAIN ENGINEERING DEPT. APPROVAL.
2. DRIVEWAY AREA MUST MEET CODE FOR LOT COVERAGE.
3. NO DRIVEWAY SHALL BE CLOSER THAN 40' FROM END OF CORNER RADII.
4. DRIVEWAY WIDTH IS 22' MAXIMUM FROM RIGHT-OF-WAY LINE TO BACK OF CURB.
5. DRIVEWAYS SHALL BE NO CLOSER THAN 5' FROM THE ADJACENT PROPERTY LINE.
6. A FORD A-1 METER BOX IS REQUIRED FOR ALL CURB STOPS LOCATED WITHIN THE DRIVEWAY.
7. JOINT WIDTH SHALL BE AS SPECIFIED IN Mn/DOT 2521.



NORTH
ST. PAUL

TYPICAL RESIDENTIAL DRIVEWAY

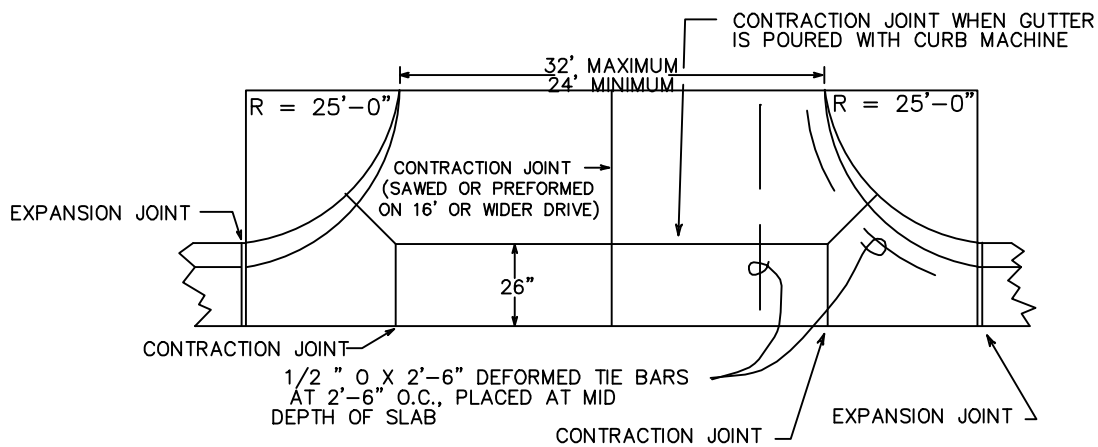
SPECIAL DETAILS

Date: Jan. 2016

Revised:

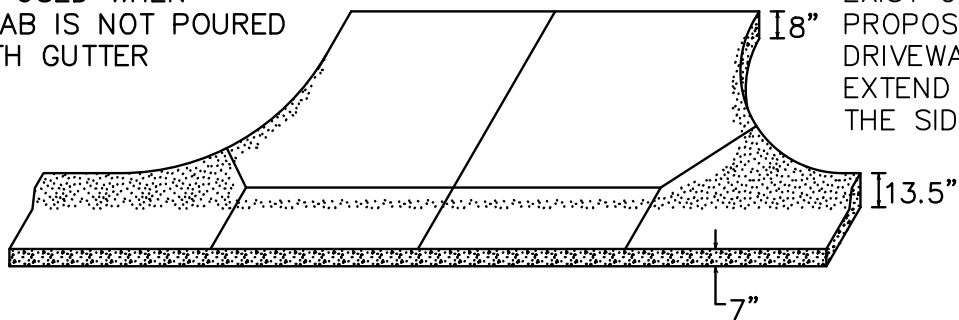
ST-5

NO SCALE



PLAN

STEEL TO BE USED WHEN DRIVEWAY SLAB IS NOT POURED INTEGRAL WITH GUTTER (SEE ABOVE)



WHERE SIDEWALKS EXIST OR ARE PROPOSED, THE DRIVEWAY SHALL EXTEND THROUGH THE SIDEWALK

SECTION

NOTES:

1. DRIVEWAYS WITH GRADE GREATER THAN 10% MUST OBTAIN ENGINEERING DEPT. APPROVAL
2. DRIVEWAY AREA MUST MEET CODE FOR LOT COVERAGE
3. NO DRIVEWAY SHALL BE CLOSER THAN 40' FROM END OF CORNER RADII
4. 2% MAX. CROSS-SLOPE ON SIDEWALKS



NORTH
ST. PAUL

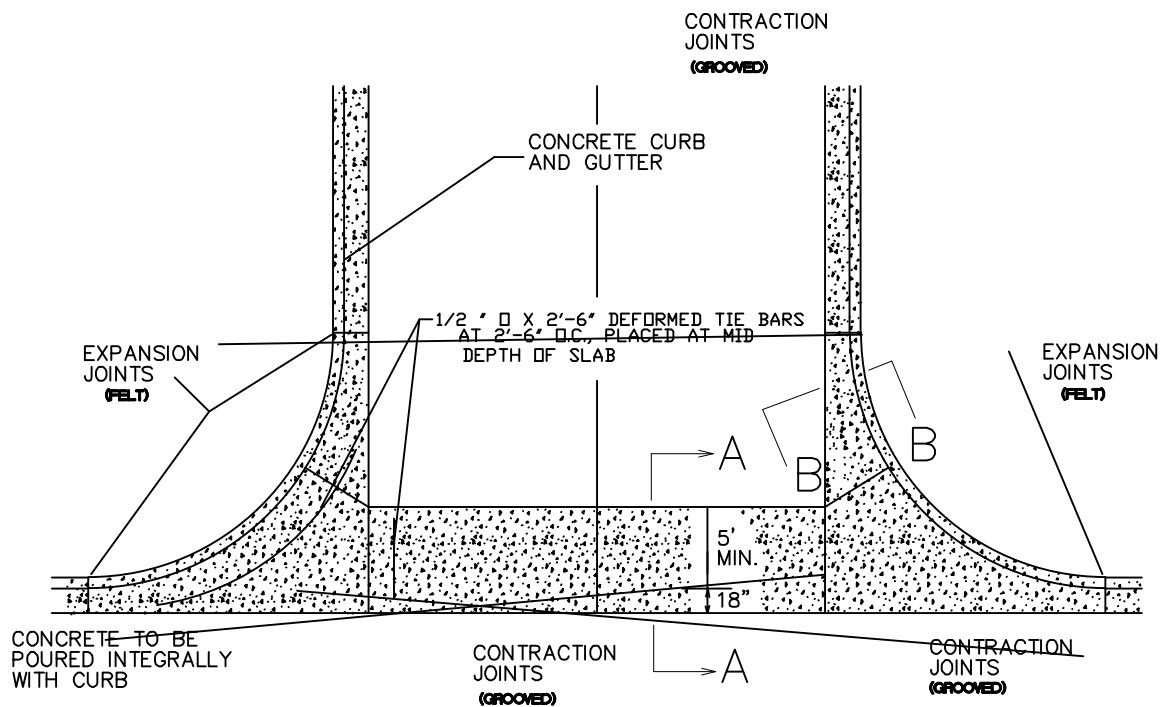
COMMERCIAL AND MULTI-FAMILY
DRIVEWAY WITHOUT CURB

SPECIAL DETAILS

Date: Jan. 2016

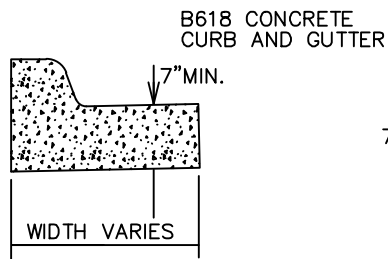
Revised:

ST-6

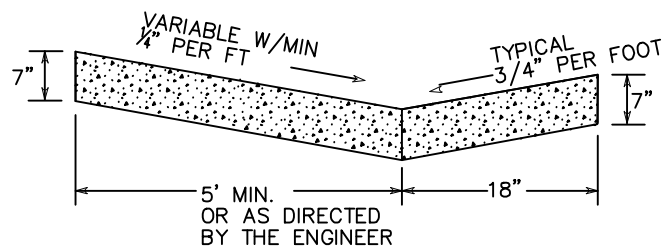


PLAN

NO SCALE



SECTION B-B



SECTION A-A

NOTES:

1. STEEL TO BE USED WHEN DRIVEWAY SLAB IS NOT POURED INTERGRAL WITH GUTTER (SEE ABOVE)
2. WHERE SIDEWALKS EXIST OR ARE PROPOSED, THE DRIVEWAY SHALL EXTEND THROUGH THE SIDEWALK WITH THE CURB DROPPED
3. 2% MAX. CROSS-SLOPE ON SIDEWALKS



**NORTH
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**COMMERCIAL AND MULTI-FAMILY
DRIVEWAY WITH CURB**

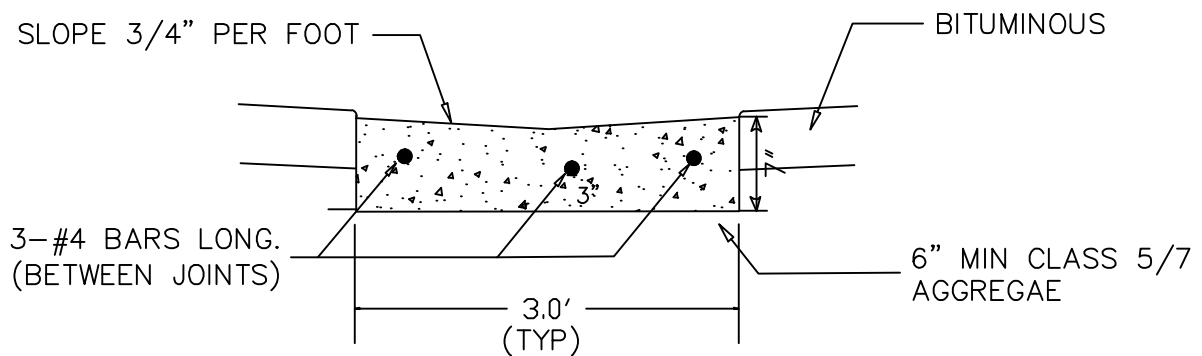
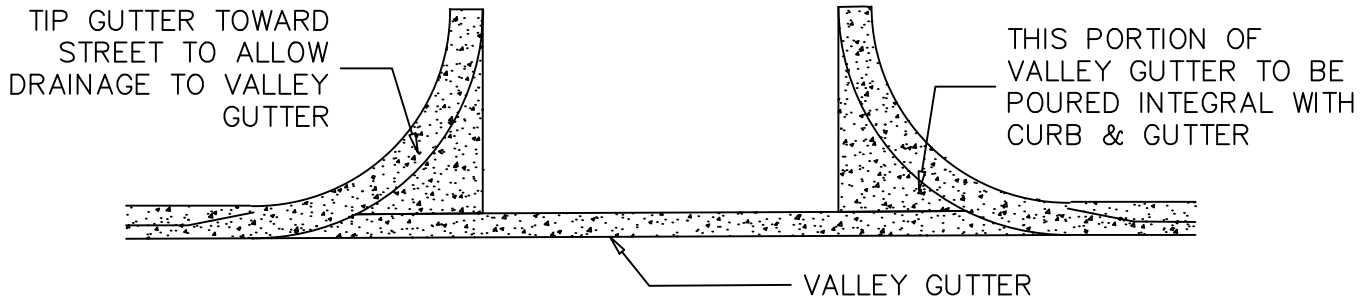
SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-7

NO SCALE



NOTES:

1. SEE PLATE NO. ST-2 FOR CONCRETE CURB AND GUTTER DETAILS
2. #4 ROD TO BE USED IN VALLEY GUTTER FROM EXPANSION JOINT TO EXPANSION JOINT
3. PAID AS 7" CONCRETE VALLEY GUTTER



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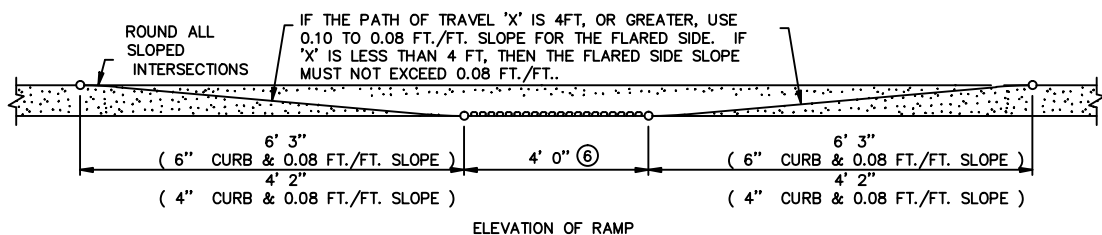
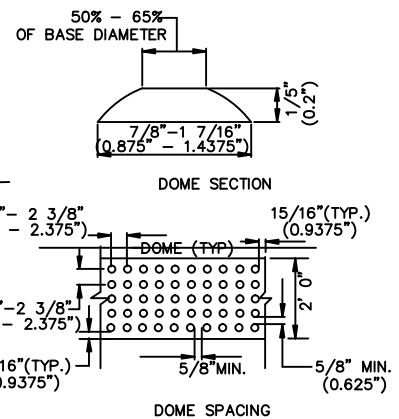
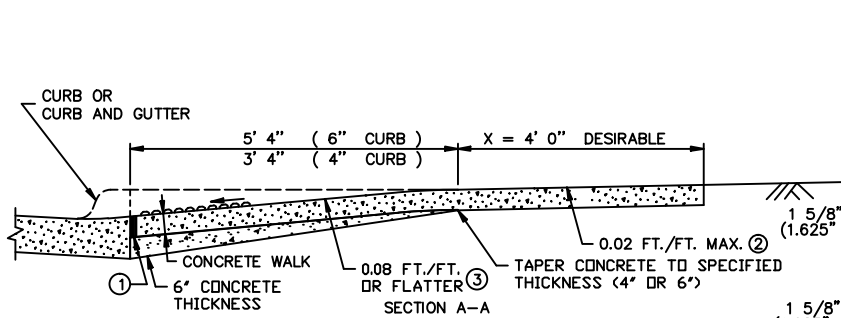
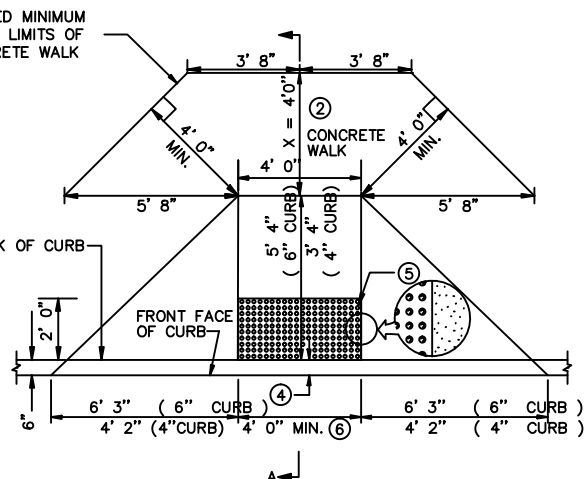
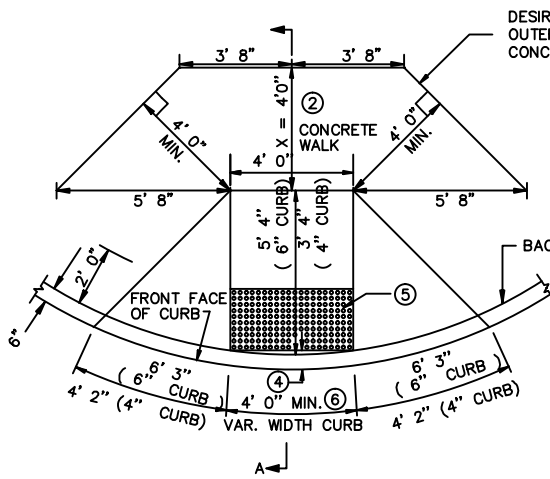
TYPICAL CONCRETE
VALLEY GUTTER

SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-8



NOTES:

1. ALL ADA RAMPS SHALL COMPLY WITH THE MOST UP-TO-DATE PROWAG REQUIREMENTS OR MNDOT ADA DETAIL. WHICHEVER IS MORE STRICT.



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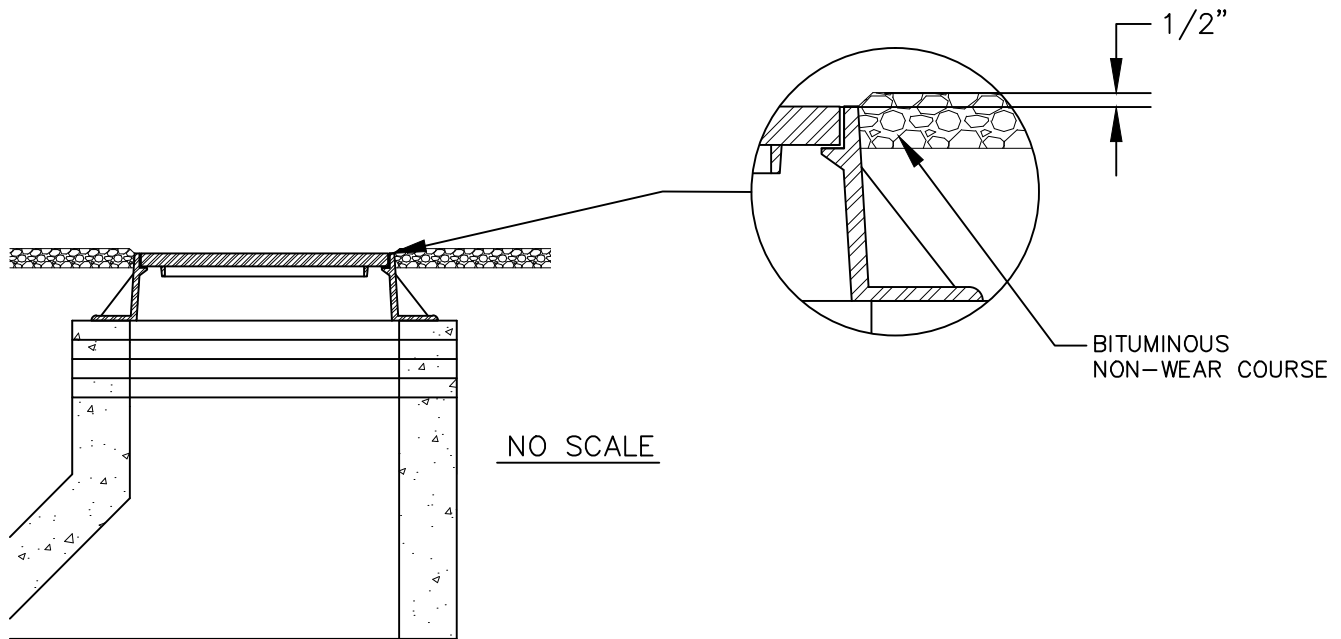
ADA RAMP
(TRUNCATED DOMES)

SPECIAL DETAILS

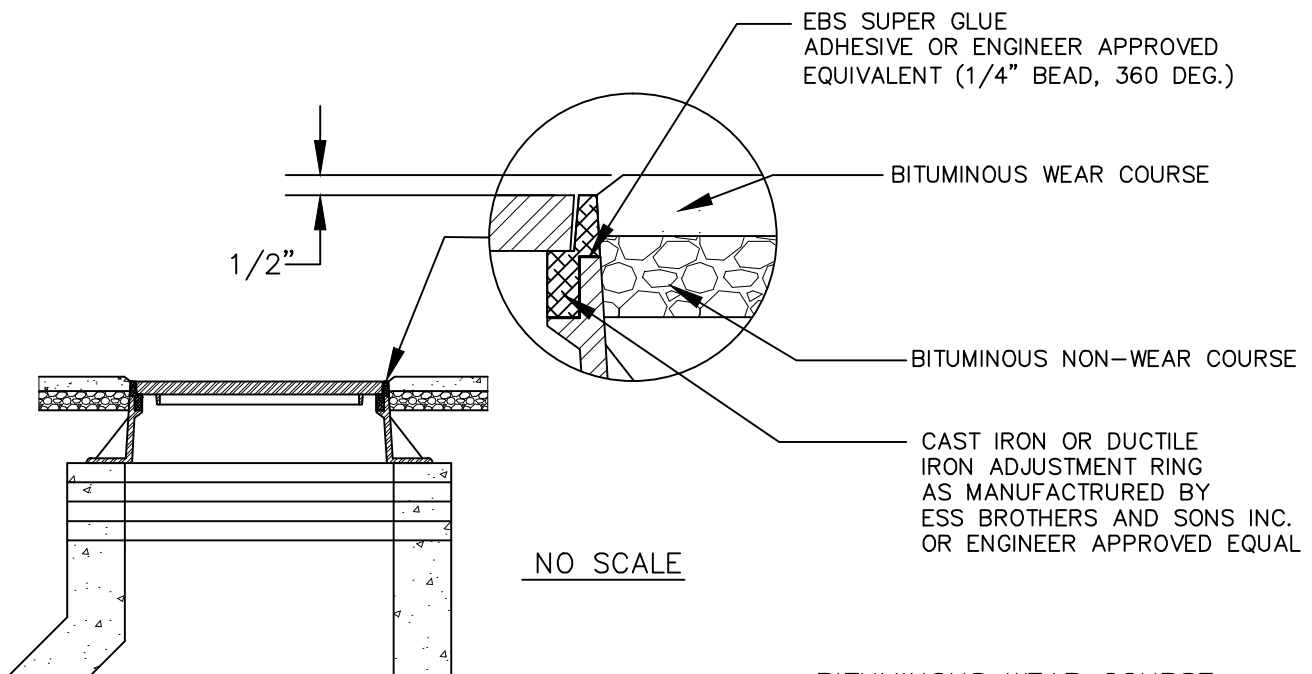
Date: Jan. 2016

Revised:

ST-9



BITUMINOUS BASE COURSE
ADJUSTMENT DETAIL



BITUMINOUS WEAR COURSE
ADJUSTMENT DETAIL

NOTES:

1. THE HEIGHT OF THE CAST IRON OR DUCTILE IRON ADJUSTMENT RING IS DETERMINED BY THE THICKNESS OF THE OVERLAY.
2. CAST IRON OR DUCTILE IRON ADJUSTMENT RINGS TO BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATION.



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CASTING ADJUSTMENT
DETAIL

SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-10

TYPICAL GROUPING MAY VARY
FROM 1 TO BOXES AS
DETERMINED BY THE UNITED
STATES POSTAL SERVICE

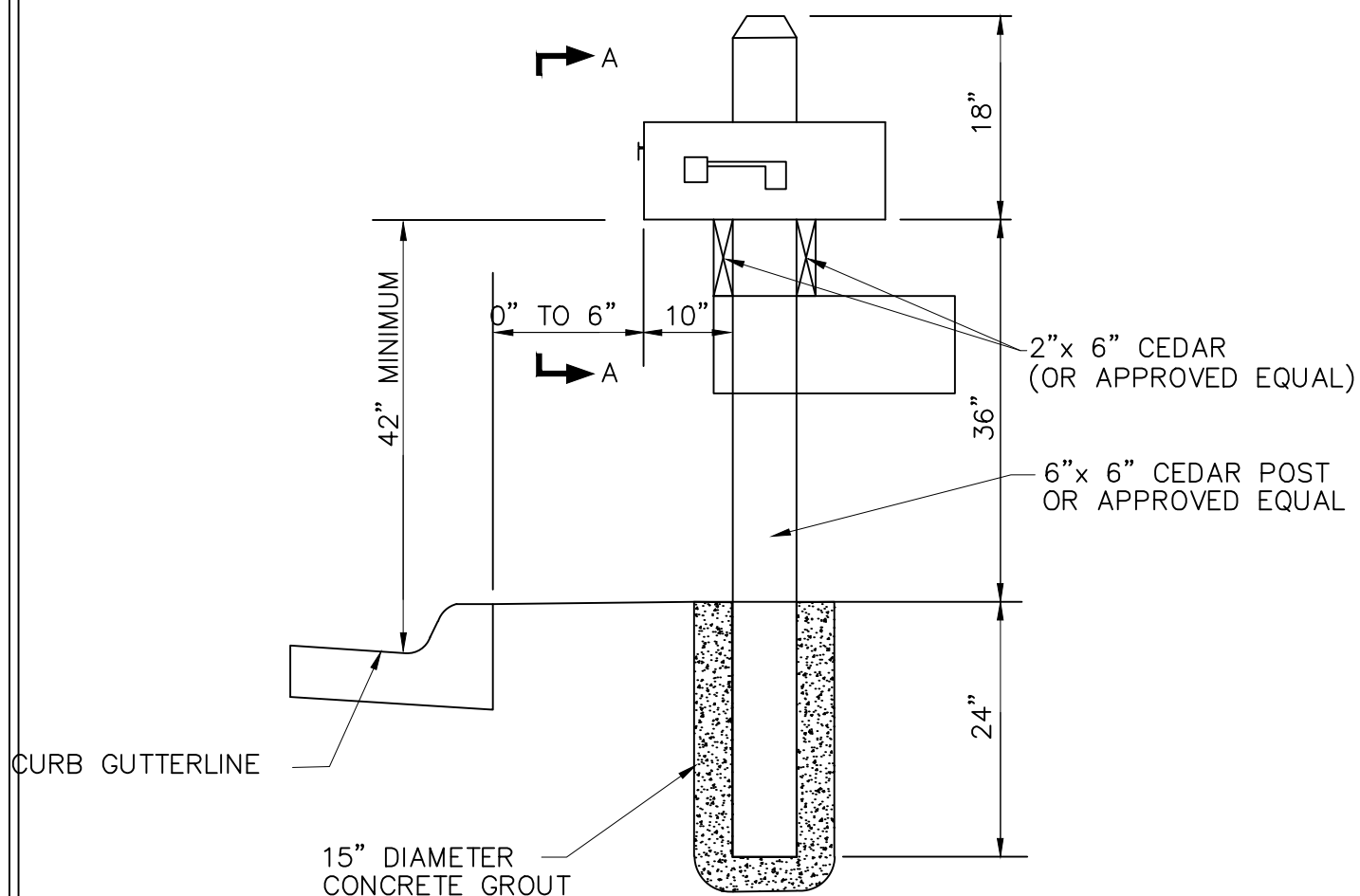
U.S. POST OFFICE APPROVED
METAL MAIL BOX (BLACK MAIL
BOX WITH WHITE NUMBERING)

NEWSPAPER BOX

2"x 6" CEDAR
(OR APPROVED EQUAL)
ATTACH TO POST USING
4-1/4" GALVANIZED LAG BOLTS

- 6" x 6" CEDAR POST
OR APPROVED EQUAL

SECTION A-A



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MAILBOX DETAIL

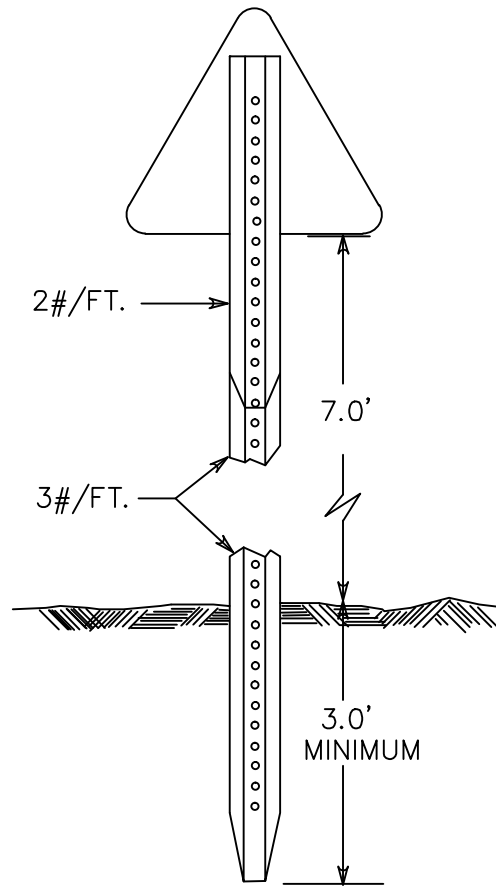
SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-11

NO SCALE



TRAFFIC SIGN SPECIFICATIONS

STOP SIGN SHALL BE R1-1, 30" X 30"
OR AS DIRECTED BY CITY ENGINEER.

ALUMINUM SHALL BE 5052-H38 OR 6061-T6 ALLOY.
GAUGE SHALL BE: 0.080 ON THE LONGEST SIDE UP TO 30"
0.100 ON THE LONGEST SIDE (OVER 30")

REFLECTING SHEETING SHALL BE HIGH INTENSITY.
ALL SIGNS CONFORM TO MN MUTCD AND MOST CURRENT
MNDOT REQUIREMENTS UNLESS APPROVED BY CITY ENGINEER.

CHANNEL POST SPECIFICATIONS

STEEL CHANNEL POSTS SHALL WEIGH 2LB./FT OR
3LB./FT. AS REQUIRED. POSTS SHALL BE PUNCHED ON
1" CC AND PAINTED GREEN. POSTS SHALL BE OF THE
4-RIB DESIGN. POSTS ARE TO BE 7 FEET IN LENGTH.



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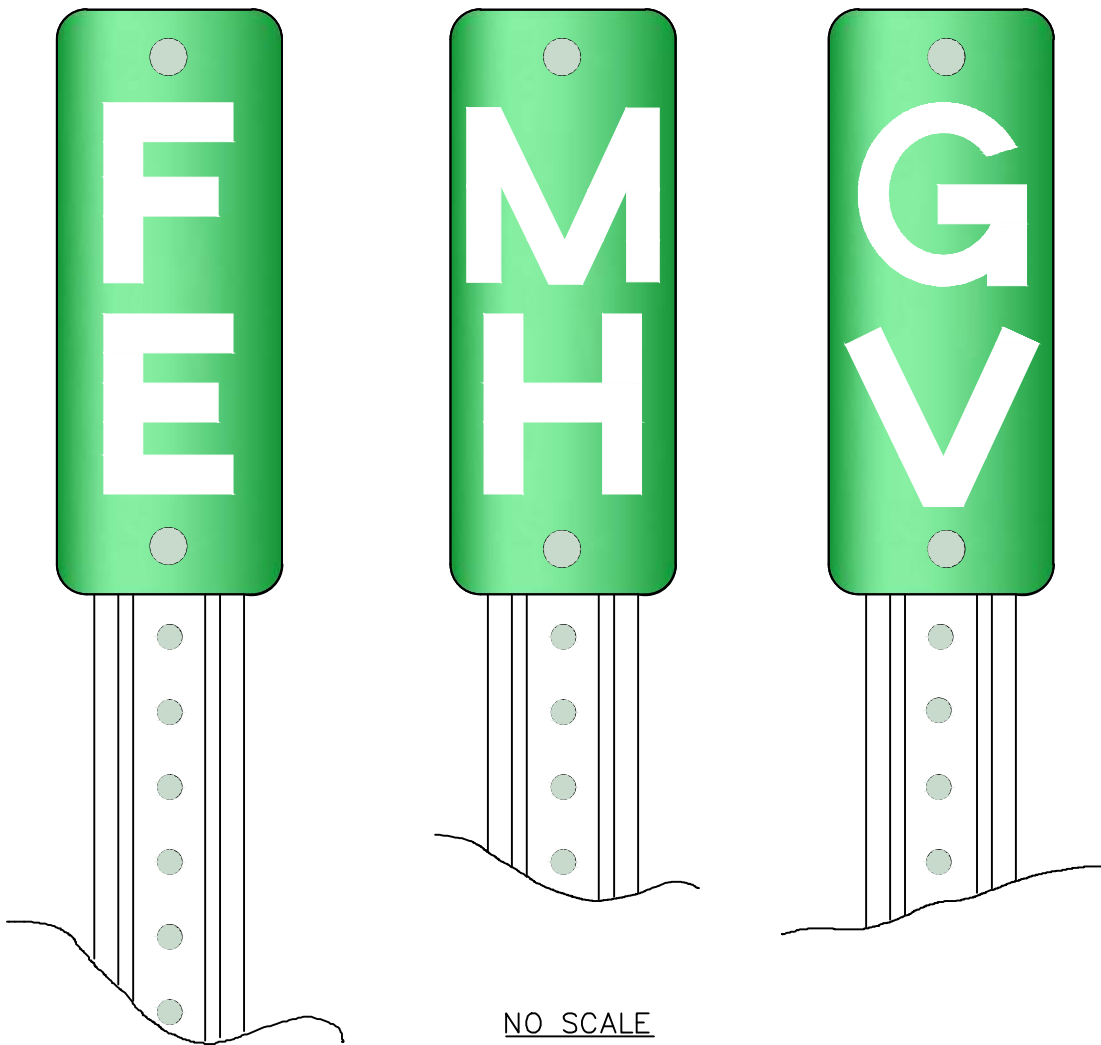
**TRAFFIC
SIGN**

SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-12



NOTES:

1. STRUCTURE MARKER SIGNS SHALL BE FURNISHED AND INSTALLED FOR ALL STRUCTURES LOCATED OUTSIDE OF THE STREET RIGHT OF WAY AND SHALL BE CONSIDERED INCIDENTAL.
2. 0.063" THICK ALUMINUM SIGN. WHITE LETTERS ON GREEN HIGH INTENSITY REFLECTORIZED BACKGROUND.
3. U-CHANNEL POST, MINIMUM 1.2LB./FT.
4. 6'-6" LONG, PAINTED GREEN.



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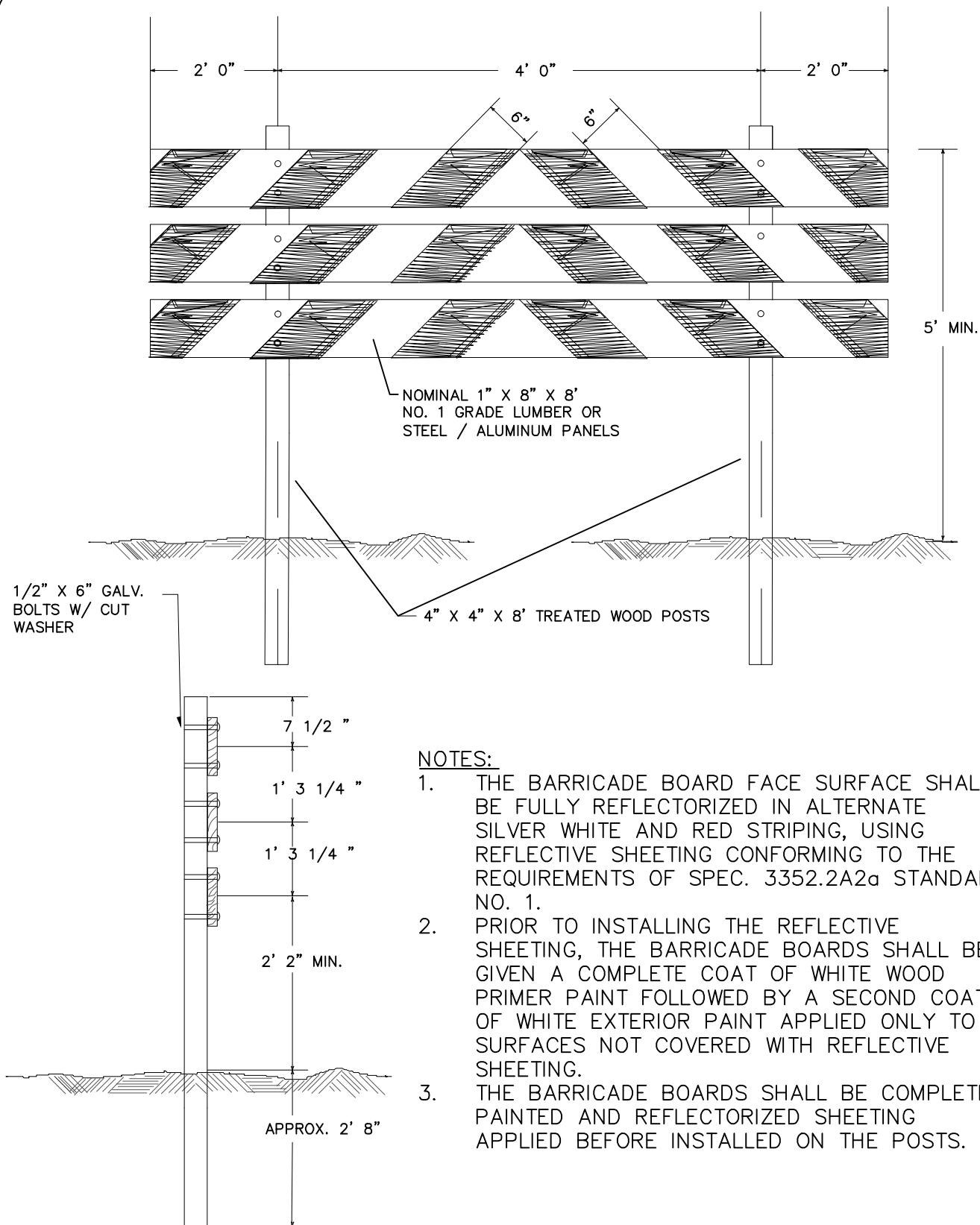
STRUCTURE MARKER
SIGNS

SPECIAL DETAILS

Date: Jan. 2016

Revised:

ST-14



NORTH
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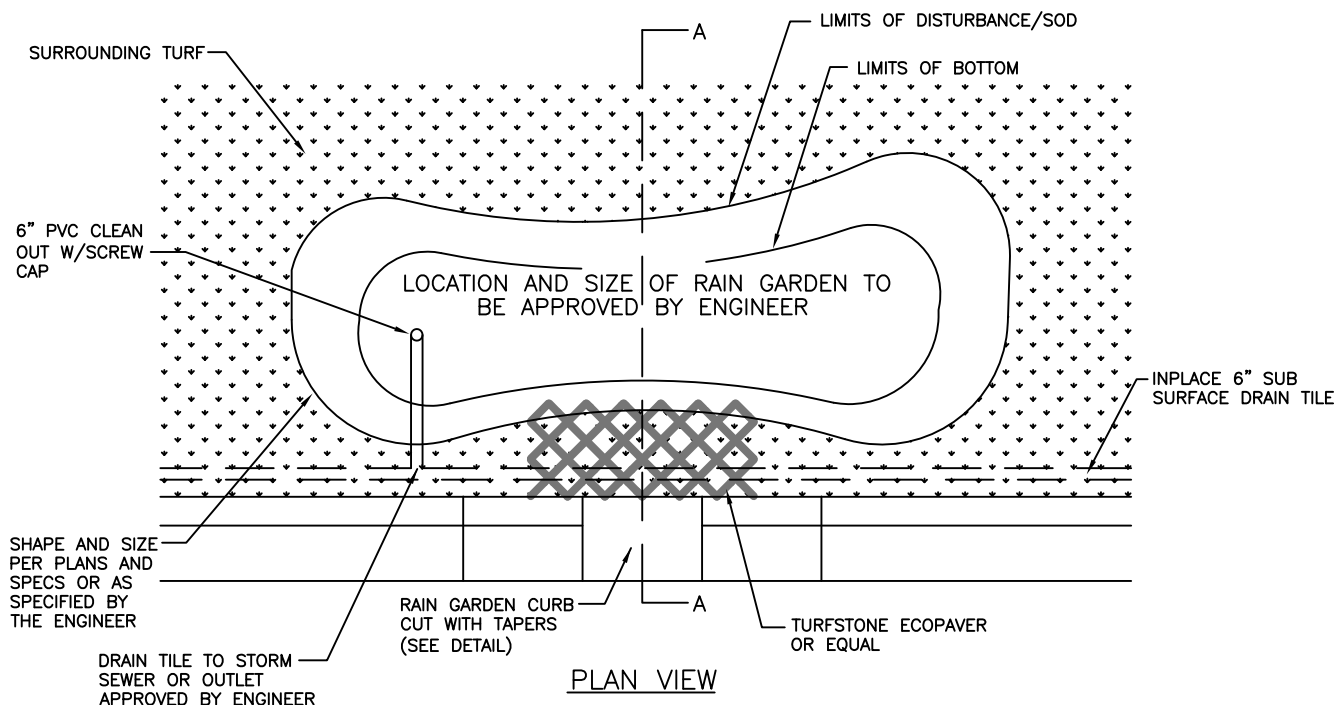
PERMANENT
BARRICADE

SPECIAL DETAILS

Date: Jan. 2016

Revised:

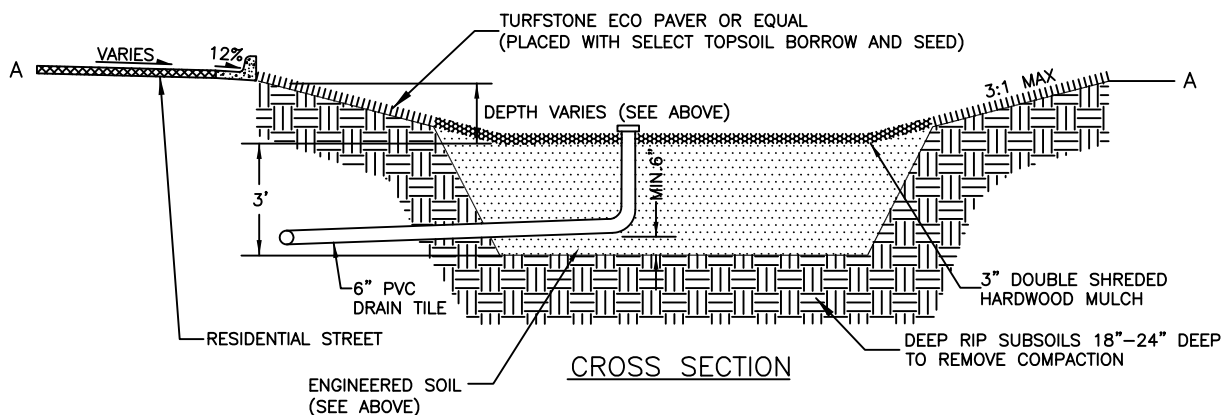
ST-15



ENGINEERED SOIL

MIX 1: 70% COARSE WASHED SAND (IMPORTED)
 30% LEAF-LITTER COMPOST (ORGANIC, GRADE 2)
 MIX: 2: 70% EXISTING SOILS (WELL MIXED)
 30% LEAF-LITTER COMPOST (ORGANIC GRADE 2)

SUBSOIL TYPE	SUBSOIL TYPE	DEPTH	ENGR. SOIL MIX
A	SAND/GRAVEL	12"	1
B	SAND WITH CLAY OR SILT	9"	1
C	CLAY OR SILT WITH SAND	6"	1 OR 2
D	CLAYS OR SILTS	6"	2



NOTE:

1. FINAL GRADE AND MULCHING SHALL BE DONE BY HAND.
2. NO EQUIPMENT WILL BE ALLOWED ON THE RAIN GARDEN AFTER THE BOTTOM IS SCARIFIED.
3. SOD SHALL BE PLACED IN ADJACENT AREAS PRIOR TO RAIN GARDEN INSTALLATION.
4. WHERE SOD CANNOT BE PLACED PRIOR TO RAIN GARDEN INSTALLATION PERIMETER EROSION CONTROL SHALL BE INSTALLED AND REMAIN IN PLACE UNTIL TURF IS ESTABLISHED.
5. THE CURB CUT SHALL BE PLUGGED WITH SAND BAGS UNTIL TURF IS ESTABLISHED.
6. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING ENGINEER FOR INSPECTION OF RAIN GARDEN FOR:
 - (1) FINALIZING RAIN GARDEN SIZE AND LOCATION.
 - (2) OBSERVATION OF EXCAVATION AND SCARIFYING OF SUBSOIL.
 - (3) APPROVAL TO BACKFILL WITH ENGINEERED SOILS.



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CURBSIDE
RAINGARDEN

SPECIAL DETAILS

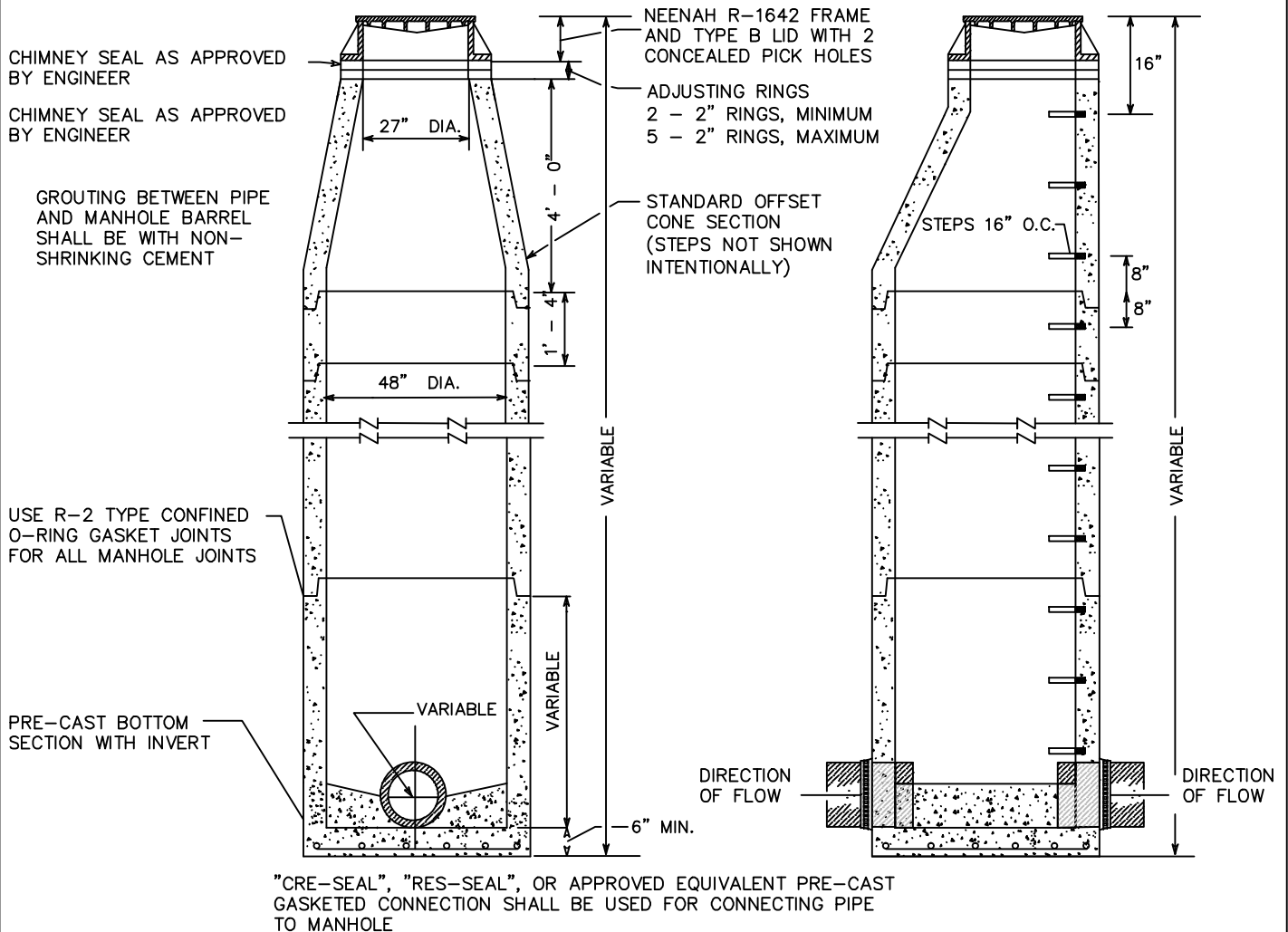
Date: Jan. 2016

Revised:

ST-16

MANHOLE SHALL CONFORM TO THE
REQUIREMENTS OF ASTM C-478

NO SCALE



NOTES:

1. ALL CONNECTIONS TO EXISTING STRUCTURES SHALL BE CORE DRILLED
2. MANHOLE STEPS SHALL BE CAST IN ALUMINUM OR MA INDUSTRY WITH VINYL COATING CONFORMING TO ALL OSHA REQUIREMENTS, OR APPROVED EQUIVALENT AND SHALL BE LOCATED ON THE DOWN STREAM SIDE OF MANHOLE
3. STEPS SHALL BE PLACED SO THAT THE OFFSET VERTICAL PORTION OF THE CONE IS FACING DOWN STREAM
4. MANHOLE COVERS SHALL BE CAST WITH THE WORDS "SANITARY SEWER"
5. THE INITIAL & FINAL RAISING OF CASTINGS SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT
6. MAXIMUM DEPTH FROM TOP OF CASTING TO FIRST STEP SHALL NOT BE MORE THAN 16"
7. STEPS SHALL ALIGN WITH THE OPENING TO PROVIDE ACCESS TO THE MANHOLE
8. ALL MANHOLES TO HAVE INFI-SHIELD OR ENGINEER APPROVED EQUIVALENT EXTERNAL MANHOLE CHIMNEY SEAL OR APPROVED EQUIVALENT
9. WHEN MANHOLE JOINS OCCUR BELOW THE WATER TABLE THEY SHALL BE WRAPPED AS DESCRIBED IN THE SPECIFICATION (INCIDENTAL)



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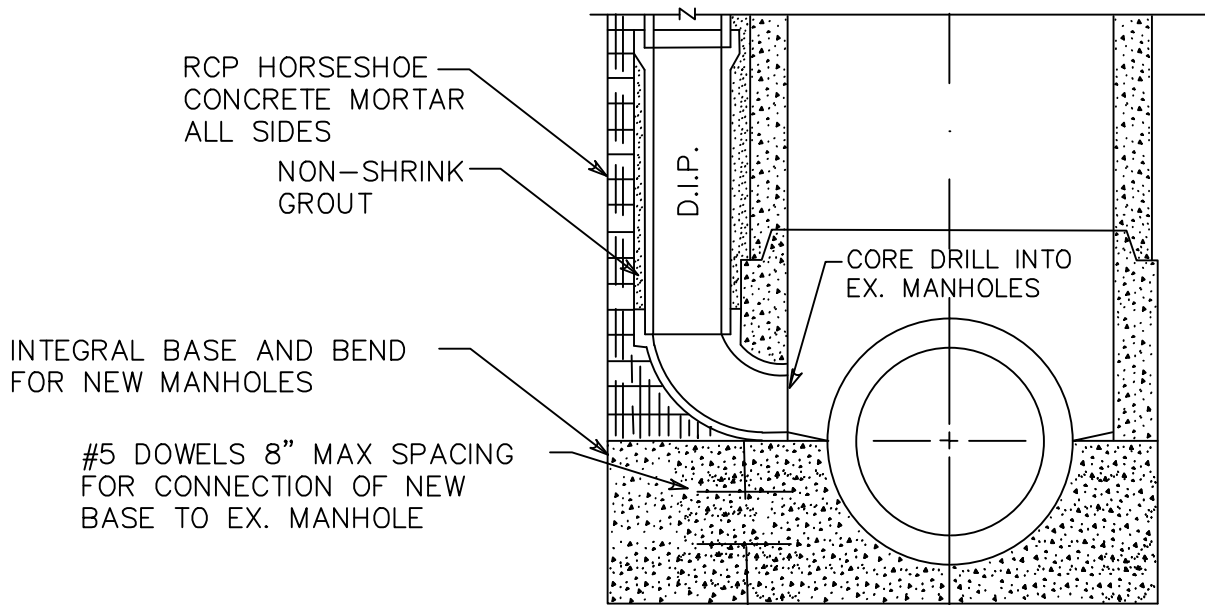
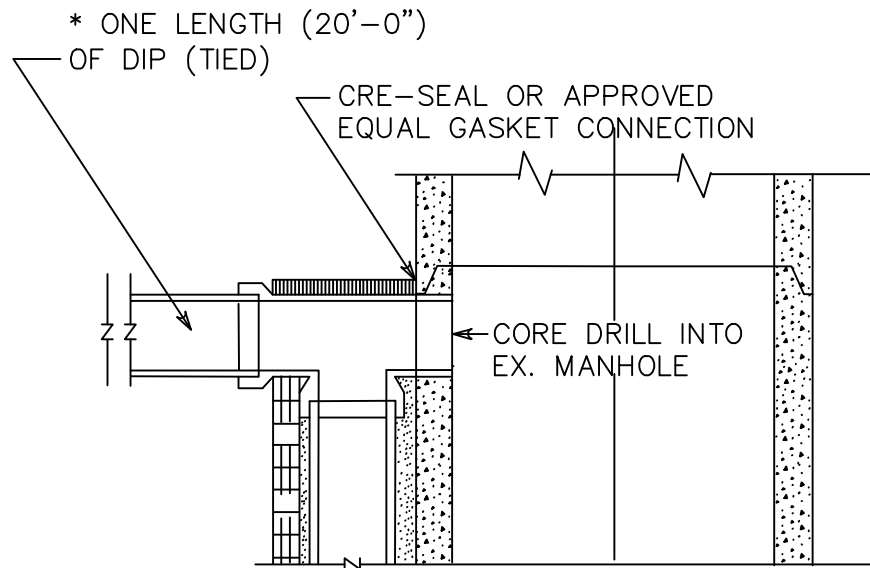
STANDARD MANHOLE
FOR SANITARY SEWER

SPECIAL DETAILS

Date: Jan. 2016

Revised:

SS-1



NORTH
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STANDARD DROP MANHOLE (OUTSIDE)

SPECIAL DETAILS

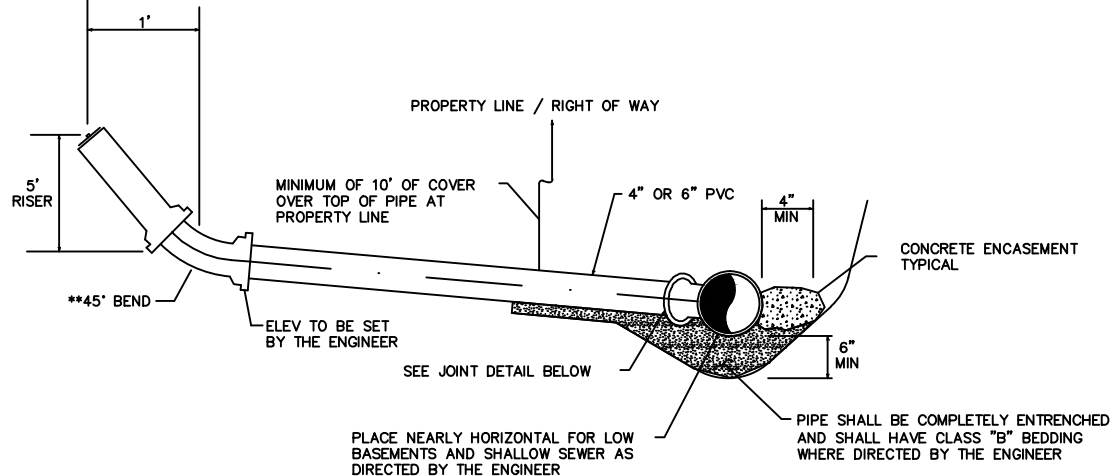
Date: Jan. 2016

Revised:

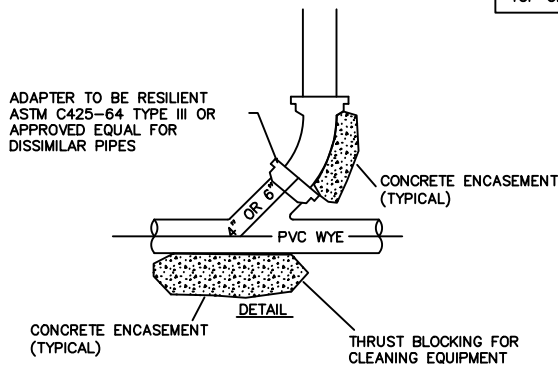
SS-2

DRAINAGE UTILITY EASEMENT

NO SCALE

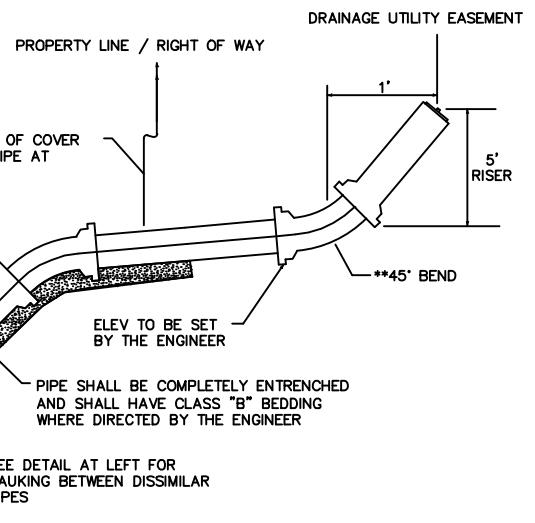


TYPICAL SERVICE WHERE COVER OVER TOP OF SEWER IS 12' OR LESS



CONCRETE ENCASEMENT (TYPICAL)

THRUST BLOCKING FOR CLEANING EQUIPMENT



TYPICAL SERVICE WHERE COVER OVER TOP OF SEWER IS 12' OR MORE

NOTES:

PVC = POLY-VINYL CHLORIDE SDR 26

ALL SERVICE CONNECTIONS INCLUDING NECESSARY BENDS AND SPECIAL FITTINGS SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE BID PER LINEAR FOOT OF 4" OR 6". NO ADDITIONAL COMPENSATION SHALL BE ALLOWED FOR CONCRETE ENCASEMENT OR PIPE BEDDING. SERVICE STUB SHALL BE PLUGGED AND MARKED WITH A 4 X 4 TIMBER PROTRUDING 3' OUT OF GROUND PAINTED GREEN.



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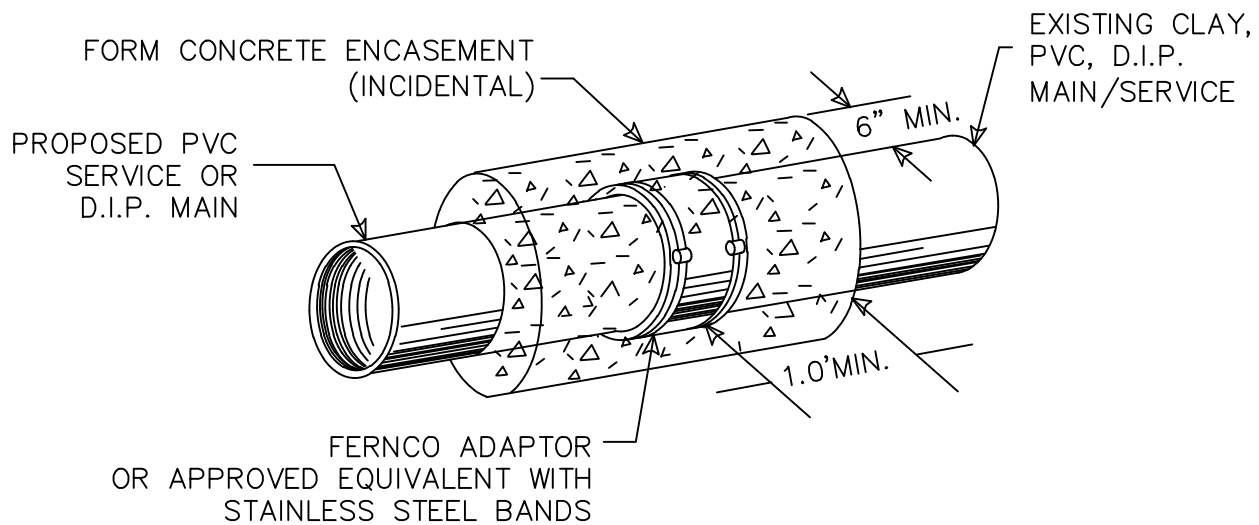
TYPICAL SERVICE CONNECTIONS FOR SANITARY SEWER

SPECIAL DETAILS

Date: Jan. 2016

Revised:

SS-3



NO SCALE

NOTES:

WRAP ADAPTER WITH POLYETHYLENE PRIOR TO ENCASEMENT WITH CONCRETE



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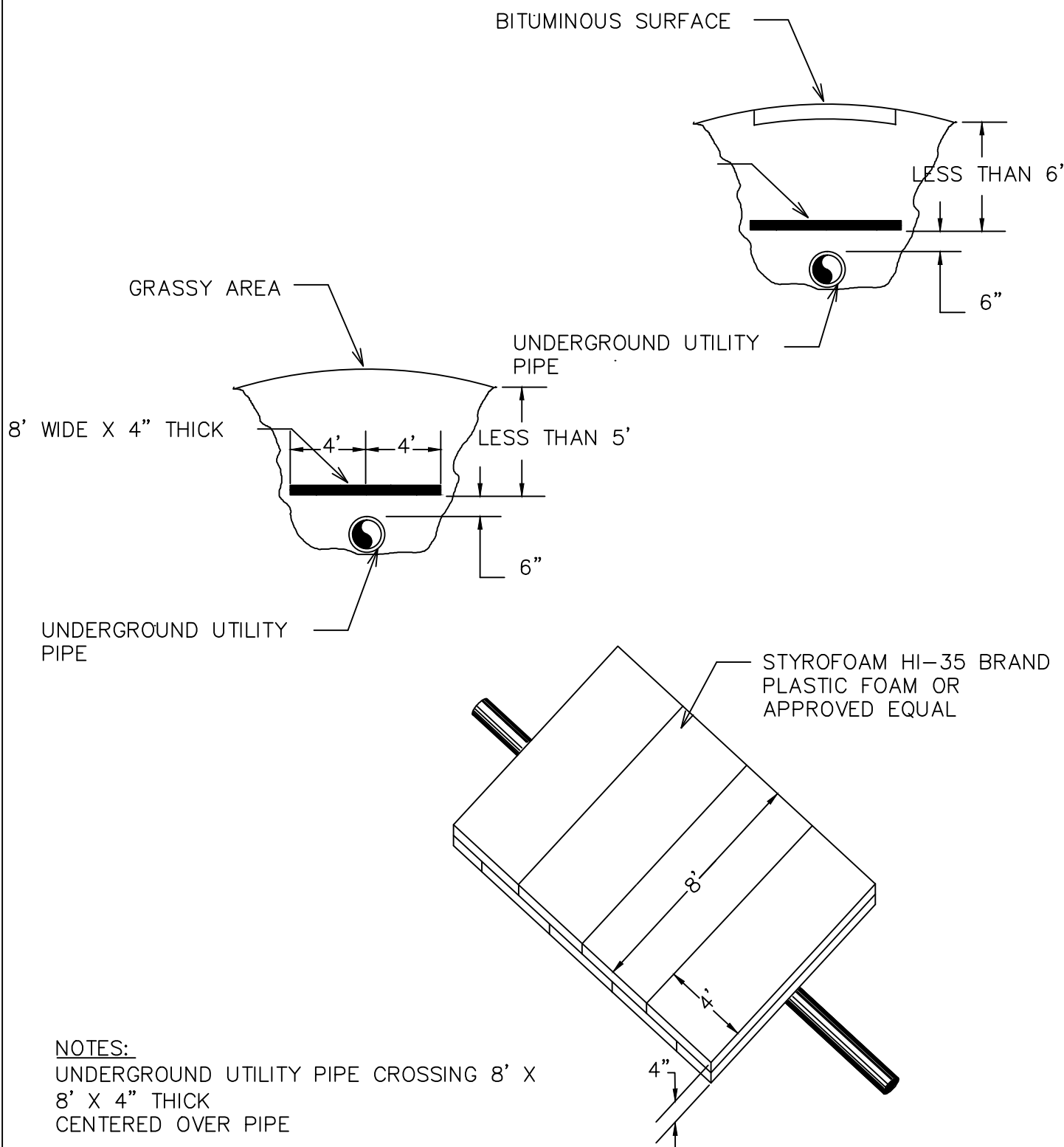
FERNCO
ADAPTORS

SPECIAL DETAILS

Date: Jan. 2016

Revised:

SS-4



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ST. PAUL

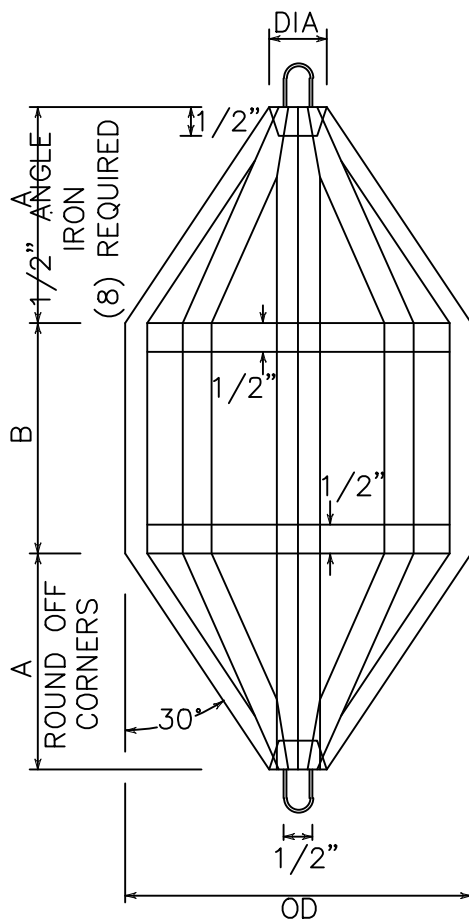
INSULATION DETAIL

SPECIAL DETAILS

Date: Jan. 2016

Revised:

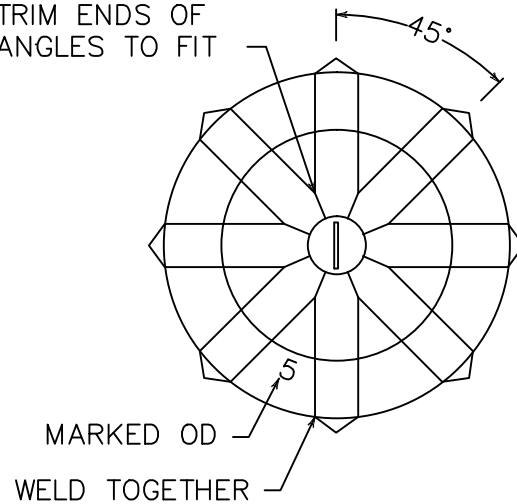
SS-5



DECEMBER, 1973			MANDREL OD*			RING OD		
NOMINAL DIA	A	B	D3033	D3034 (SDR42)	D3034 (SDR35)	D3033	D3034 (SDR42)	D3034 (SDR35)
6	4.0"	4"	5.67	5.62	5.62	4.06	4.91	4.91
8	5.3"	6"	7.37	7.00	7.52	6.66	6.89	6.61
10	6.7"	6"	9.22	9.50	9.41	8.51	8.79	8.70
12	8.0"	8"	11.06	11.31	11.19	10.35	10.60	10.48
15	10.0"	9"	13.62	---	---	13.11	---	---

* (AVERAGE OD - 2 TIMES THE MINIMUM WALL THICKNESS) x (0.95)

TRIM ENDS OF ANGLES TO FIT



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MANDREL DETAIL

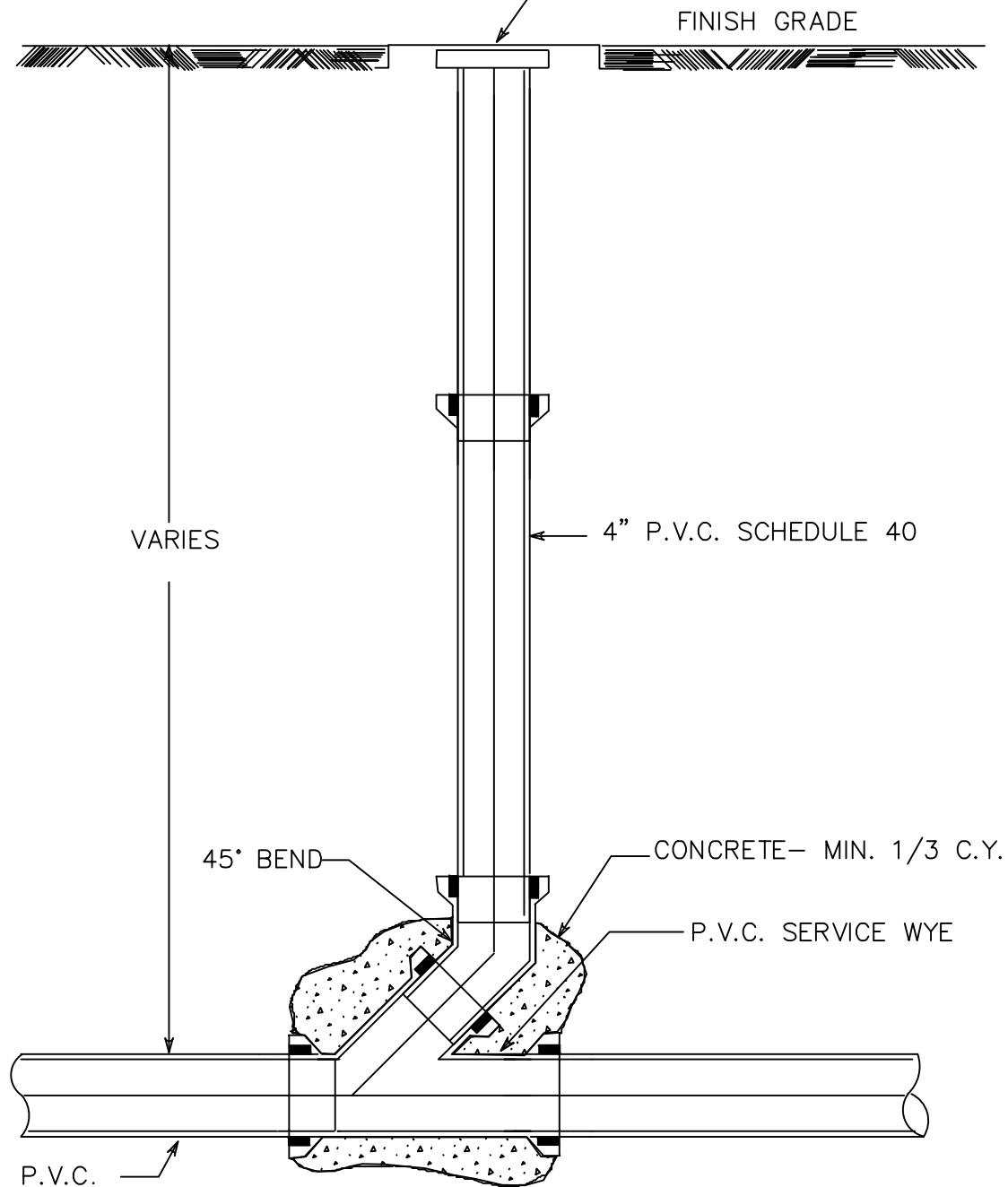
SPECIAL DETAILS

Date: Jan. 2016

Revised:

SS-6

INSTALL METAL METER BOX AND COVER NO. H-10817 OR APPROVED EQUAL OVER ALL PVC CLEANOUTS AND ALSO INSTALL METER BOX AND COVERS OVER ALL CAST IRON CLEANOUTS IN DRIVEWAYS AND PARKING AREAS.



NOTES:

1. PAID AS SERVICE PIPE
2. INSTALL EVERY 100 FEET OR AS DIRECTED BY ENGINEER
3. ALL SERVICES SHALL HAVE A CLEANOUT AT THE PROPERTY LINE



**NORTH
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**SANITARY SEWER
SERVICE CLEANOUT**

SPECIAL DETAILS

Date: Jan. 2016

Revised:

SS-7

ADAPTOR REQUIRED ON ALL
GATE VALVES (INCIDENTAL)

NO SCALE

HYDRANT: PACER, WB-67-250 WITH STAINLESS STEEL
LOWER BODY BOLTS. BURY LENGTH 8 1/2 FEET, INDICATED
BY MEANS OF A METAL TAG ATTACHED TO ONE OF THE
FLANGE BOLTS.

GATE VALVE ADAPTOR
1/4" STEEL WITH
PROTECTIVE COATING

GATE VALVE

BOX

1/2" RUBBER GASKET
INSTALLED BETWEEN THE
GATE VALVE AND GATE
VALVE ADAPTOR

'HYDRAFINDER' (CANDYCANES)
FIRE HYDRANT LOCATOR

OPERATING NUT SHALL BE 1 1/2"
PENTAGON AND BE TURNED COUNTER
CLOCKWISE TO OPEN.

OUTLET NOZZLES & THREADS: TWO 2 1/2" HOSE
CONNECTIONS AND ONE 4" STROZ NOZZLE (NATIONAL
STANDARD THREADS).

CAPS TO BE CHAINED
(PENTAGON NUT ON
CAPS)

SEE STANDARD PLATE W-4

1" PVC PIPE (TRACER WIRE COVER)
EXTENDS MINIMUM 2" ABOVE GROUND

2" MIN.
4" MAX.

TRACER WIRE CONNECTED TO WELDED
CONNECTIVITY STUD 2" BELOW FLANGE (FOR
LOCATING PURPOSES)

1 1/2" CLEAR STONE
ABOVE WEEP HOLES. COVER
HOLES COVERED WITH 2 LAYERS
OF 4 MIL POLYETHYLENE.

BRACING
AS REQUIRED

PRECAST CONCRETE
BLOCK

UNDISTURBED SOIL

2' DIAMETER BY 3' DEEP PIT
UNDER HYDRANT FILLED WITH
A MINIMUM OF 1 C.Y. OF 1 1/2"
CLEAR STONE.

UNDISTURBED SOIL

18"x18"x5"
CONCRETE
BLOCK

TIE RODS

6"

D.I.P.

WATERMAIN

CL STREET

10'
TYPICAL

7'-6"
MIN.

2'-6"

22"

5'

NOTES:

1. HYDRANT COATINGS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AFTER THE
BASE COURSE OF BITUMINOUS IS INSTALLED. PRIME AND PAINT HYDRANTS PER
AWWA AND MANUFACTURER'S STANDARDS
2. ALL HYDRANT LEADS SHALL BE TIED WITH 3/4" TIE RODS. TIE ROD SHALL
EXTEND FROM TEE TO VALVE AND VALVE TO HYDRANT. MEGA LUGS MAY BE USED IN
LIEU OF TIE RODS
3. HYDRANTS SHALL HAVE A 16" BREAK OFF TRAFFIC FLANGE
4. ALL RODS AND RETAINERS TO BE COATED WITH BITUMASTIC
5. YELLOW "OUT OF ORDER" TAG TO BE INSTALLED ON THE PUMPER CONNECTION
AFTER BACKFILL
6. THE INITIAL & FINAL RAISING OF VALVE BOXES SHALL BE CONSIDERED
INCIDENTAL TO THE PROJECT
7. TYPICAL HYDRANT SHALL BE PAINTED "FIRE HYDRANT" RED



NORTH
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TYPICAL HYDRANT INSTALLATION

SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-1

NO SCALE

16" OR LARGER
WATERMAIN
HIGH POINT

2' DIAMETER BY 3' DEEP PIT
UNDER HYDRANT FILLED WITH A
MINIMUM OF 1 C.Y. OF 1-1/2"
CLEAR STONE.

NOTES:

1. HYDRANT COATINGS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AFTER THE BITUMINOUS BASE COURSE IS INSTALLED. PRIME AND PAINT HYDRANTS PER AWWA AND MANUFACTURER'S STANDARDS.
2. ALL HYDRANT LEADS SHALL BE TIED WITH 3/4" TIE RODS. TIE RODS SHALL EXTEND FROM TEE TO VALVE FROM VALVE TO HYDRANT. "MEGA LUGS" MAY BE USED IN LIEU OF TIE RODS.
3. HYDRANTS SHALL HAVE 16" BREAK-OFF TRAFFIC FLANGE.
4. ALL TIE RODS AND RETAINERS TO BE COATED WITH BITUMASTIC
5. WATERMAIN OVERDEPTH INCIDENTAL
6. RAW WATER MAIN HYDRANTS SHALL BE PAINTED BLACK
7. TRUNK WATER MAIN HYDRANTS SHALL BE PAINTED RED



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TYPICAL BLOW OFF HYDRANT INSTALLATION

SPECIAL DETAILS

Date: Jan. 2016

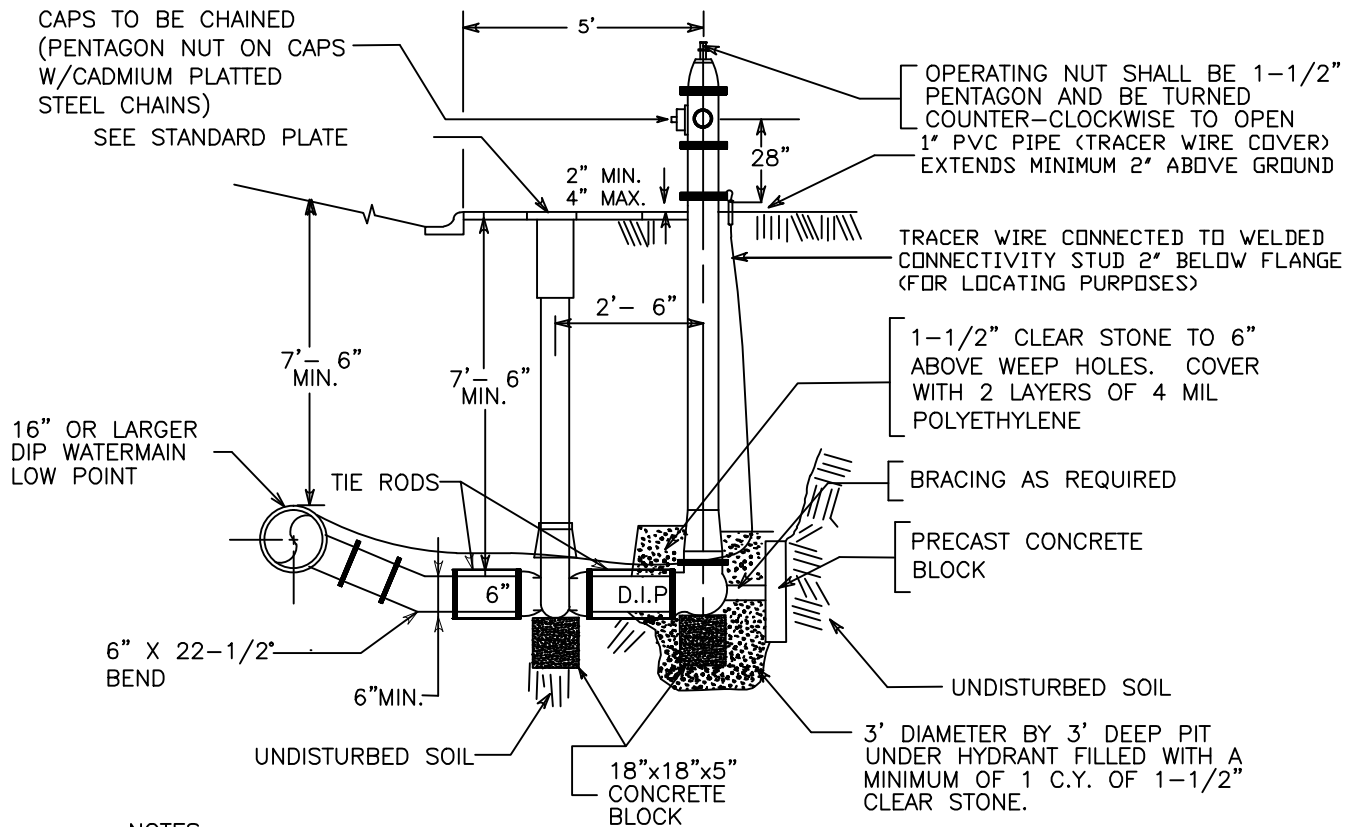
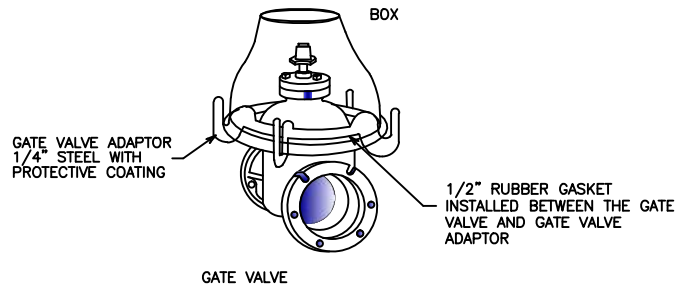
Revised:

W-2

ADAPTOR REQUIRED ON ALL
GATE VALVES (INCIDENTAL)

HYDRANT: PACER, WB-67-250 WITH HIGH PRESSURE
CONVERSION, EPOXY COATED, VALVE WASHERS, BRONZE
CROSS ARM, AND 304 STAINLESS STEEL BOLTS, OR
EQUAL BURY LENGTH 8 FEET, INDICATED BY MEANS OF
A METAL TAG ATTACHED TO ONE OF THE FLANGE
BOLTS.

OUTLET NOZZLES & THREADS: TWO 2 1/2" HOSE
CONNECTIONS, ONE 4" STEAMER CONNECTION, AND ONE 4"
STORZ HOSE (NATIONAL STANDARD THREADS).



NOTES:

1. HYDRANT COATINGS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AFTER THE BITUMINOUS BASE COURSE IS INSTALLED. PRIME AND PAINT HYDRANTS PER AWWA AND MANUFACTURER'S STANDARDS.
2. ALL HYDRANT LEADS SHALL BE TIED WITH 3/4" TIE RODS. TIE RODS SHALL EXTEND FROM TEE TO VALVE AND FROM VALVE TO HYDRANT. 'MEGA-LUGS' MAY BE USED IN LIEU OF TIE RODS.
3. HYDRANTS SHALL HAVE 16" BREAK-OFF TRAFFIC FLANGE.
4. ALL TIE RODS AND RETAINERS TO BE COATED WITH BITUMASTIC.
5. HYDRANT RISER EXTENSION IS INCIDENTAL
6. VALVE BOX EXTENSION AND VALVE STEM EXTENSION ARE INCIDENTAL
7. RAW WATER MAIN HYDRANTS SHALL BE PAINTED BLACK
8. TRUNK WATER MAIN HYDRANTS SHALL BE PAINTED RED
9. THE PUMPER NOZZLE SHALL BE AN INTEGRAL PART OF THE FIRE HYDRANT. ADAPTORS WILL NOT BE ACCEPTED.
10. PROVIDE PERMANENT MARKING WHICH INDICATE: MANUFACTURER NAME, YEAR OF MANUFACTURE, AND BURY DEPTH.



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TYPICAL CLEAN-OUT HYDRANT INSTALLATION

SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-3

Diagram illustrating the connection of a water service line from the street to a building, showing the curb box, corporation stop, and water service pipe.

Labels and Dimensions:

- DRAINAGE & UTILITY EASEMENT
- RIGHT OF WAY
- FINISH GRADE
- STREET C
- T-FENCE POST PAINTED BLUE
- 9'
- 1'
- 4' MIN.
- 7'-6" MIN.
- CURB BOX WITH 1"-1 1/4" STANDPIPE AND STATIONARY ROD (8'-6" AT FULL EXTENSION)
- CONTROL ROD
- CURB BOX
- COPPER WATER SERVICE PROVIDE SOME SLACK TO ALLOW FOR SETTLEMENT
- CORPORATION STOP
- 8"x4"x4" CONCRETE M.H. BLOCK
- TYPE "K" COPPER PIPE, 1" MINIMUM
- 30°
- 30°
- HORIZONTAL GOOSENECK LOOP SHALL BE NO HIGHER THAN WATERMAIN
- 8"x4"x4" CONCRETE M.H. BLOCK

1. CURB BOXES & RODS SHALL BE ADJUSTABLE UP AND DOWN FOR 7½' OF COVER (INCIDENTAL)
2. COPPER IS TO BE ONE PIECE, NO JOINTS, COUPLINGS, ETC., ALLOWED FROM MAIN TO CURB STOP
3. WATER SERVICE AND SANITARY SEWER SERVICE SHALL HAVE A 3' HORIZONTAL SEPARATION
4. CURB BOXES LOCATED IN DRIVEWAYS OR PARKING LOTS SHALL BE COVERED WITH A FORD A-1 METER BOX COVER (INCIDENTAL)



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TYPICAL WATER SERVICE

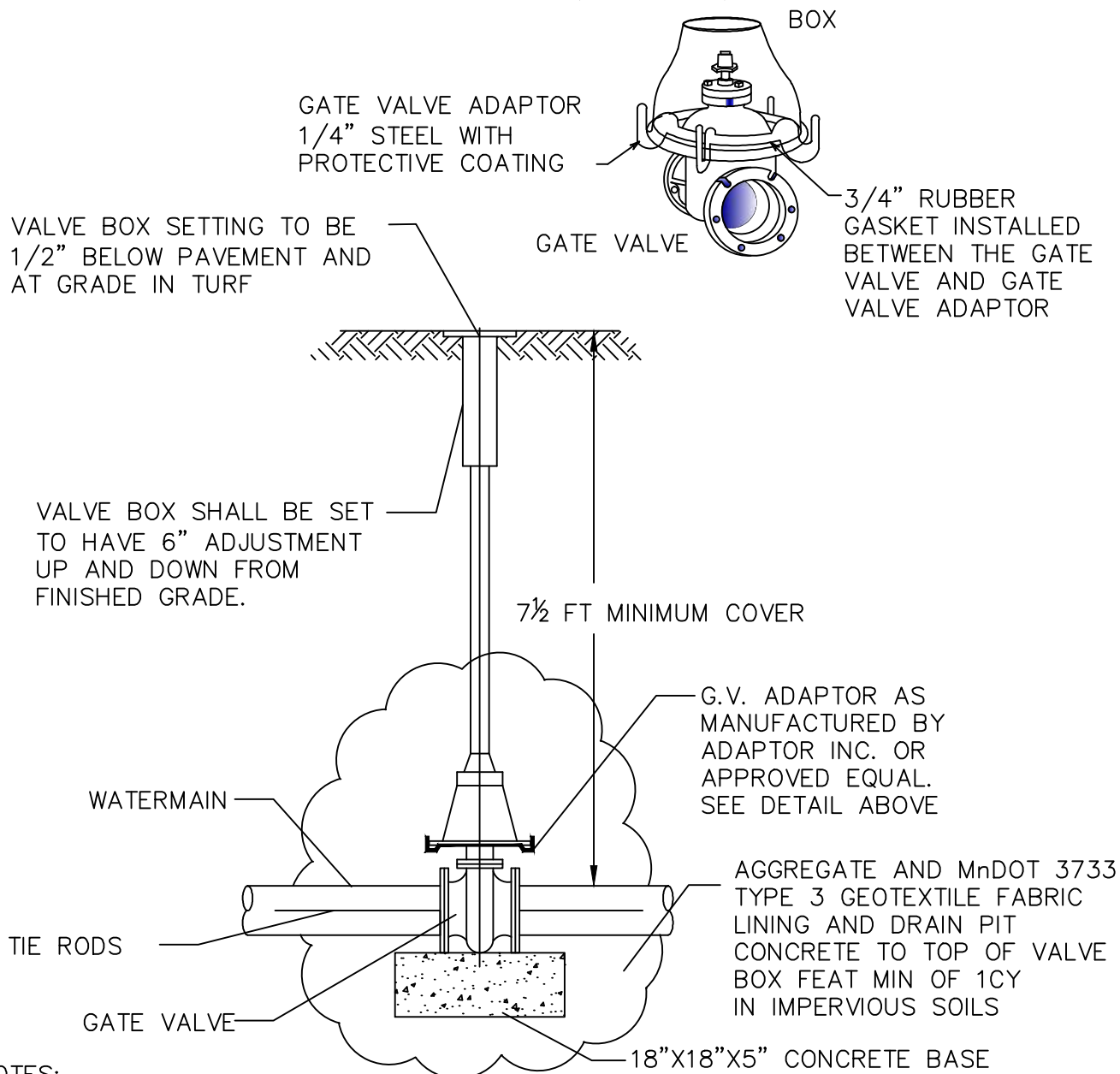
Date: Jan. 2016

Revised:

W-4

ADAPTOR REQUIRED ON ALL
GATE VALVES (INCIDENTAL)

NO SCALE



NOTES:

1. GATE VALVES SHOULD BE USED ON 4" THROUGH 16" WATERMAIN.
2. VALVE BOX INSERTS ARE NOT ALLOWED UNLESS APPROVED BY THE ENGINEER.
3. VALVE BOXES SHALL BE INSTALLED PLUMB AND SHALL ALLOW A 4" P.V.C. PIPE TO PASS ENTIRELY OVER THE GATE VALVE NUT AFTER INSTALLATION IS COMPLETE.
4. ALL VALVES SHALL BE TIED WITH 3/4" THREADED TIE RODS TO THE MAIN. MEGA LUGS MAY BE USED IN LIEU OF TIE RODS.
5. THE INITIAL & FINAL RAISING OF VALVE BOXES SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.



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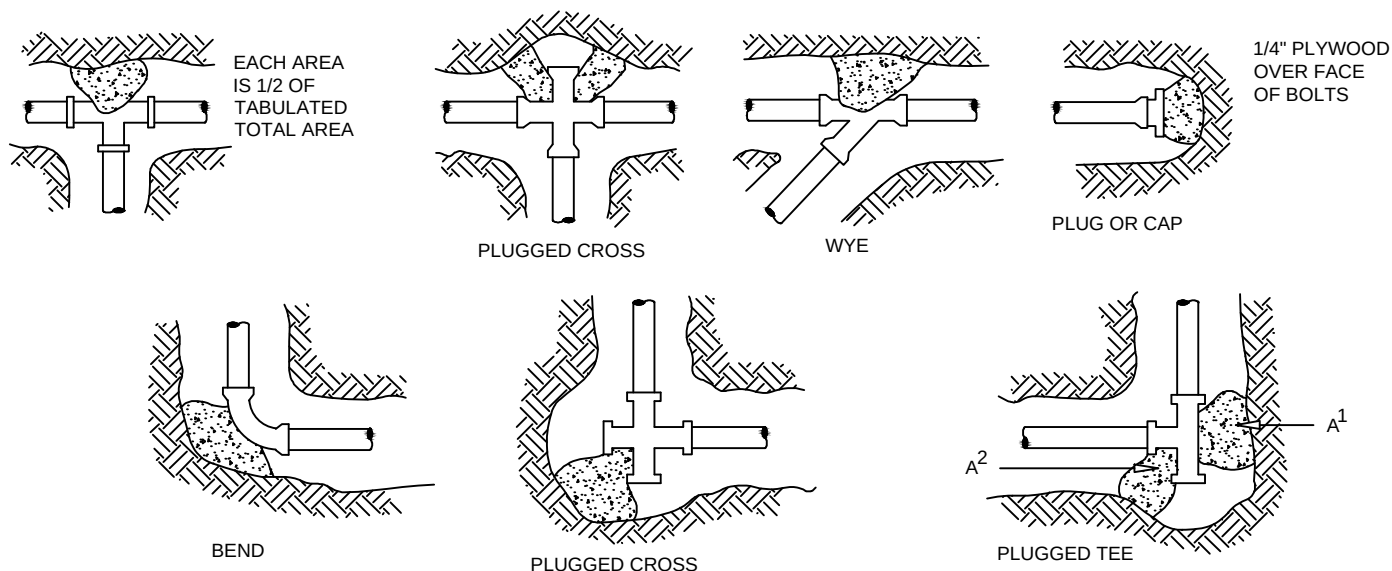
**GATE VALVE AND
BOX INSTALLATION**

SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-5



NOMINAL FITTING SIZE, INCHES	TEE, WYE, PLUG OR CAP	90° BEND, PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22-1/2° BEND	11-1/4° BEND
			A ¹	A ²			
4	1.0	1.4	1.9	1.4	1.0	-	-
6	2.1	3.0	4.3	3.0	1.6	1.0	-
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.6	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24	34.0	48.0	68.0	48.0	26.2	13.6	6.8

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH.
2. KEEP CONCRETE CLEAR OF JOIN AND ACCESSORIES.
3. REQUIRED BEARING AREAS AT FITTING SHALL BE AS NOTED ABOVE UNLESS INDICATED OTHERWISE.
4. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON THE PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD PLAN.
5. ABOVE BEARING AREAS BASED ON TEST PRESSURES OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS. PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION: BEARING AREA=(TEST PRESSURE/150)X(2000/SOIL BEARING STRESS)X(TABLE VALUE).



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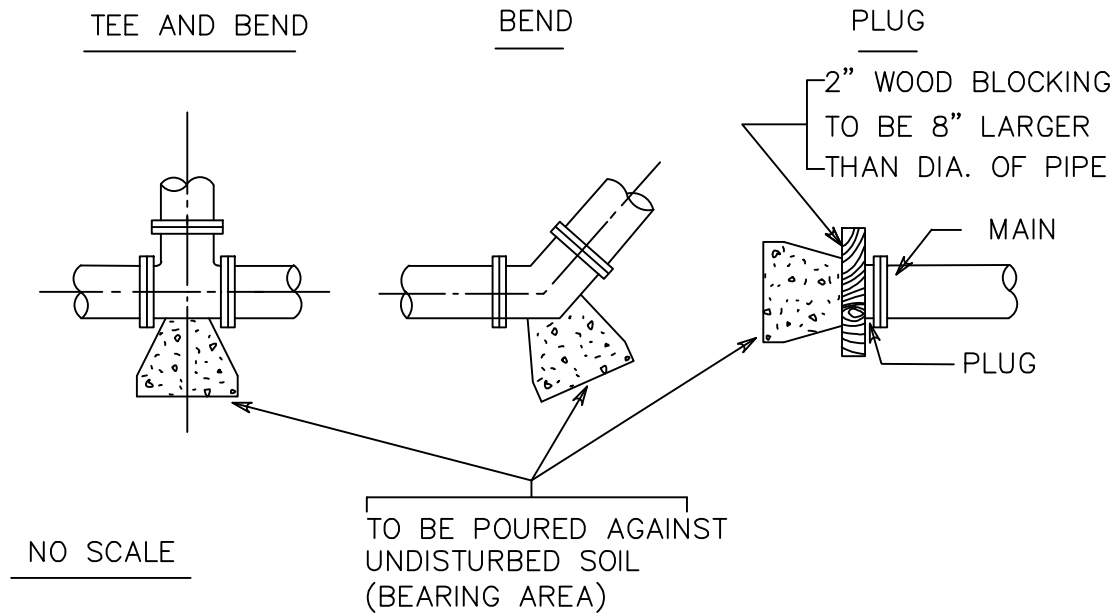
**POURED CONCRETE
THRUST BLOCKING
FOR WATERMAIN**

SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-6



PIPE SIZE	BEARING AREA
6"	4.0 SQ. FT.
8"	6.0"
10" – 12"	12.0"
16"	20.0"

NOTES:

1. THRUST BLOCKING TO BE USED FOR ALL BENDS
2. THRUST BLOCKING SHALL ONLY BE USED WHERE WORKING PRESSURES ARE LESS THAN 150 PSI
3. ALL FITTINGS MUST HAVE MEGA-LUGS. $\frac{3}{4}$ " TIE RODS INSTALLED WHERE NECESSARY TO RESTRAIN ALL JOINTS
4. POURED CONCRETE THRUST BLOCKING WILL BE REQUIRED ON ALL WATERMAIN PLUGS AND ON ALL FITTINGS FOR 12" DIAMETER PIPE AND LARGER OR AS DIRECTED



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THRUST BLOCKING
FOR WATER MAIN

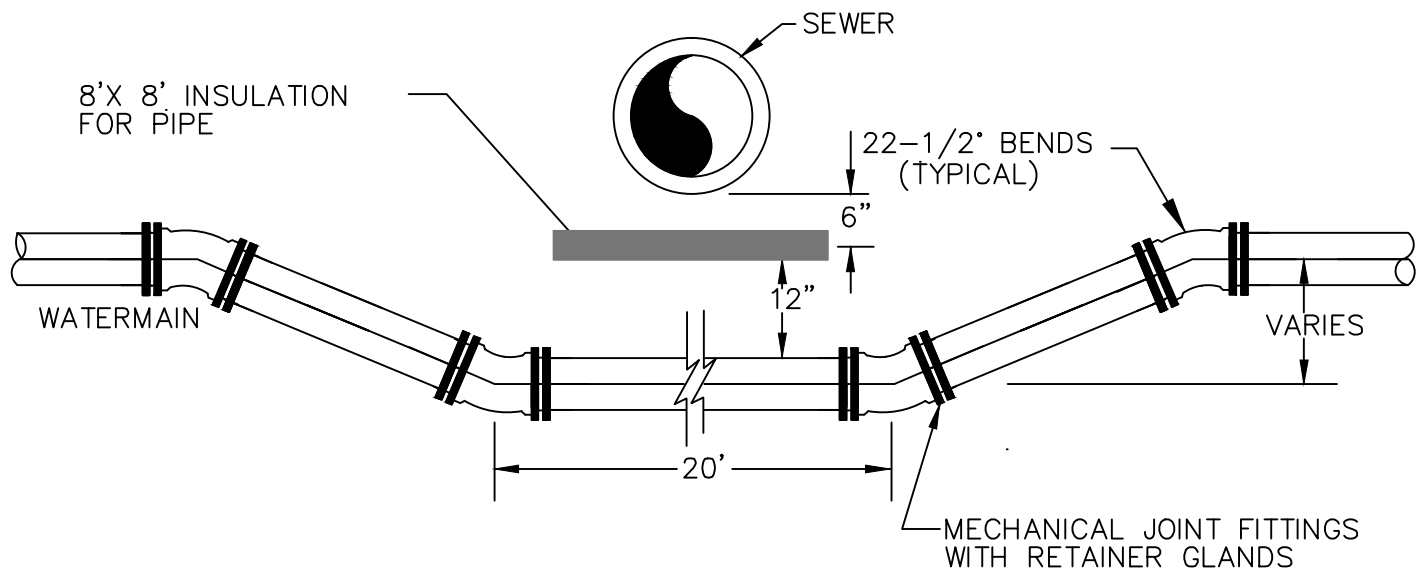
SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-7

NO SCALE



NOTES:

1. MINIMUM OF FOUR (4) 22.5° BENDS
2. 3/4" TIE RODS INSTALLED TO RESTRAIN ALL JOINTS
3. INSULATION IS REQUIRED WHEN 18" MINIMUM IS NOT MET OR AS DIRECTED



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WATERMAIN LOWERING WITH INSULATION DETAIL

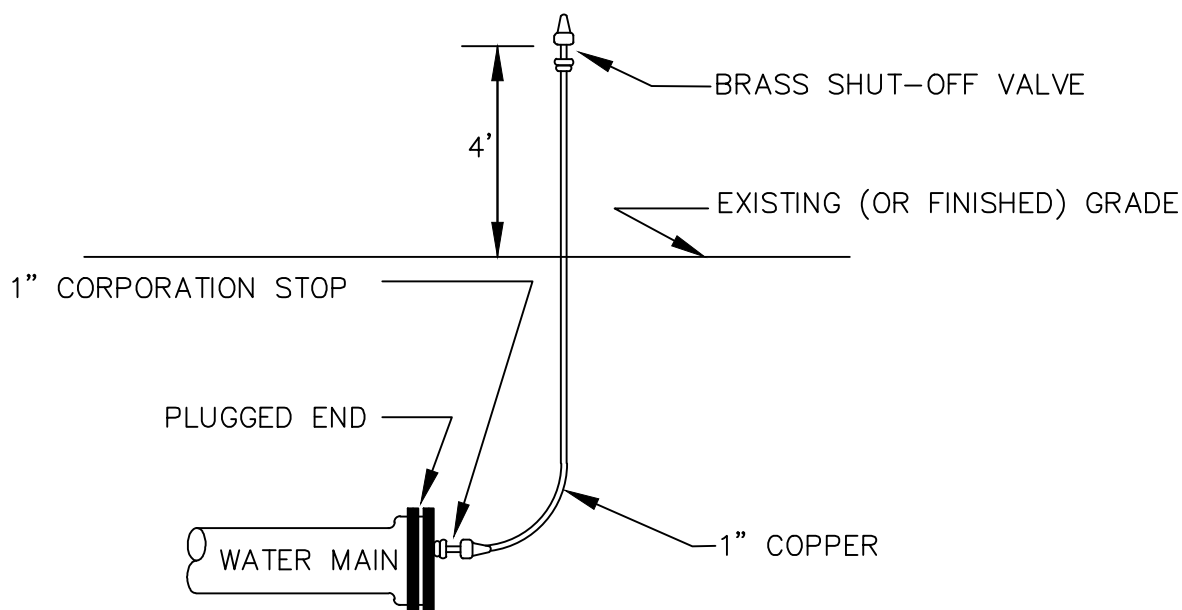
SPECIAL DETAILS

Date: Jan. 2016

Revised:

W-8

NO SCALE



NOTES:

1. RE-USE EX. AIR BLEED LINES AND PLUGS ON PROPOSED STUBS. INSTALLATION TO BE MADE AT NO ADDITIONAL COMPENSATION. FURNISH NEW GASKETS WHERE REQUIRED.
2. NEW LINES WILL BE PAID FOR AT UNIT PRICE BID FOR 1" COPPER AND 1" CORPORATION STOP, AS SPECIFIED. ALL OTHER WORK TO BE INCIDENTAL TO THE PROJECT.
3. TO BE REMOVED AFTER TESTING AND/OR PRIOR TO FREEZE-UP. INSTALL BLOCKING AT PLUGGED END AFTER COPPER REMOVAL.



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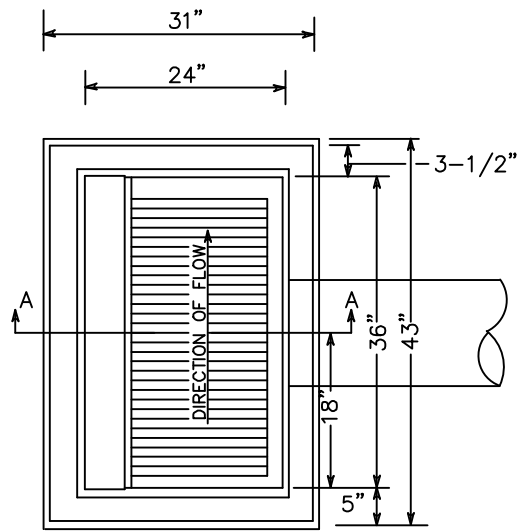
AIR BLEED
INSTALLATION

SPECIAL DETAILS

Date: Jan. 2016

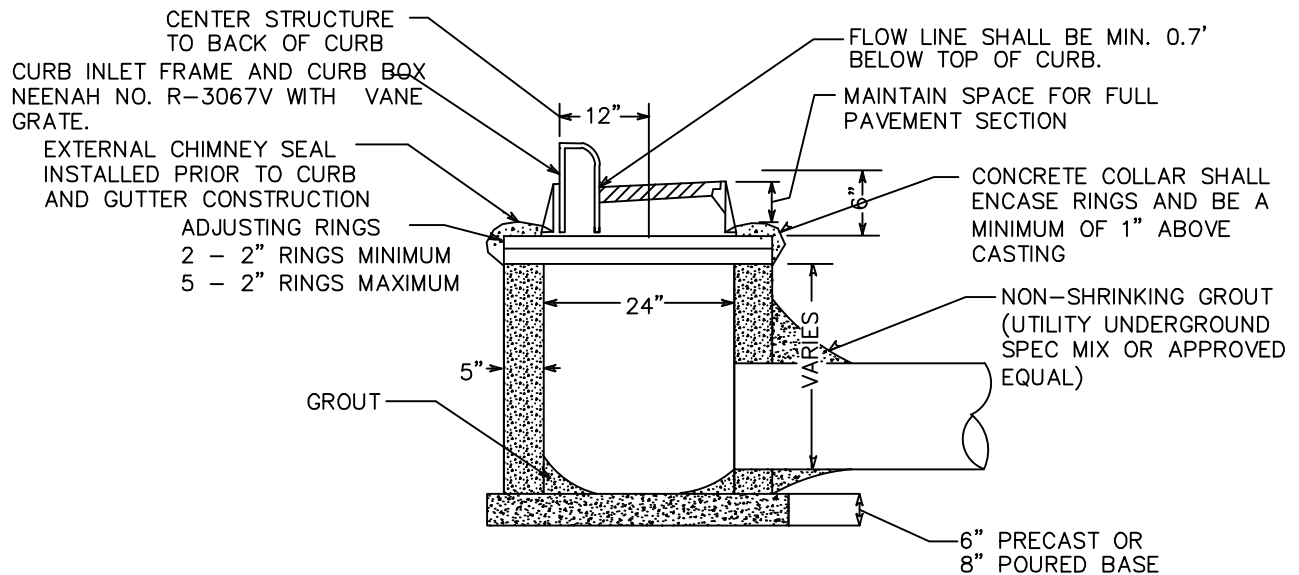
Revised:

W-9



NO SCALE

PLAN



VOIDS & DOGHOUSES FILLED WITH CONCRETE BRICK OR BLOCK ONLY

SECTION A-A

NOTES:

1. REINFORCING TO CONSIST OF #4 BARS @ 8" O.C., 4' MINIMUM LENGTH, EACH SIDE OF CASTING
2. GROUT BOTTOM TO DRAIN TO CENTER
3. PIPE CUT-OUTS TO BE LOCATED WHERE REQUIRED
4. ADJUSTING RINGS SHALL HAVE MORTAR JOINTS - PLASTER OUTSIDE, STRIKE CLEAN INSIDE
5. INLET PROTECTION TO BE INSTALLED IN CATCH BASIN AND MAINTAINED AS DIRECTED BY THE ENGINEER



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STANDARD
CATCH BASIN

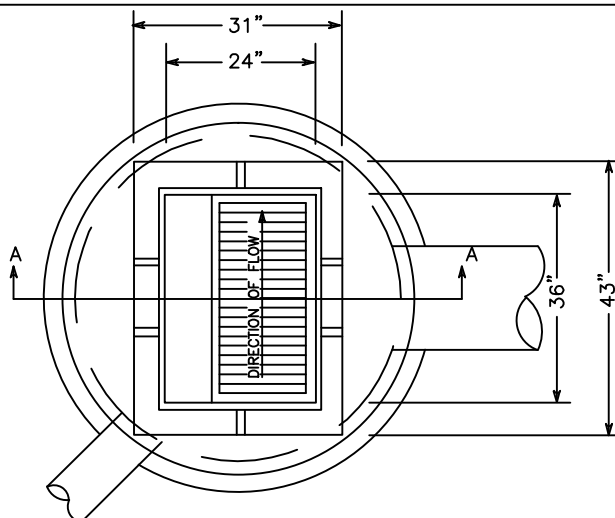
SPECIAL DETAILS

Date: Jan. 2016

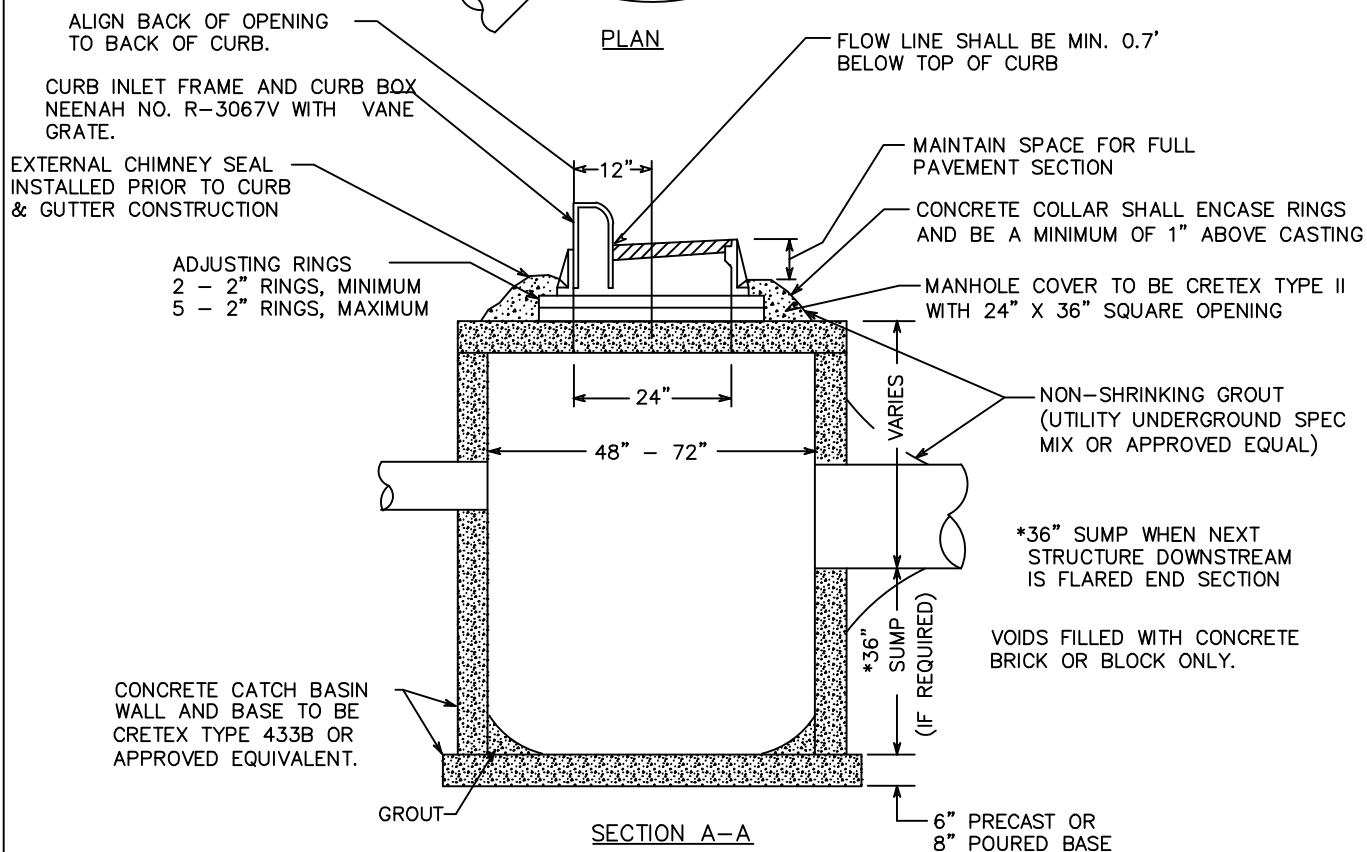
Revised:

STM-1

NO SCALE



PLAN



NOTES:

1. REINFORCING TO CONSIST OF #4 BARS @ 8" O.C., 4' MINIMUM LENGTH, EACH SIDE OF CASTING
2. MANHOLE STEPS SHALL BE CAST ALUMINUM OR MA INDUSTRY WITH VINYL COATING OR APPROVED EQUIVALENT AND SHALL BE LOCATED @ 16" O.C. PARALLEL WITH THE CURB
3. GROUT BOTTOM TO DRAIN TO CENTER
4. PIPE CUT-OUTS TO BE LOCATED WHERE REQUIRED
5. ADJUSTING RINGS SHALL HAVE MORTAR JOINTS - PLASTER OUTSIDE, STRIKE CLEAN INSIDE
6. INLET PROTECTION TO BE INSTALLED IN CATCH BASIN AND MAINTAINED AS DIRECTED BY THE ENGINEER
7. STEPS SHALL ALIGN WITH THE OPENING TO PROVIDE ACCESS TO THE MANHOLE
8. MAXIMUM DEPTH FROM TOP OF CASTING TO FIRST STEP SHALL NOT BE MORE THAN 16"



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CATCH BASIN
MANHOLE

SPECIAL DETAILS

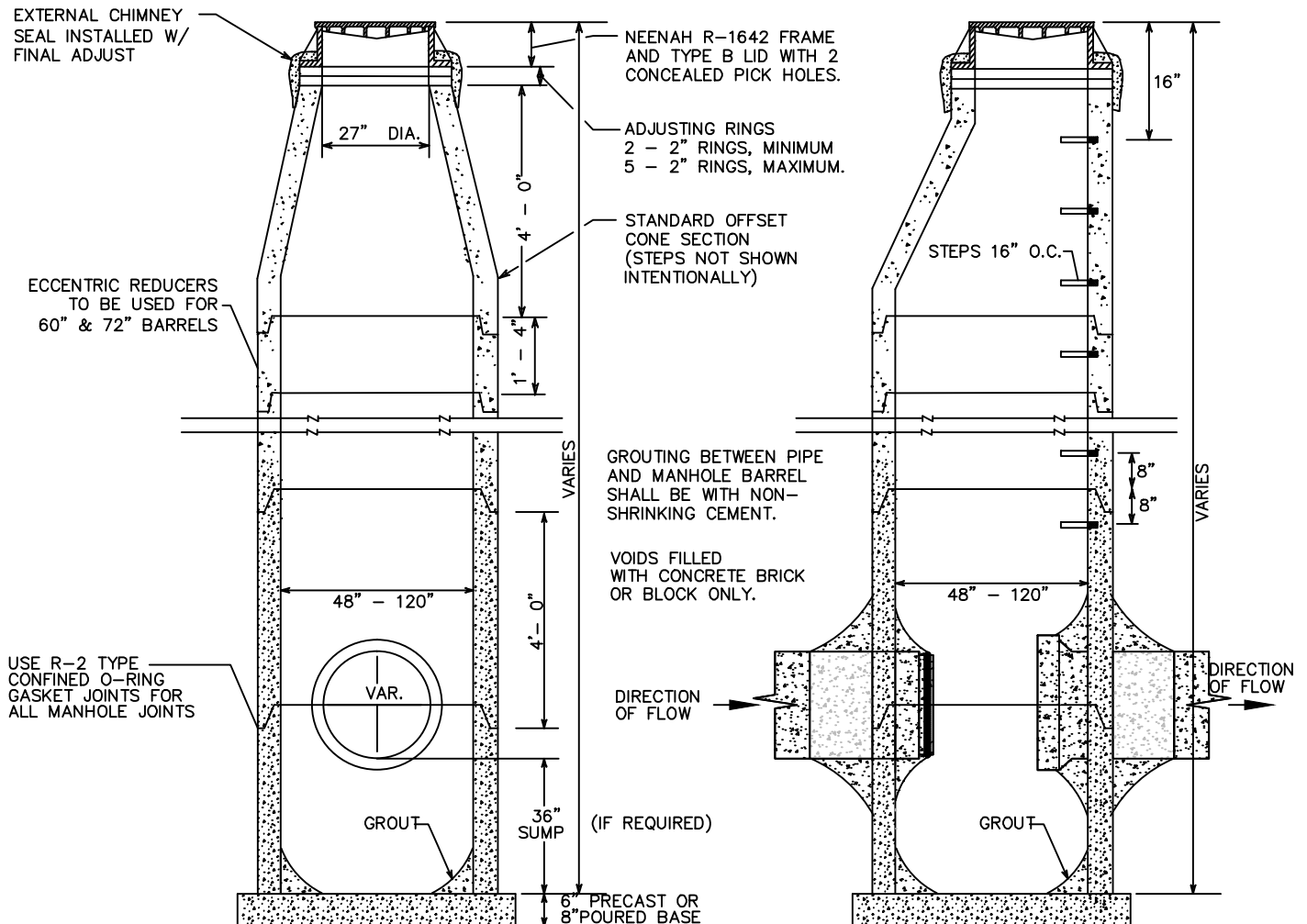
Date: Jan. 2016

Revised:

STM-2

NO SCALE

MANHOLE SHALL CONFORM TO THE REQUIREMENTS OF
ASTM C-478



NOTES:

1. MANHOLE STEPS SHALL BE CAST ALUMINUM OR MA INDUSTRY WITH VINYL COATING OR APPROVED EQUIVALENT AND SHALL BE LOCATED ON THE DOWN STREAM SIDE OF THE MANHOLE
2. STEPS SHALL BE PLACED SO THAT THE OFFSET VERTICAL PORTION OF THE CONE IS FACING DOWN STREAM
3. MANHOLE COVER SHALL BE CAST WITH THE WORDS "STORM SEWER"
4. THE INITIAL AND FINAL RAISING OF CASTINGS SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT
5. MAXIMUM DEPTH FROM TOP OF CASTING TO FIRST STEP SHALL NOT BE MORE THAN 16"
6. STEPS SHALL ALIGN WITH THE OPENING TO PROVIDE ACCESS TO THE MANHOLE



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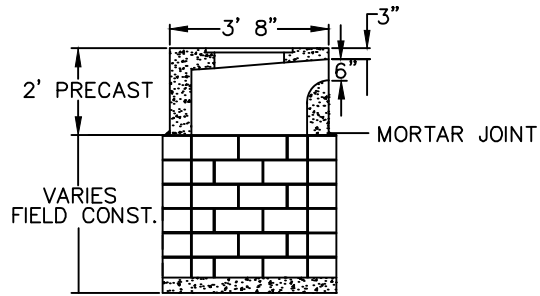
STANDARD MANHOLE
FOR STORM DRAIN

SPECIAL DETAILS

Date: Jan. 2016

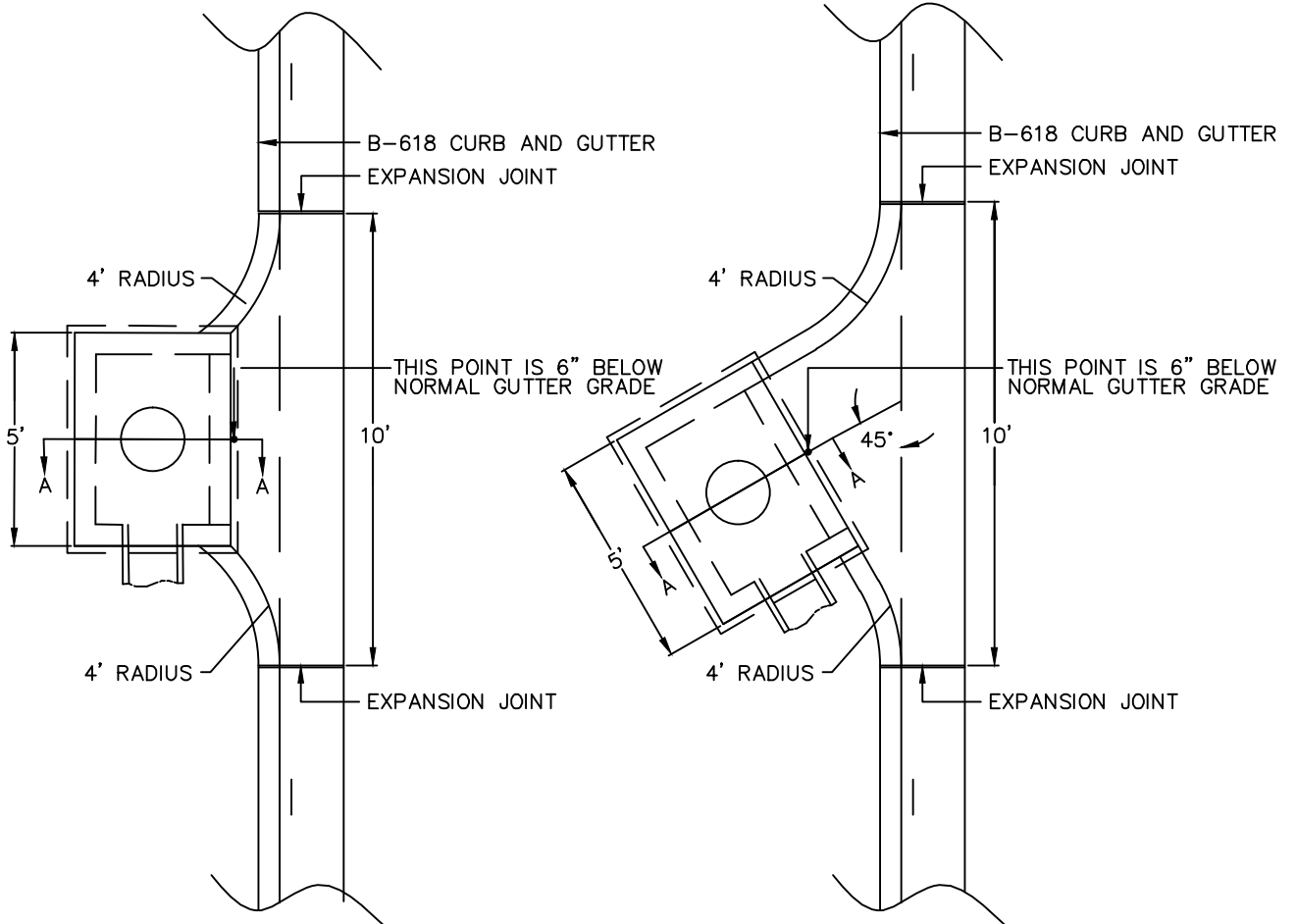
Revised:

STM-3



SECTION A-A

- NOTES:
1. LOWER SECTION SHALL BE CONSTRUCTED OF SOLID BLOCK MASONRY OR CAST IN PLACE CONCRETE.
 2. SLOPE FLOOR $5/8$ " PER FOOT TO OUTLET.
 3. SEE MNDOT PLATE 4021F.



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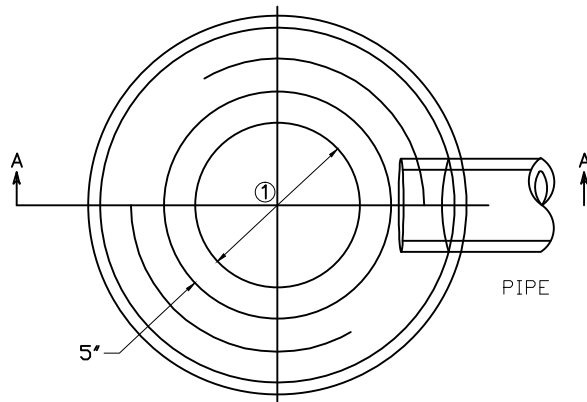
CATCH BASIN
HIGH CAPACITY INLET

SPECIAL DETAILS

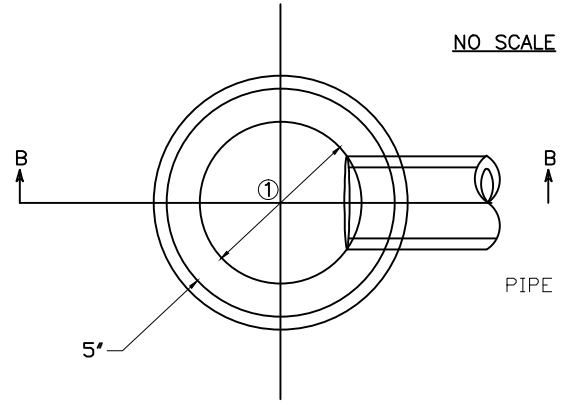
Date: Jan. 2016

Revised:

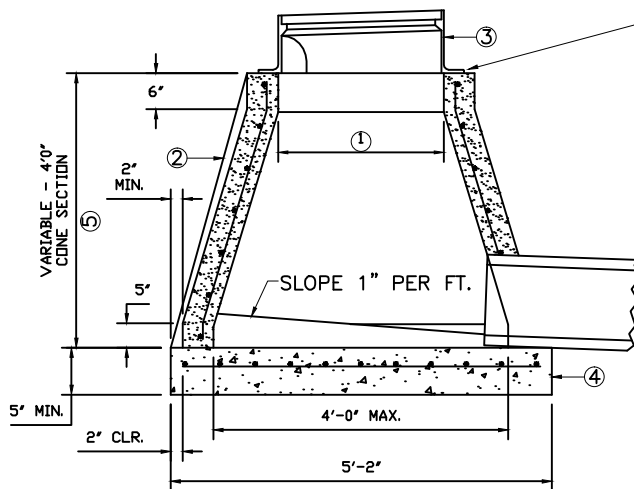
STM-4



TOP VIEW
REINFORCEMENT NOT SHOWN

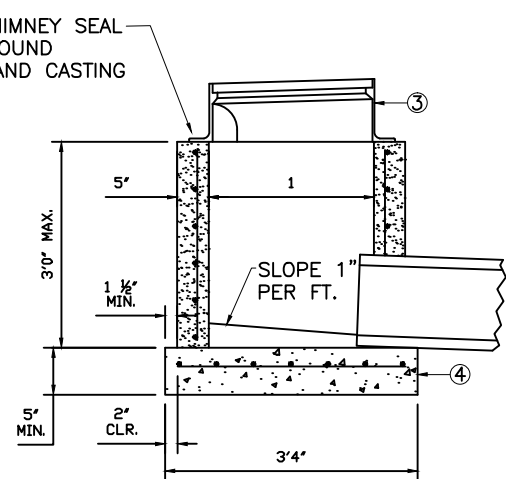


TOP VIEW
REINFORCEMENT NOT SHOWN



SECTION A-A

DESIGN G



SECTION B-B

DESIGN H

NOTES:

REINFORCING: SINGLE LINE STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.12 SQ. IN. PER FOOT OF HEIGHT.

- ① 2'3" NOM. OPENING.
- ② A STRAIGHT TAPERED WALL IS ACCEPTABLE.
- ③ REFER TO PLAN FOR CASTINGS REQUIRED. USE ADJUSTING RINGS WHERE NECESSARY. CASTING AND PRECAST CONC. ADJUSTING RINGS, SHALL BE SET ON FULL MORTAR BEDS. CASTING INCLUDED IN PAYMENT FOR EACH CATCH BASIN.
- ④ 8 IN. POURED CONCRETE BASE. BASE REINFORCEMENT: 0.12 SQ. IN. PER FT. IN EACH DIRECTION. AN APPROVED ALTERNATE PRECAST CONCRETE BASE MAY BE USED.
- HEIGHT OF STRUCTURE MAY BE INCREASED UP TO 1 FT. BY THE USE OF A PRECAST
- ⑤ SECTION OR CONCRETE BLOCK CONSTRUCTION ABOVE THE CONE SECTION.



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CATCH BASIN
DESIGN G & H

SPECIAL DETAILS

Date: Jan. 2016

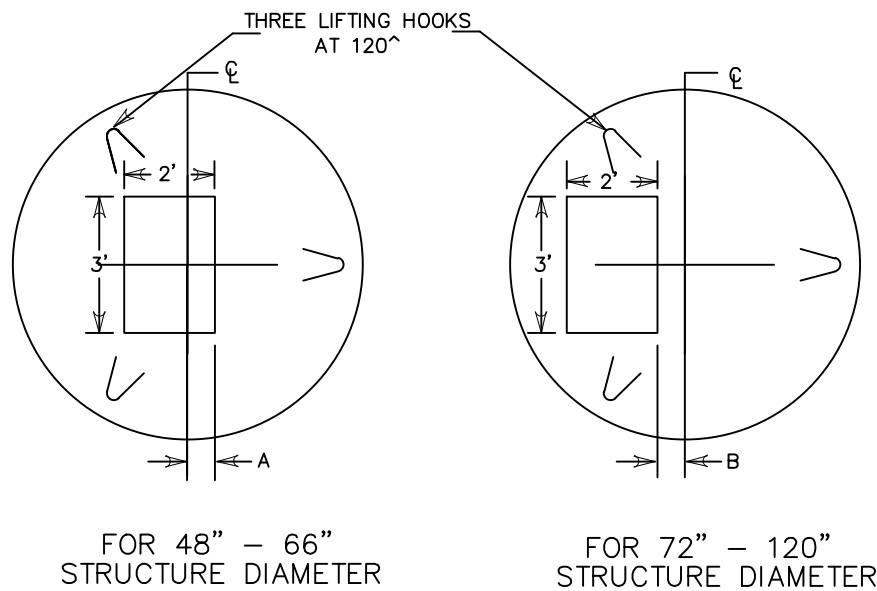
Revised:

STM-5

**MANHOLE TOP SLAB WITH OFF-SET
2' x 3' HOLE**

NO SCALE

STRUCTURE DIAMETER (in.)	COVER DIAMETER (in.)	MINIMUM t (in.)	A (in.)	B (in.)	WEIGHT OF COVER (lbs)
48	58	6	9		930
54	65	8	6		1710
60	72	8	3		2230
66	79	8	0		2810
72	86	8		3	3440
78	93	8		6	4120
84	100	8		9	4860
90	108	8		12	5760
96	114	8		15	6490
102	120	8		18	7260
108	126	12		21	12100
120	144	12		24	16100



PRECAST COVER DETAIL

NOTE:

CONTRACTOR TO SUBMIT REINFORCEMENT
DETAIL FOR PRECAST COVER TO
ENGINEER FOR APPROVAL.



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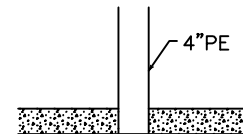
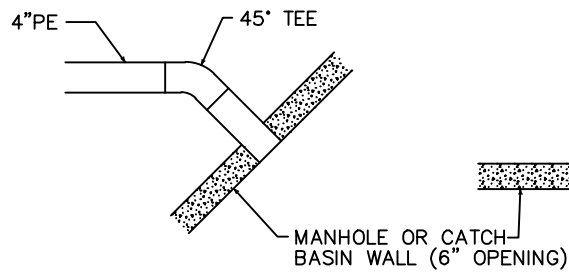
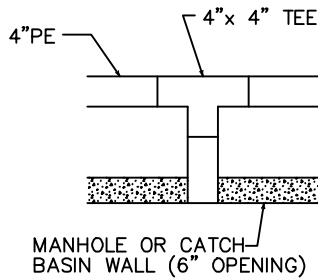
PRECAST COVER DETAIL

SPECIAL DETAILS

Date: Jan. 2016

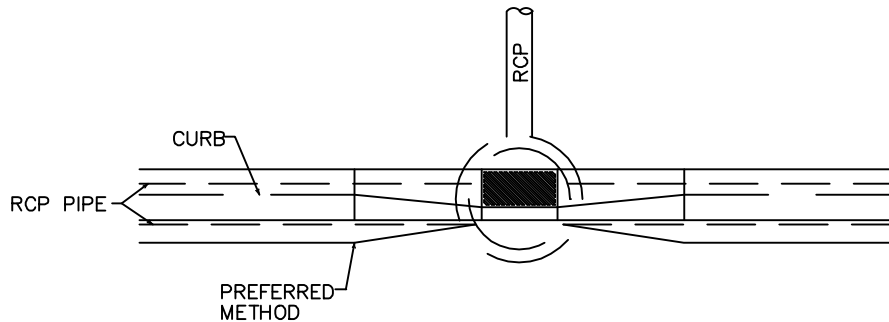
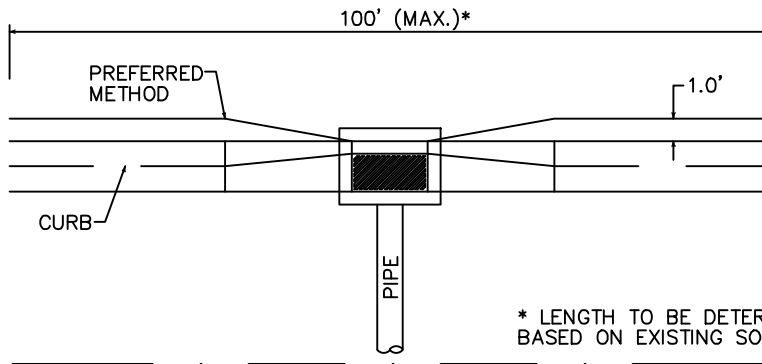
Revised:

STM-6



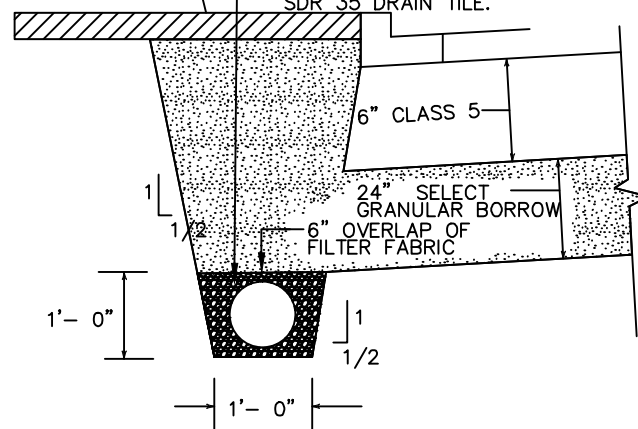
NO SCALE

ALL CONNECTIONS TO EXISTING STRUCTURES SHALL BE CORE DRILLED



4" PERFORATED DRAIN TILE 25' EACH DIRECTION AT LOW POINT CATCH BASINS. W/COARSE AGGREGATE (MNDOT 3149.2H) WRAP WITH GEOTEXTILE (Mn/DOT 3733, TYPE 1) (ALL TO BE INCLUDED IN THE UNIT PRICE BID PER LINEAL FOOT OF 4" PERFORATED PVC SDR 35 DRAIN TILE.

TURF ESTABLISHMENT



4" PERFORATED DRAIN TILE



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4" PERFORATED
SUBDRAIN

SPECIAL DETAILS

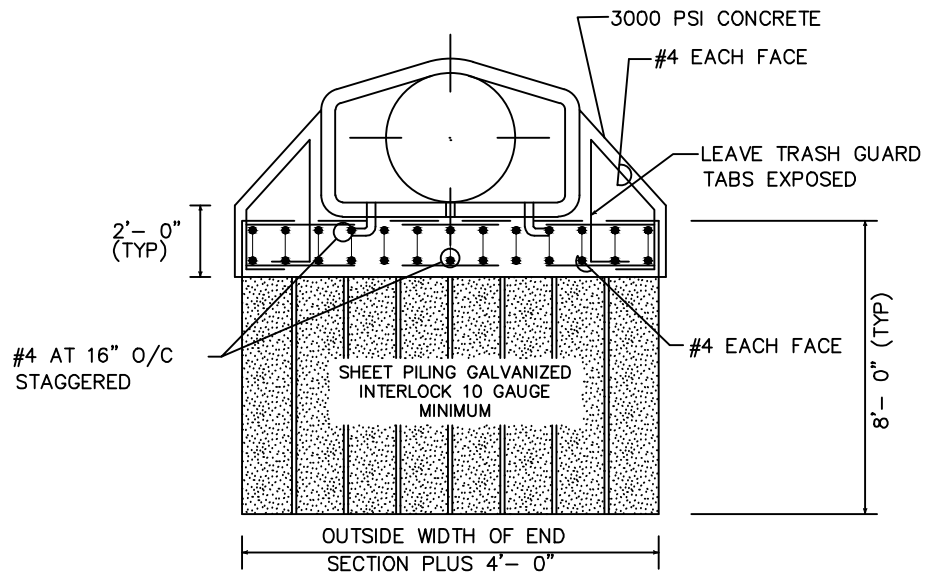
Date: Jan. 2016

Revised:

STM-7

NOTES:

THIS DRAWING IS TYPICAL FOR ALL FLARED END SECTIONS 24 INCHES IN DIAMETER OR LARGER. ALL TRASH GUARDS WILL BE GALVANIZED.

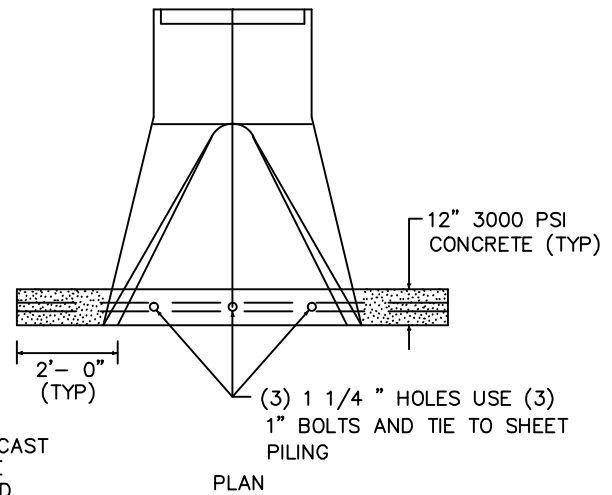
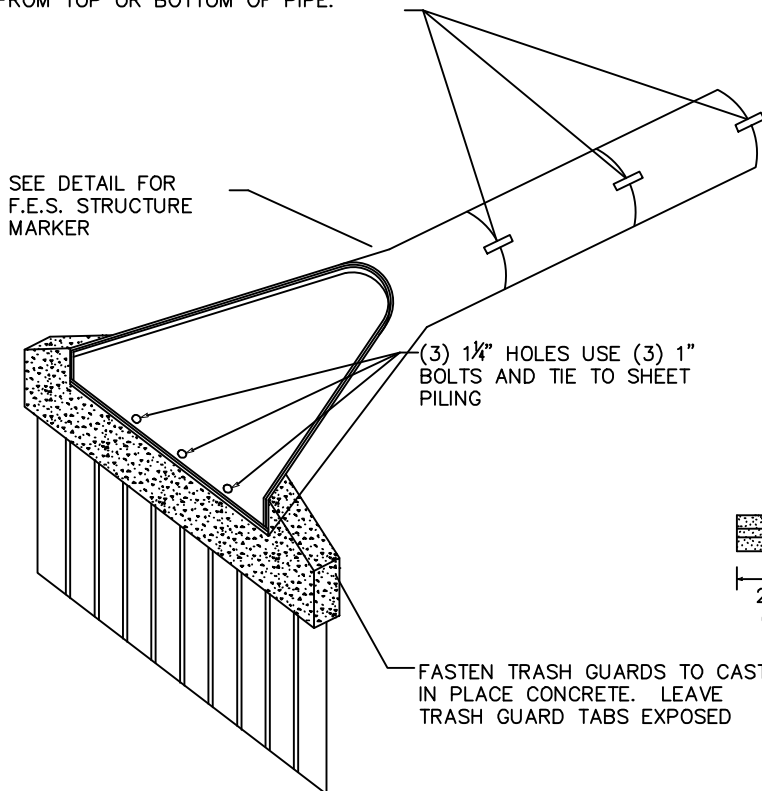


ELEVATION

NO SCALE

TIE LAST 3 PIPE JOINTS AND USE 2 TIE BOLT FASTENERS PER JOINT INSTALLED AT 60" FROM TOP OR BOTTOM OF PIPE.

PILING FOR FLARED END SECTION



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FES SHEET PILING

SPECIAL DETAILS

Date: Jan. 2016

Revised:

STM-8

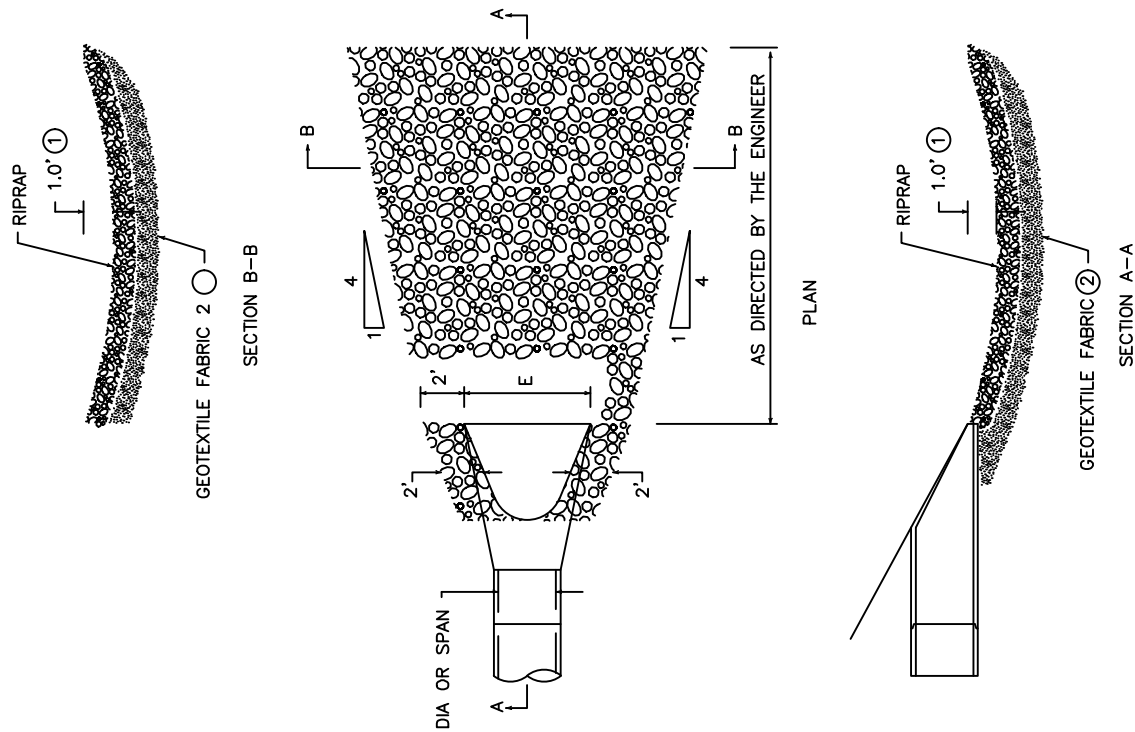
RIPRAP AT RCP OUTLETS

RIPRAP AT RCP OUTLETS									
DIA ROUND PIPE	CLASS III D 50 = 9"			CLASS IV D 50 = 12"			CLASS V D 50 = 15"		
	15" DEPTH RIPRAP	7.5" DEPTH GRANULAR FILTER	18" DEPTH RIPRAP	9" DEPTH GRANULAR FILTER	24" DEPTH RIPRAP	12" DEPTH GRANULAR FILTER			
	(CU YD)	(CU YD)	(CU YD)	(CU YD)	(CU YD)	(CU YD)			
12	2.1	1.1	2.6	1.3	3.4	1.7			
15	2.9	1.4	3.5	1.7	4.6	2.3			
18	3.6	1.8	4.4	2.2	5.8	2.9			
21	4.6	2.3	5.6	2.8	7.4	3.7			
24	5.8	2.9	6.9	3.5	9.2	4.6			
27	6.9	3.4	8.3	4.1	11.0	5.5			
30	8.3	4.1	9.9	5.0	13.2	6.6			
36	11.0	5.5	13.2	6.6	17.6	8.8			
42	13.6	6.8	16.4	8.2	21.8	10.9			
48	16.8	8.4	20.1	10.1	26.8	13.4			
54	19.8	9.9	23.7	11.9	31.6	15.8			
60	23.0	11.5	27.6	13.8	36.8	18.4			
66	27.0	13.5	32.4	16.2	43.2	21.6			
72	31.1	15.6	37.4	18.7	49.8	24.9			
84	40.0	20.0	48.0	24.0	64.0	32.0			
90	45.5	22.8	54.6	27.3	72.8	36.4			

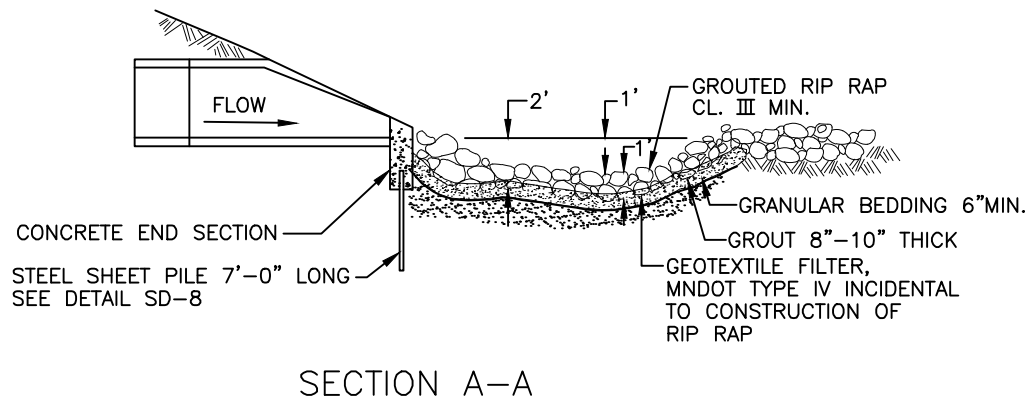
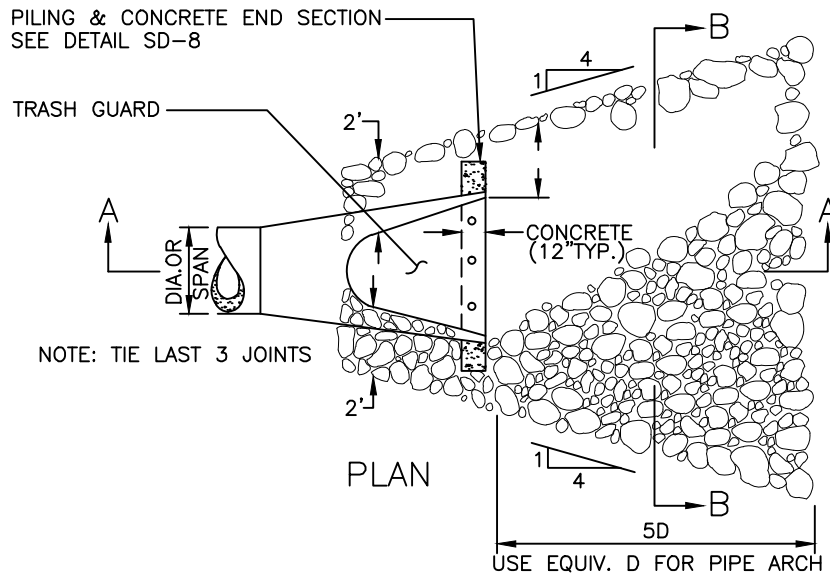
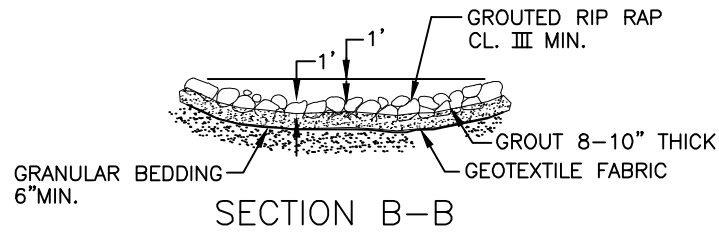
RIPRAP AT RCP-A OR BOXES OF EQUIVALENT SPAN WIDTH

RIPRAP AT RCP-A OR BOXES OF EQUIVALENT SPAN WIDTH									
SPAN ROUND PIPE	CLASS III D 50 = 9"			CLASS IV D 50 = 12"			CLASS V D 50 = 15"		
	15" DEPTH RIPRAP	7.5" DEPTH GRANULAR FILTER	(CU YD)	18" DEPTH RIPRAP	9" DEPTH GRANULAR FILTER	(CU YD)	24" DEPTH RIPRAP	12" DEPTH GRANULAR FILTER	(CU YD)
(IN)									
22	3.6	1.8		4.4	2.2		5.8	2.9	
28	5.8	2.9		6.9	3.5		9.2	4.6	
36	8.1	4.1		9.8	4.9		13.0	6.5	
43	11.0	5.5		13.2	6.6		17.6	8.8	
51	13.6	6.8		16.4	8.2		21.8	10.9	
58	16.5	8.3		19.8	9.9		26.4	13.2	
65	19.8	9.9		23.7	11.9		31.6	15.8	
73	23.3	11.6		27.9	14.0		31.2	18.6	
88	32.4	16.2		38.9	19.4		51.8	25.9	
102	43.5	21.8		52.2	26.1		69.6	34.8	
115	44.0	22.0		52.8	26.4		70.4	35.2	
122	49.3	24.6		59.1	29.6		78.8	39.4	
138	61.3	30.6		73.5	36.8		98.0	49.0	
154	74.4	37.2		89.3	44.6		119.0	59.5	

WILL BE



- ① FOR PIPES GREATER THAN OR EQUAL TO 48", USE 2.0'
- ② THE FABRIC SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CULVERT APRON 3 FEET.
- ③ GROUT REQUIRED ON 21" & GREATER DIA. PIPE OR AS DIRECTED BY ENGINEER.



NOTE:

1. CONCRETE GROUT MATERIAL WILL BE USED ON ALL PIPE OUTLETS 21" DIA. OR LARGER.
2. PLACE RIPRAP INTO THE CONCRETE GROUT AFTER THE GROUT HAS BEEN PLACED AT A 8"-10" UNIFORM DEPTH.
3. DIMENSIONS AND C.Y. OF CONCRETE WILL BE DETERMINED BY ENGINEER.



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GROUTED RIPRAP AT OUTLETS

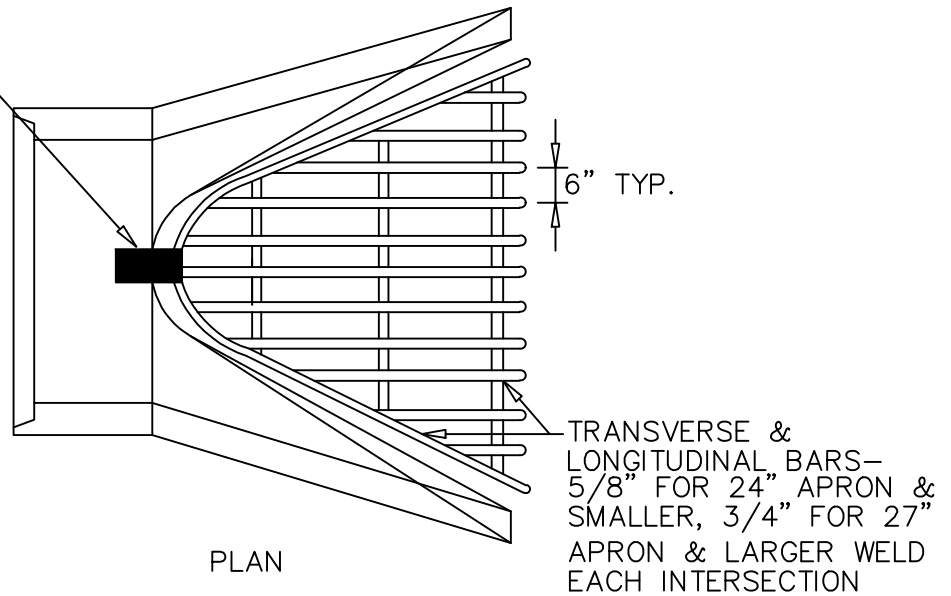
SPECIAL DETAILS

Date: Jan. 2016

Revised:

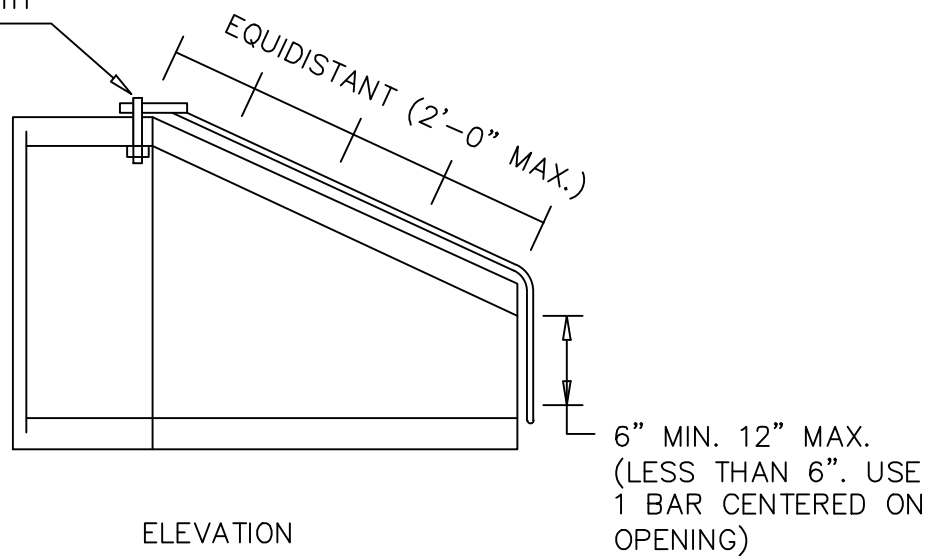
STM-10

16 GA. GALVANIZED
STEEL STRAP



PLAN

- (1) 1" EYE BOLT WITH
- (2) WASHERS EACH



ELEVATION

NOTES:

1. ENTIRE TRASH GUARD ASSEMBLY TO BE HOT-DIP GALVANIZED AFTER FABRICATION.
2. SIZE OF TRASH GUARD VARIABLE DEPENDED ON SIZE OF FLARED END SECTION.
3. PLACE TRASH GUARDS ON APRONS 18" AND LARGER, UNLESS OTHERWISE NOTED.



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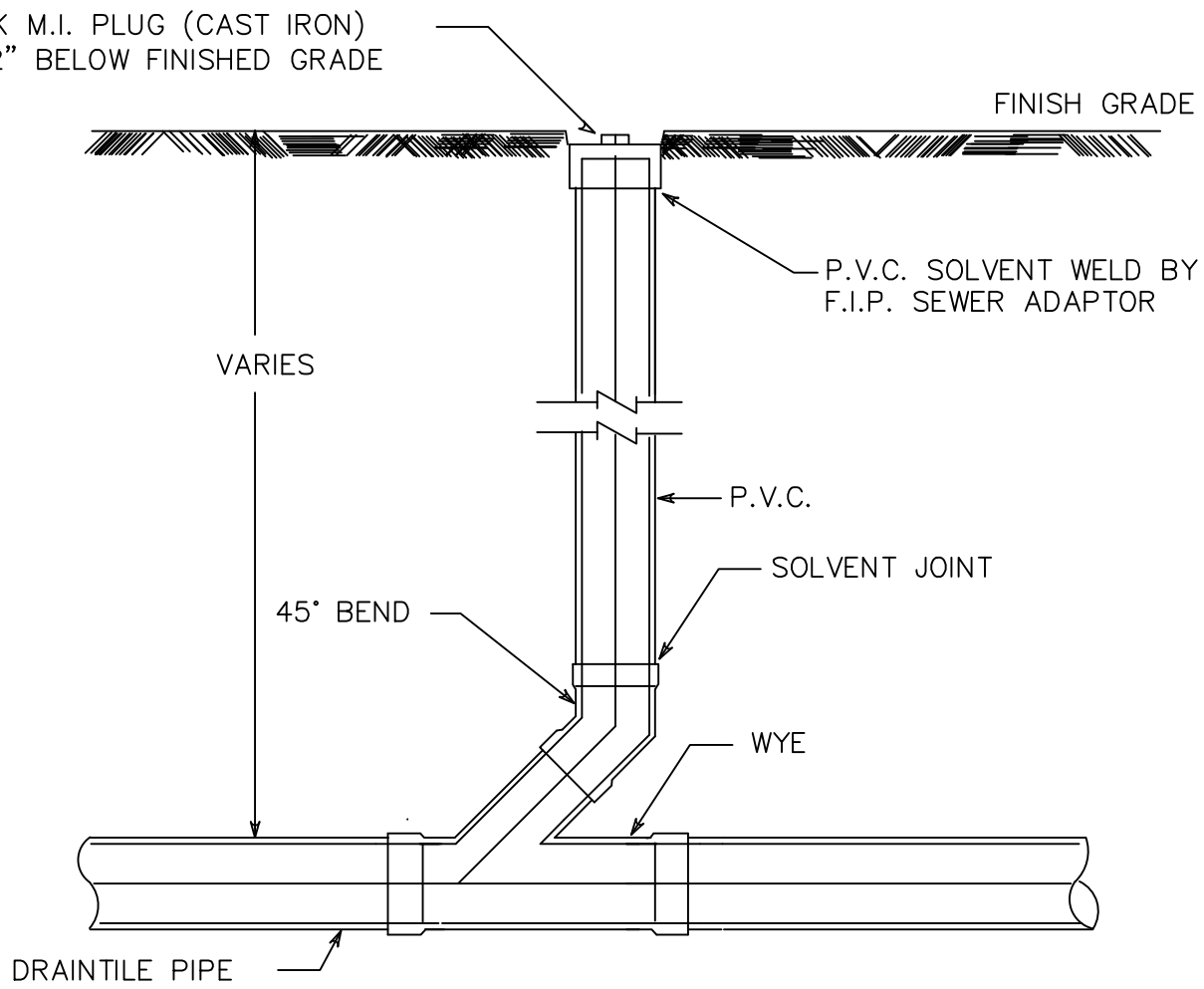
**TRASH GUARD FOR
STORM SEWER APRONS**

SPECIAL DETAILS

Date: Jan. 2016

Revised:

STM-11



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DRAINTILE CLEANOUT FOR STORM DRAIN

SPECIAL DETAILS

Date: Jan. 2016

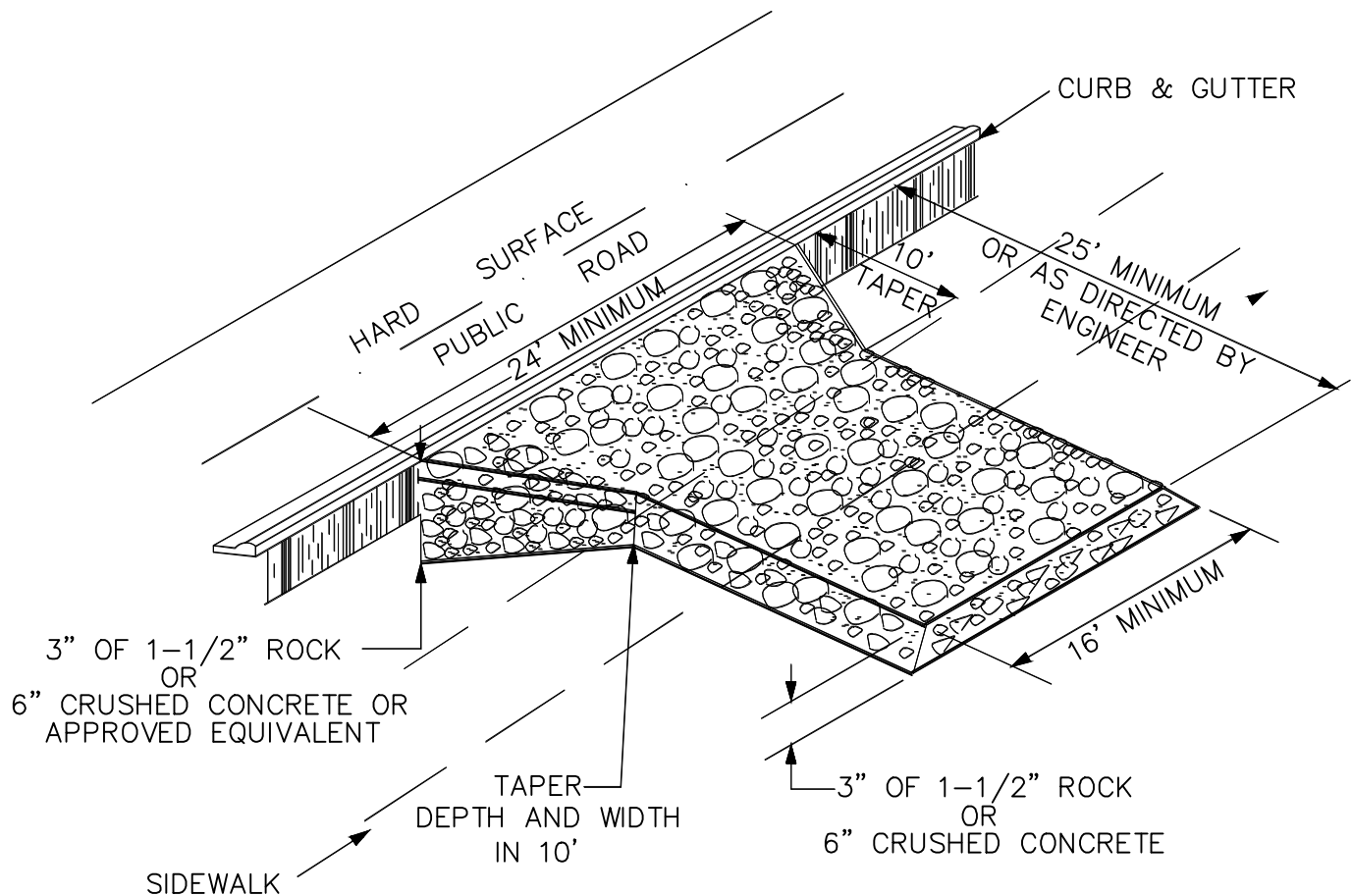
Revised:

STM-12

NO SCALE

SPECIAL NOTE:

SPECIAL ATTENTION SHALL BE PAID WHEN
INSTALLING DRIVEWAYS TO NOT
UNDERMINE OR DAMAGE EXISTING
SIDEWALKS.



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ROCK CONSTRUCTION
ENTRANCE

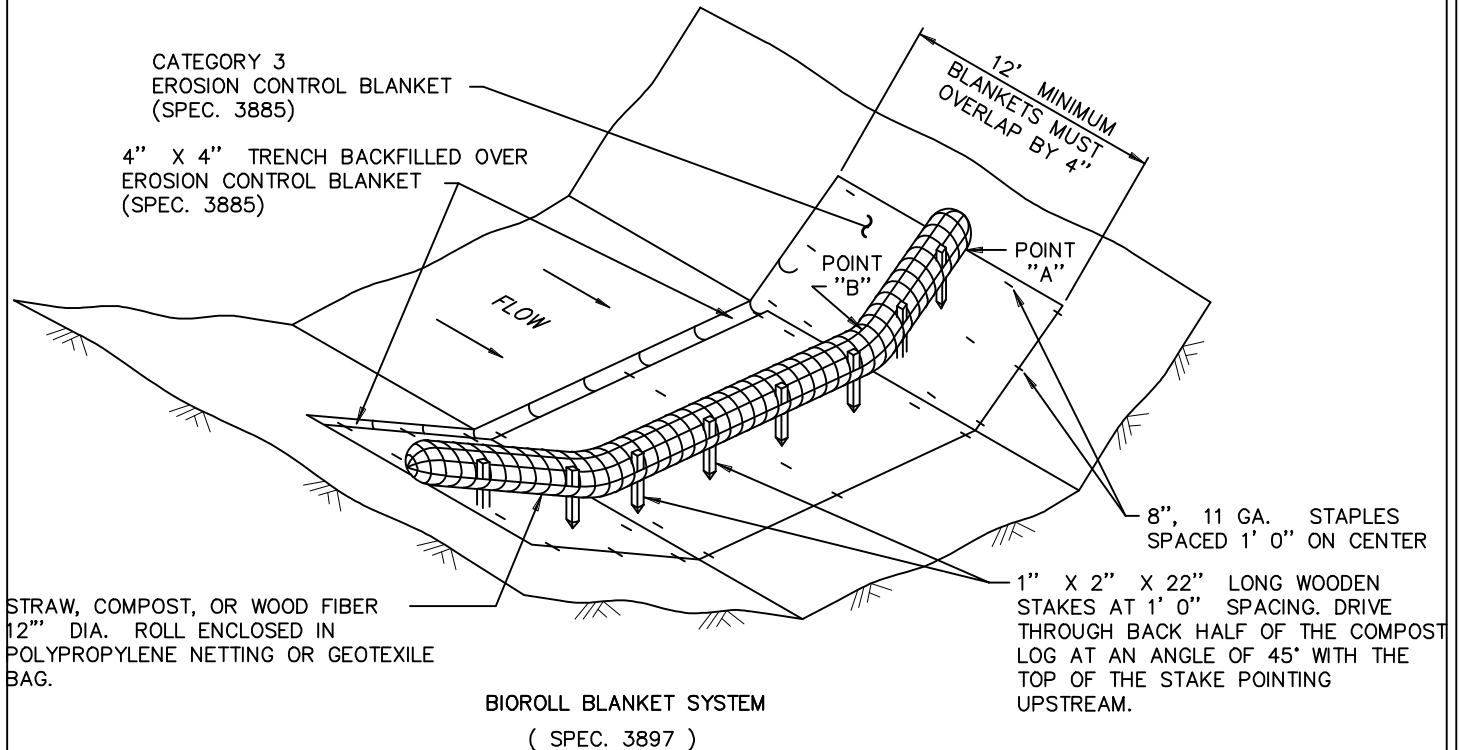
SPECIAL DETAILS

Date: Jan. 2016

Revised:

EC-1

NO SCALE



NOTES

1. FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
2. SHOULD THE BIOROLL DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USEABLE LIFE AND THE BARRIER STILL BE NECESSARY, THE BIOROLL SHALL BE PLACED PROMPTLY.
3. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY 1/2 HEIGHT OF THE BARRIER, OR AS DIRECTED BY THE ENGINEER.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED, SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDED.
5. ALL MATERIAL & INSTALLATION MUST CONFORM TO THE REQUIREMENTS OF THE CURRENT EDITION OF THE MNDOT CONSTRUCTION SPECIFICATIONS SECTION 3897.
6. POINT A MUST BE A MINIMUM OF 6" HIGHER THAN POINT B TO ENSURE THAT WATER FLOWS OVER THE DIKE AND NOT AROUND THE ENDS.
7. STAPLE DENSITY SHALL CONFORM TO MANUFACTURER'S SPECIFICATIONS.



NORTH
ST. PAUL

BIO-ROLL BLANKET

SPECIAL DETAILS

Date: Jan. 2016

Revised:

EC-2

EC-3

WETLAND
BUFFER

NO
MOWING
ALLOWED

2 X 2 POST

SPECIFICATIONS

SUBMIT PLAN TO CITY OF MAHTOMEDI PRIOR TO INSTALLATION OF SIGNS, MATERIAL AND WORDS MAY CHANGE

MONUMENT

CONSISTS OF A POST AND A WETLAND BUFFER SIGN

WETLAND BUFFER SIGNS

MOUNTED FLUSH WITH THE TOP OF THE POST FASTENED WITH NON-REMOVABLE SCREWS OR RIVETS SIZE: 12" H X 8" W ALUMINUM SHALL BE 5052-H38 OR 6061-T6 ALLOY, GAUGE SHALL BE 0.080.

POST MATERIALS

2" X 2" X 8' POST

COLOR

COLOR SHALL BE GREEN LETTERS ON WHITE BACKGROUND

POST INSTALLATION

MOUNTED TO A HEIGHT OF FOUR FEET ABOVE GRADE SET AT LEAST 42" IN THE GROUND INSTALLED AT EACH LOT LINE WHERE IT CROSSES A WETLAND BUFFER WITH A MAXIMUM SPACING OF 300 FEET BETWEEN SIGNS (IF NO BUFFER IS REQUIRED THE MONUMENT SHALL BE AT THE EDGE OF THE WETLAND). PLACE ADDITIONAL POSTS AS NECESSARY TO FOLLOW BUFFER CONTOUR LINE



NORTH
ST. PAUL

WETLAND BUFFER
MARKER

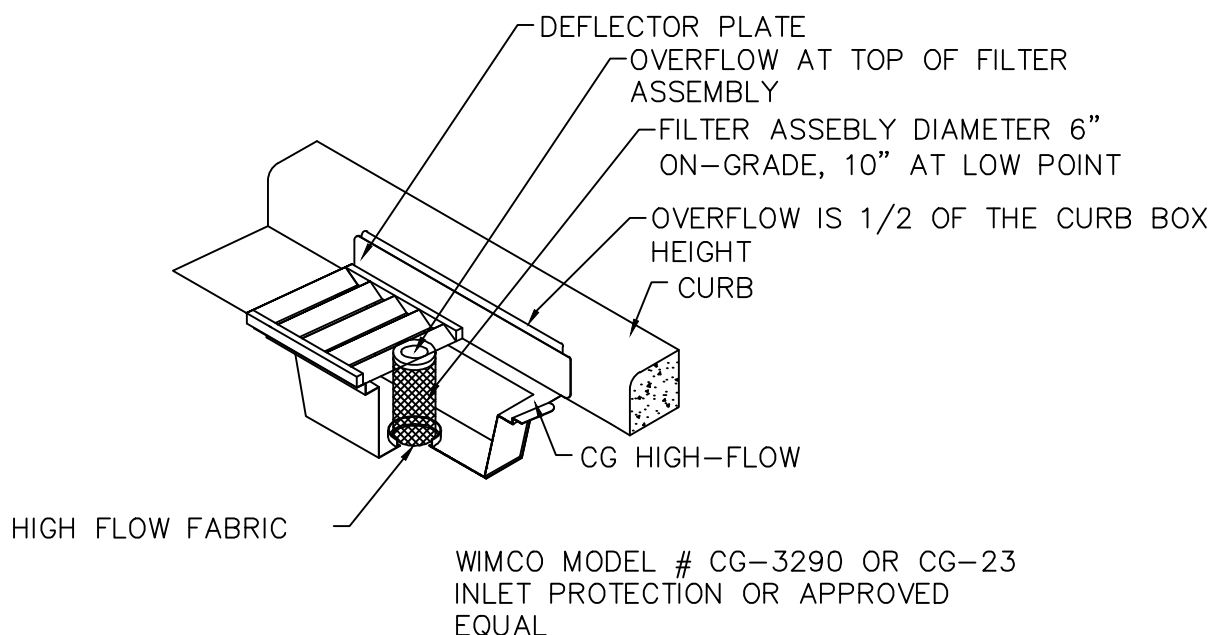
SPECIAL DETAILS

Date: Jan. 2016

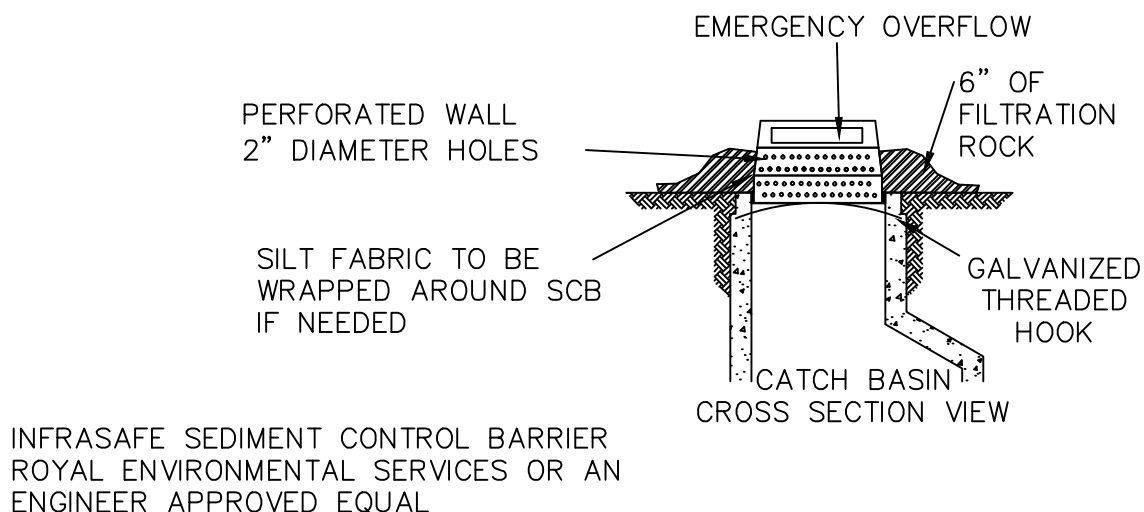
Revised:

EC-4

NO SCALE



CURB AND GUTTER INLET PROTECTION



REAR YARD INLET PROTECTION

NOTES:

1. DEVICES TO BE INSTALL IMMEDIATELY UPON INSTALLATION OF CONCRETE STRUCTURE CONE OR TOP SLAB. CASTING ASSEMBLY MUST ALSO BE AT LEAST TEMPORARILY IN PLACE.
2. CHECK FILTER MEDIA AFTER EACH RAIN EVENT & CLEAN AND REPLACE IF SEDIMENT CLOGS FILTER.
3. REMOVE SEDIMENT AND DEBRIS FROM RECEPTICLE AFTER EACH RAIN EVENT.



NORTH
ST. PAUL

STORM SEWER
INLET PROTECTION

SPECIAL DETAILS

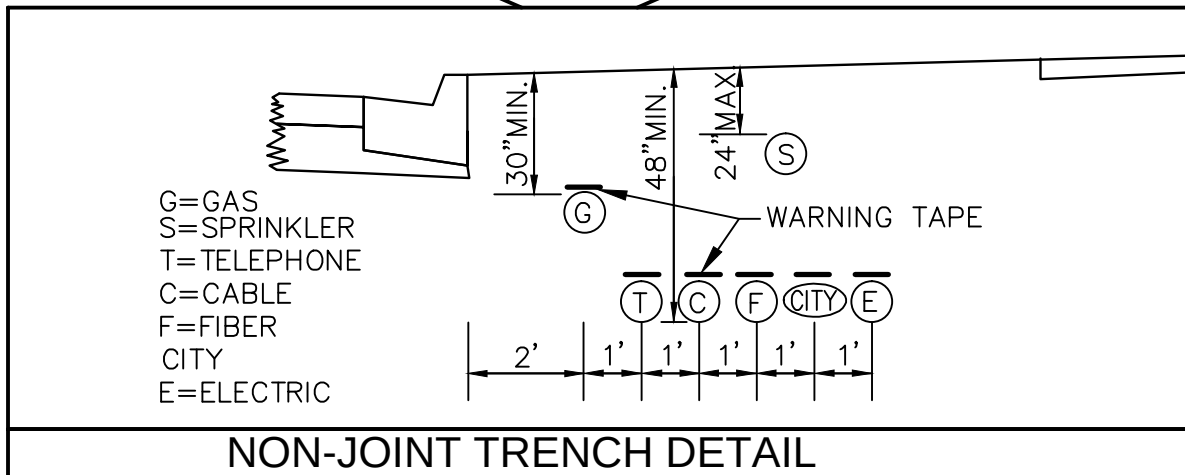
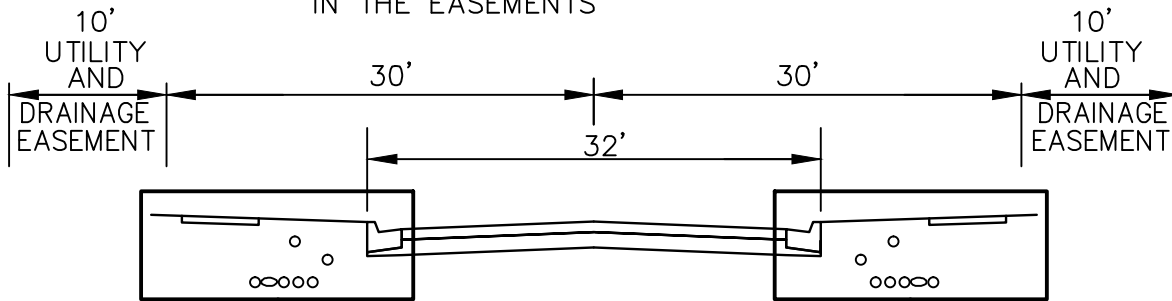
Date: Jan. 2016

Revised:

EC-5

NOTE:

A PERMIT IS REQUIRED TO WORK IN THE PUBLIC RIGHT OF WAY. THIS INCLUDES INSTALLATION OF SMALL OR PRIVATE UTILITIES. ALL ABOVE GROUND TRANSFORMERS AND PEDESTALS SHALL BE LOCATED IN THE EASEMENTS



NON-JOINT TRENCH DETAIL

NOTES:

1. GAS MAIN SHALL HAVE LOCATE WIRE, 30" MIN. COVER AND 12" MIN. SEPARATION FROM OTHER UTILITIES.
2. ALL SMALL UTILITIES INCLUDING GAS MAINS ON NEW AND RECONSTRUCTED PROJECTS SHALL BE DUAL MAIN, ONE ON EACH SIDE OF STREET
3. WARNING TAPE REQUIRED MIN. 12" ABOVE ALL UTILITIES.
4. IRRIGATION IN BOULEVARD SHALL BE PRESSURE TESTED PLASTIC PIPE TESTED TO TWICE THE OPERATING PRESSURE AND TO BE SEAMLESS (NO JOINTS). A THREE YEAR LONG MAINTENANCE BOND IS REQUIRED. TRACKING WIRE ALSO TO BE BURIED IN CROSSING.
5. SEE PROJECT PLANS AND SPECIFICATIONS FOR STREET AND RIGHT OF WAY WIDTH.
6. BOULEVARD WIDTH MAY VARY DEPENDING ON SIDEWALK/TRAIL INSTALLATION.



**NORTH
ST. PAUL**

**SMALL/PRIVATE UTILITY
NON-JOINT TRENCH**

SPECIAL DETAILS

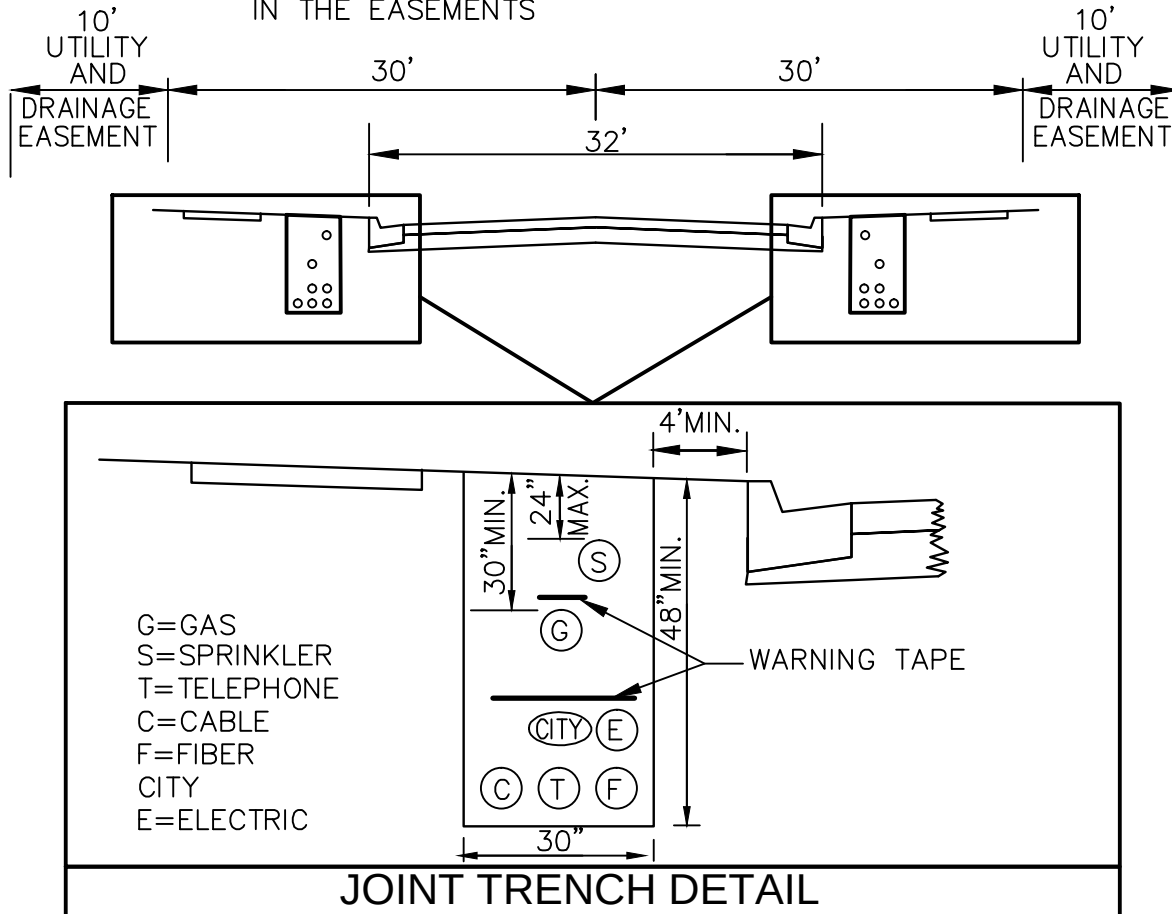
Date: Jan. 2016

Revised:

PU-1

NOTE:

A PERMIT IS REQUIRED TO WORK IN THE PUBLIC RIGHT OF WAY. THIS INCLUDES INSTALLATION OF SMALL OR PRIVATE UTILITIES. ALL ABOVE GROUND TRANSFORMERS AND PEDESTALS SHALL BE LOCATED IN THE EASEMENTS



NOTES:

1. GAS MAIN SHALL HAVE LOCATE WIRE, 30" MIN. COVER AND 12" MIN. SEPARATION FROM OTHER UTILITIES.
2. ALL SMALL UTILITIES INCLUDING GAS MAINS ON NEW AND RECONSTRUCTED PROJECTS SHALL BE DUAL MAIN, ONE ON EACH SIDE OF STREET
3. WARNING TAPE REQUIRED MIN. 12" ABOVE ALL UTILITIES.
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5. SEE PROJECT PLANS AND SPECIFICATIONS FOR STREET AND RIGHT OF WAY WIDTH.
6. BOULEVARD WIDTH MAY VARY DEPENDING ON SIDEWALK/TRAIL INSTALLATION.



NORTH
ST. PAUL

SMALL/PRIVATE UTILITY
JOINT TRENCH

SPECIAL DETAILS

Date: Jan. 2016

Revised:

PU-2

APPENDIX C

DUCTILE IRON MECHANICAL JOINT FITTINGS WEIGHTS
(AWWA C110)

Ductile Iron Mechanical Joint Fittings

Weight in Pounds per AWWA C110/A21.10-08

BENDS (MJ-MJ)				
Size	90°	45°	22 1/2°	11 1/4°
4"	55	50	50	50
6"	85	75	75	75
8"	125	110	110	110
10"	190	155	160	160
12"	255	215	220	220
14"	340	270	275	275
16"	430	340	345	345
18"	545	420	430	430
20"	680	530	535	540
24"	1025	755	765	770

NOTE:

DO NOT use 90° bends.

Use (2) 45° bends.

TEES (MJ-MJ)										
Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
4"	80									
6"	115	125								
8"	165	175	185							
10"	235	250	260	310						
12"	315	325	340	390	410					
14"		435	450	465	495	520				
16"		540	550	570	590	620	650			
18"		590	605	620	640	755	785	820		
20"		725	735	755	775	795	945	1140	1020	
24"		985	1000	1020	1030	1055	1075	1400	1450	1535

CROSSES (MJ-MJ)										
Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
4"	105									
6"	140	160								
8"	185	205	235							
10"	260	285	310	380						
12"	340	360	385	460	495					
14"		475	500	540	585	635				
16"		575	605	645	685	735	790			
18"		625	655	685	725	870	930	995		
20"		760	790	820	860	905	1085	1155	1230	
24"		1025	1045	1085	1110	1155	1200	1590	1675	1835

REDUCERS (MJ-MJ)										
Size	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
6"	60									
8"	80	95								
10"	105	115	135							
12"	135	150	165	190						
14"		190	210	230	255					
16"		230	250	280	305	335				
18"			295	325	350	380	415			
20"				375	405	430	470	510		
24"					550	575	615	660	705	

SOLID SLEEVES (MJ)			
Size		Short	Long
4"		35	45
6"		45	65
8"		65	85
10"		85	115
12"		110	145
14"		150	195
16"		180	235
18"		215	285
20"		240	325
24"		320	425

CAPS (MJ) FLAT		DISHED
Size		
4"	15	
6"	25	
8"	45	
10"	60	
12"	80	
14"	120	
16"	155	
18"	195	
20"	240	
24"	345	

PLUGS (MJ) FLAT	
Size	
4"	15
6"	25
8"	45
10"	65
12"	85
14"	115
16"	145
18"	185
20"	225
24"	335

APPENDIX D

DISINFECTING WATER MAINS
(AWWA C651)



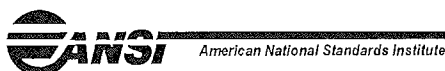
**American Water Works
Association**

The Authoritative Resource on Safe Water®

ANSI/AWWA C651-05
(Revision of ANSI/AWWA C651-99)

AWWA Standard

Disinfecting Water Mains



Effective date: June 1, 2005.

First edition approved by AWWA Board of Directors Sept. 30, 1947.

This edition approved Jan. 16, 2005.

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Incorporates Errata dated June 2005, and March 2006.

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AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising section of Journal AWWA

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

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Science and Technology

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* Liaison, nonvoting

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Foreword

This Foreword is for information only and is not a part of ANSI/AWWA C651.

I. Introduction.

I.A. *Background.* This standard describes methods of disinfecting newly constructed potable-water mains; mains that have been removed from service for planned repairs or for maintenance that exposes them to contamination; mains that have undergone emergency repairs because of physical failure; and mains that, under normal operation, continue to show the presence of coliform organisms. The disinfecting agents discussed in this standard are chlorine solutions that may be derived from liquid chlorine (Cl_2), calcium hypochlorite ($\text{Ca}(\text{OCl})_2$), or sodium hypochlorite (NaOCl). Combinations of free chlorine residual and contact time are provided.

I.B. *History.* This standard was first approved on Sept. 30, 1947, by the AWWA Board of Directors and published as 7D.2-1948, A Procedure for Disinfecting Water Mains. Revisions were approved by the AWWA Board of Directors on Sept. 14, 1948; Mar. 6, 1953; May 27, 1954; June 2, 1968; June 7, 1981; and June 20, 1999. All were done under the designation ANSI/AWWA C601, Standard for Disinfecting Water Mains. In 1986, the designation of the standard was changed to ANSI/AWWA C651, and the subsequent editions were approved by the AWWA Board of Directors on June 18, 1992, and June 20, 1999. This edition was approved on Jan. 16, 2005.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or contact with, drinking water rests with individual states.* Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health

*Persons outside of the US should contact the appropriate authority having jurisdiction.

effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on April 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF, NSF*/ANSI[†] 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,[‡] and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 60. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 60 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C651 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements including applicable standards.
2. Determine the status of certifications by all parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

* NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48105.

† American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

‡ Both publications available from National Academy of Sciences, 500 Fifth St., N.W., Washington, DC 20001.

II. Special Issues.

II.A. *Information on Application of This Standard.* Generally, it is easier to disinfect a new main rather than one that has had emergency repairs. The unsanitary conditions created when an existing main bursts or is cut into are likely to be difficult to control. The need to quickly restore water service to the community requires more rapid disinfection procedures than those prescribed for newly constructed mains.

Crews responsible for the repair of mains should be aware of the potential health hazards and should be trained to carefully observe prescribed construction practices and disinfection procedures.

Disinfection requires skills not necessarily mastered by competent construction crews. Some utilities prefer to disinfect water mains using specially trained treatment crews. However, because the effectiveness of disinfection depends, in large measure, on maintaining clean pipes and avoiding major contamination during construction, there are some advantages to having the construction crew retain the responsibility for disinfection. Furthermore, certain functions, such as placing tablets, must be performed by the construction crew. In either case, it is strongly recommended that pipe crews be aware of the need to maintain clean pipes and avoid contamination.

While bacteriological testing in accordance with Sec. 5.1 is used to verify the absence of coliform organisms and is generally accepted as verification that disinfection of the pipeline has been accomplished, following sanitary practices for handling and installation of pipe, valves, fittings, and accessories, coupled with adequate flushing of the line before disinfection, is necessary to ensure that the disinfected pipeline will be ready for connection to the water system. Failure to pass the bacteriological test requires that the flushing or disinfection process be repeated. It must be remembered that the final water quality test is not the primary means for certifying the sanitary condition of a main. The sanitary handling of materials, the practices during construction, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main.

Three methods of disinfecting newly constructed water mains are described in this standard: the tablet method, the continuous-feed method, and the slug method. The utility should decide which of these methods is most suitable for a given situation. Factors to consider when choosing a method should include the length and diameter of the main, type of joints present, availability of materials, equipment required for disinfection, training of the personnel who will perform the disinfection, and safety concerns. For example, the continuous-feed or slug methods should be

used with gas chlorination only when properly designed and constructed equipment is available; makeshift equipment is not acceptable when liquid-chlorine cylinders are used.

Thorough consideration should be given to the impact of highly chlorinated water flushed into the waste environment. If there is any question that damage may be caused by chlorinated-waste discharge (to fish life, plant life, physical installations, or other downstream water uses of any type), then an adequate amount of reducing agent should be applied to water being disposed of in order to thoroughly neutralize the chlorine residual remaining in the water.

The tablet method cannot be used unless the main can be kept clean and dry. It cannot be used in large-diameter mains if it is necessary for a worker to enter the main to grout joints or perform inspection, because the tablets may release toxic fumes after exposure to moist air. When using the tablet method, the chlorine concentration is not uniform throughout the main, because the hypochlorite solution is dense and tends to concentrate at the bottom of the pipe. The use of the tablet method precludes preliminary flushing. The tablet method is convenient to use in mains having diameters up to 24 in., and it requires no special equipment.

The continuous-feed method is suitable for general application. Preliminary flushing removes light particulates from the main but not from the pipe-joint spaces. The chlorine concentration is uniform throughout the main.

The slug method is suitable for use in large-diameter mains where the volume of water makes the continuous-feed method impractical and difficult to achieve for short attachments. The slug method results in appreciable savings of chemicals used to disinfect long, large-diameter mains. Also, this method reduces the volume of heavily chlorinated water to be flushed to waste.

The purpose of all three chlorination methods is to disinfect water lines, resulting in an absence of coliforms as confirmed by laboratory analysis. As noted above, the three methods attempt to provide flexibility in responding to specific situations. The tablet and continuous-feed methods both have initial chlorine concentrations of 25 mg/L and a minimum contact time of 24 hr. Because the tablet method cannot be flushed and cleaned prior to disinfection, the required free chlorine residual must be detectable after 24 hr. Because the continuous-feed method can be used to flush particles and *prechlorinate* with calcium hypochlorite granules, a higher free chlorine residual of 10 mg/L is required after 24 hr. To meet the needs of situations requiring reduced contact times, the slug feed method allows only a 3-hr contact time, but

requires a 100-mg/L initial chlorine dosage. While the contact time of each method may not be identical, the end result, absence of coliforms, is the same for all three methods.

III. Use of This Standard. It is the responsibility of the user of an AWWA Standard to determine that the products described in that standard are suitable for use in the particular application being considered.

III.A. Purchaser Options and Alternatives. This standard is written as though the disinfection work will be performed by the purchaser's personnel. Where the work is to be done for a separate contract or as part of a contract for installing mains,* appropriate provisions should be included in the purchase documents to ensure that the constructor is specifically instructed as to their responsibilities. The following items should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C651, Standard for Disinfection of Water Mains.
2. Approval requirements before use.
3. Those procedures included in the standard, which are designated as optional, that are to be included in the purchase documents.
4. Form of chlorine to be used (Sec. 4.1.1, 4.1.2, and 4.1.3).
5. Method of chlorination (Sec. 4.4.2, 4.4.3, and 4.4.4).
6. Flushing locations, rates of flushing, and locations of drainage facilities (Sec. 4.4.3.2, 4.5.1, and 4.5.2).
7. Responsibility for tapping existing mains and connections to new mains (Sec. 4.4.3.3[1], 4.4.3.3[2], and 4.6).
8. The number and frequency of samples for bacteriological tests (Sec. 5.1.1, 5.1.2, 5.1.4, and 5.2).
9. Method of taking samples (Sec. 5.1.3).
10. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects is required, in addition to the Safe Drinking Water Act.
11. Details of other federal, state, local, and provisional requirements.

III.B. Modification to Standard. Any modification to the provisions, definitions, or terminology in this standard must be provided by the purchaser.

*Refer to other AWWA standards and manuals for design criteria and installation procedures for various pipe materials.

IV. Major Revisions. Major revisions made to the standard in this edition include the following:

1. Under Sec. 5.1.4 sample results, Heterotrophic Plate Counts greater than 500 colony forming units require additional flushing.
2. Table 1 has been corrected.
3. Ascorbic Acid was added in Appendix C as a neutralizing agent.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer and Technical Support Group at (303) 794-7711, FAX (303) 795-7603, or write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at standards@awwa.org.



American Water Works
Association

ANSI/AWWA C651-05
(Revision of ANSI/AWWA C651-99)

AWWA Standard

Disinfecting Water Mains

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes essential procedures for the disinfection of new and repaired potable water mains. New water mains shall be disinfected before they are placed in service. Water mains taken out of service for inspection, repair, or other activities that might lead to contamination of water shall be disinfected before they are returned to service.

Sec. 1.2 Purpose

The purpose of this standard is to define the minimum requirements for the disinfection of water mains, including the preparation of water mains, application of chlorine, and sampling and testing for the presence of coliform bacteria.

Sec. 1.3 Application

This standard can be referenced in the purchase documents for the disinfection of water mains and can be used as a guide for the preparation of water mains, application of chlorine, and sampling and testing for the presence of coliform bacteria. The stipulations of this standard apply when this document has been referenced and only to the disinfection of water mains.

SECTION 2: REFERENCES

This standard references the following documents. In their latest editions, they form a part of this standard to the extent required within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI^{*}/AWWA B300—Hypochlorites.

ANSI/AWWA B301—Liquid Chlorine.

AWWA Manual M12, *Simplified Procedures for Water Examination*. AWWA: Denver, Colo.

Standard Methods for the Examination of Water and Wastewater. APHA,[†] AWWA, and WEF.[‡] Washington, D.C.

SECTION 3: DEFINITIONS

1. *Constructor*: The party that furnishes the work and materials for placement or installation.

2. *Manufacturer*: The party that manufactures, fabricates, or produces materials or products.

3. *Purchaser*: The person, company, or organization that purchases any materials or work to be performed.

SECTION 4: REQUIREMENTS

Sec. 4.1 Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the disinfection operations are liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules or tablets.

4.1.1 *Liquid chlorine*. Liquid chlorine conforming to ANSI/AWWA B301 contains 100 percent available chlorine and is packaged in steel containers usually of 100-lb, 150-lb, or 1-ton (45.4-kg, 68.0-kg, or 907.2-kg) net chlorine weight. Liquid

^{*}American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

[†]American Public Health Association, 800 I St., N.W., Washington, DC 20001.

[‡]Water Environment Federation, 601 Wythe St., Alexandria, VA 22314.

chlorine shall be used only (1) in combination with appropriate gas-flow chlorinators and ejectors to provide a controlled high-concentration solution feed to the water to be chlorinated; (2) under the direct supervision of someone familiar with the biological, chemical, and physical properties of liquid chlorine and who is trained and equipped to handle any emergency that may arise; and (3) when appropriate safety practices are observed to protect working personnel and the public.

4.1.2 *Sodium hypochlorite.* Sodium hypochlorite conforming to ANSI/AWWA B300 is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 qt (0.95 L) to 5 gal (18.92 L). Containers of 30 gal (113.6 L) or larger may be available in some areas. Sodium hypochlorite contains approximately 5 percent to 15 percent available chlorine, and the storage conditions and time must be controlled to minimize its deterioration. (Available chlorine is expressed as a percent of weight when the concentration is 5 percent or less, and usually as a percent of volume for higher concentrations. $\text{Percent} \times 10 = \text{grams of available chlorine per liter of hypochlorite.}$)

4.1.3 *Calcium hypochlorite.* Calcium hypochlorite conforming to ANSI/AWWA B300 is available in granular form or in 5-g tablets, and must contain approximately 65 percent available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration.

CAUTION: Tablets dissolve in approximately 7 hr and must be given adequate contact time. Do not use calcium hypochlorite intended for swimming pool disinfection, as this material has been sequestered and is extremely difficult to eliminate from the pipe after the desired contact time has been achieved.

Sec. 4.2 Basic Disinfection Procedure

The basic disinfection procedure consists of

1. Inspecting materials to be used to ensure their integrity.
2. Preventing contaminating materials from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.
3. Removing, by flushing or other means, those materials that may have entered the water main.
4. Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the main.

5. Protecting the existing distribution system from backflow caused by hydrostatic pressure test and disinfection procedures.
6. Documenting that an adequate level of chlorine contacted each pipe to provide disinfection.
7. Determining the bacteriological quality by laboratory test after disinfection.
8. Final connection of the approved new water main to the active distribution system.

Sec. 4.3 Preventive and Corrective Measures During Construction

4.3.1 *General.* Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing these organisms. Therefore, the procedures of this section must be observed to assure that a water main and its appurtenances have been thoroughly cleaned for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system prior to the receipt of satisfactory bacteriological samples may constitute a cross-connection. Therefore, the new main must be isolated until bacteriological tests described in Sec. 5 of this standard are satisfactorily completed.

4.3.2 *Keeping pipe clean and dry.* The interiors of pipes, fittings, and valves shall be protected from contamination.

4.3.2.1 *Openings.* Openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means.

4.3.2.2 *Stringing pipe.* Pipe delivered for construction shall be strung to minimize the entrance of foreign material.

4.3.2.3 *Delays.* Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

4.3.3 *Joints.* Joints of pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is free of standing water and mud that may enter the pipe.

4.3.4 *Packing materials.* Yarning or packing material shall consist of molded or tubular rubber rings, rope of treated paper, or other approved materials. Materials such as jute or hemp shall not be used. Packing material shall be handled in a manner

that avoids contamination. If asbestos rope is used, asbestos shall be prevented from entering into the water-carrying portion of the pipe.

4.3.5 *Sealing materials.* No contaminated material or any material capable of supporting growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water and shall not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated, clean applicator brushes.

4.3.6 *Cleaning and swabbing.* If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a 1 to 5 percent hypochlorite disinfecting solution. If, in the opinion of the purchaser, the dirt remaining in the pipe will not be removed using the flushing operation, then the interior of the pipe shall be cleaned using mechanical means, such as a hydraulically propelled foam pig (or other suitable device acceptable to the purchaser) in conjunction with the application of a 1 percent hypochlorite disinfecting solution. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the purchaser.

4.3.7 *Wet-trench construction.* If it is not possible to keep the pipe and fittings dry during installation, the water that may enter the pipe-joint spaces shall contain an available chlorine concentration of approximately 25 mg/L. This may be accomplished by adding calcium hypochlorite granules or tablets to each length of pipe before it is lowered into a wet trench or by treating the trench water with hypochlorite tablets.

4.3.8 *Flooding by storm or accident during construction.* If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with a chlorinated potable water that, at the end of a 24-hr holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous-feed or slug method.

4.3.9 *Backflow protection (optional).*^{*} As an optional procedure (if required by the purchaser), the new water main shall be kept isolated from the active distribution system using a physical separation (see Figure 1) until satisfactory bacteriological testing has been completed and the disinfectant water flushed out.

^{*}Optional Sec. 4.3.9 is not included as part of the standard unless required by the purchaser.

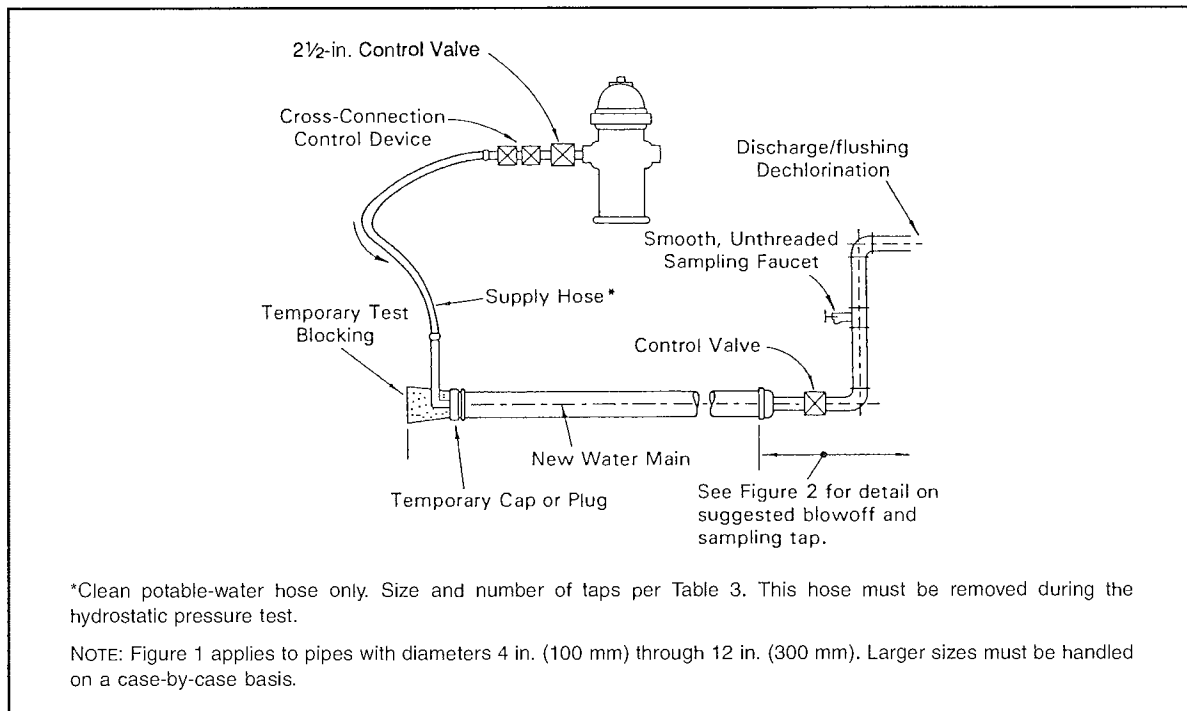


Figure 1 Suggested temporary flushing/testing connection

Water required to fill the new main for hydrostatic pressure testing, disinfection, and flushing shall be supplied through a temporary connection between the distribution system and the new main. The temporary connection shall include an appropriate cross-connection control device consistent with the degree of hazard (a double check valve assembly or a reduced pressure zone assembly) and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. It will be necessary to reestablish the temporary connection after completion of the hydrostatic pressure test to flush out the disinfectant water prior to final connection of the new main to the distribution system. NOTE: Exposure to high levels of chlorine or high pH can cause severe irritation to customers. Also, the chlorinated water can be high in disinfection by-products.

Sec. 4.4 Methods of Chlorination

4.4.1 *General.* Three methods of chlorination are explained in this section: tablet, continuous feed, and slug. Information in the Foreword is helpful in determining the appropriate method. The tablet method gives an average chlorine dose of approximately 25 mg/L; the continuous-feed method gives a 24-hr chlorine

residual of not less than 10 mg/L; and the slug method gives a 3-hr exposure of not less than 50-mg/L free chlorine.

4.4.1.1 *Preflushing of source water.* The source of potable water used for disinfection and pressure testing shall be flushed prior to its use to ensure that contaminants or debris are not introduced into the new pipe. Adequate drainage must be provided during flushing. Drainage should take place away from the construction area. During the contact period, it is recommended that the valve isolating the new main from this system (if applicable) be tagged to prevent unintentional release of the elevated chlorine residual water into the system.

4.4.2 *Tablet method.* The tablet method consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is completed. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.

4.4.2.1 *Placing of calcium hypochlorite granules.* During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules shall be as shown in Table 1.

WARNING: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

Table 1 Ounces of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft interval

Pipe Diameter (<i>d</i>)		Calcium Hypochlorite Granules	
<i>in.</i>	(<i>mm</i>)	<i>oz</i>	(<i>g</i>)
4	100	1.7	48
6	150	3.8	108
8	200	6.7	190
10	250	10.5	298
12	300	15.1	428
14 and larger	(350 and larger)	$D^2 \times 15.1$	$D^2 \times 428$

Where D is the inside pipe diameter in feet $D = d/12$

Table 2 Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, <i>ft (m)</i>				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
<i>in.</i>	<i>(mm)</i>	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet; any portion of tablet rounded to the next higher integer.

4.4.2.2 Placing of calcium hypochlorite tablets. During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe. Also, one tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The number of 5-g tablets required for each pipe section shall be $0.0012 d^2 L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet. Table 2 shows the number of tablets required for commonly used sizes of pipe. The tablets shall be attached by a food-grade adhesive. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe. Attach tablets inside and at the top of the main, with approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section to indicate that the pipe has been installed with the tablets at the top.

4.4.2.3 Filling and contact. When installation has been completed, the main shall be filled with water at a rate to ensure that the water within the main will flow at a velocity no greater than 1 ft/sec (0.3 m/sec). Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hr. As an optional procedure, if required by the purchaser, water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consistent with the degree of hazard, for backflow protection of the active distribution system (see Figure 1). A detectable free

chlorine residual should be found at each sampling point after the 24-hr period. The results must be reported.

4.4.3 Continuous-feed method. The continuous-feed method consists of placing calcium hypochlorite granules in the main during construction (optional), completely filling the main to remove air pockets, flushing the completed main to remove particulates, and filling the main with potable water. The potable water shall be chlorinated so that after a 24-hr holding period in the main there will be a free chlorine residual of not less than 10 mg/L.

4.4.3.1 Placing of calcium hypochlorite granules. At the option of the purchaser, calcium hypochlorite granules shall be placed in pipe sections as specified in Sec. 4.4.2.1. The purpose of this procedure is to provide a strong chlorine concentration in the first flow of flushing water that flows down the main. In particular, this procedure is recommended when the type of pipe is such that this first flow of water will flow into annular spaces at pipe joints.

4.4.3.2 Preliminary flushing. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec (0.76 m/sec) unless the purchaser determines that conditions do not permit the required flow to be discharged to waste. Table 3

Table 3 Required flow and openings to flush pipelines (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter		Flow Required to Produce 2.5 ft/sec (approx.) Velocity in Main		Size of Tap, in. (mm)			Number of 2½-in. (64-mm) Hydrant Outlets
in.	(mm)	gpm	(L/sec)	1 (25)	1½ (38)	2 (51)	
				Number of Taps on Pipe†			
4	(100)	100	(6.3)	1	—	—	1
6	(150)	200	(12.6)	—	1	—	1
8	(200)	400	(25.2)	—	2	1	1
10	(250)	600	(37.9)	—	3	2	1
12	(300)	900	(56.8)	—	—	2	2
16	(400)	1,600	(100.9)	—	—	4	2

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2½-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4½-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

†Number of taps on pipe based on discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

shows the rates of flow required to produce a velocity of 2.5 ft/sec (0.76 m/sec) in commonly used sizes of pipe. Note that flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity and pigging of the main may be required.

For 24-in. (600-mm) or larger diameter mains, an acceptable alternative to flushing is to broom-sweep the main, carefully removing sweepings prior to chlorinating the main.

4.4.3.3 Procedure for chlorinating the main.

1. Water supplied from a temporary, backflow-protected connection to the existing distribution system or other approved supply source shall flow at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated using a Pitot gauge in the discharge, measuring the time to fill a container of known volume, or measuring the trajectory of the discharge and using the formula shown in Figure 2. The main should undergo hydrostatic testing prior to disinfection.

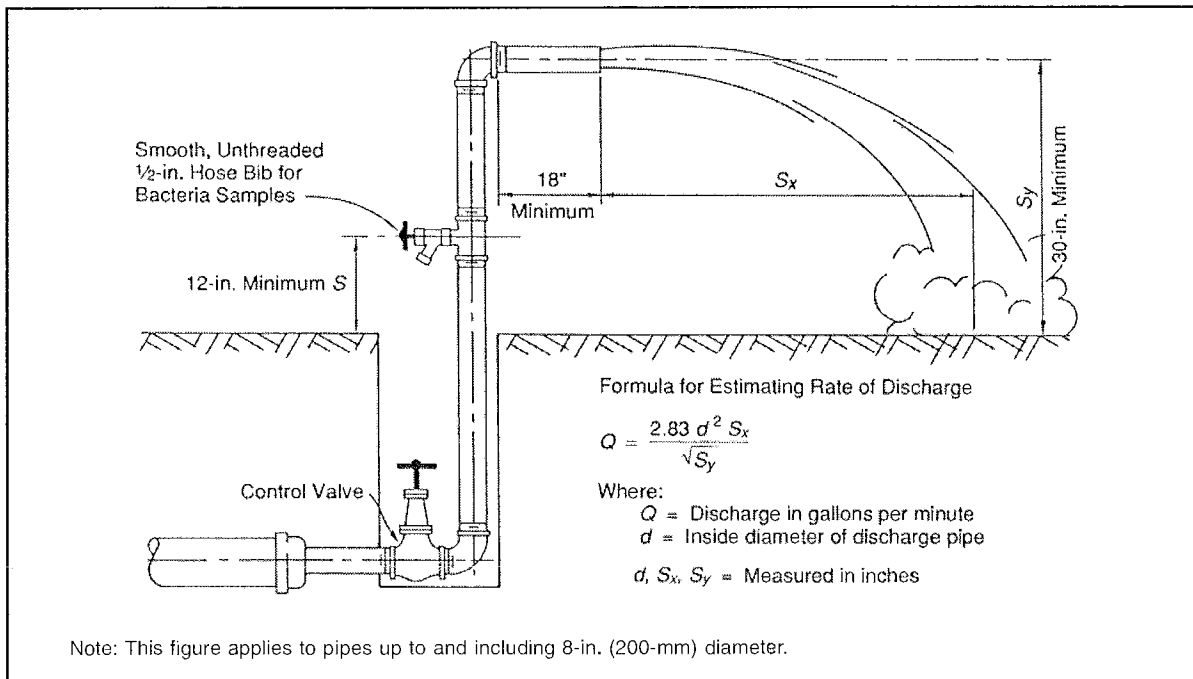


Figure 2 Suggested combination blowoff and sampling tap

2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To ensure that this concentration is provided, measure the chlorine concentration at regular intervals in accordance with the procedures described in the current edition of *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12, or using appropriate chlorine test kits (see Appendix A).

Table 4 gives the amount of chlorine required for each 100 ft (30.5 m) of pipe of various diameters. Solutions of 1 percent chlorine may be prepared with sodium hypochlorite or calcium hypochlorite. The latter solution requires 1 lb (454 g) of calcium hypochlorite in 8 gal (30.3 L) of water.

3. As an optional procedure, if required by the purchaser, water used to fill the new main during the application of chlorine shall be supplied through a temporary connection. This temporary connection shall be installed with an appropriate cross-connection control device, consistent with the degree of hazard for backflow protection of the active distribution system (see Figure 1). Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hr, during which time valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24-hr period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L of free chlorine.

Table 4 Chlorine required to produce 25-mg/L concentration in 100 ft (30.5 m) of pipe by diameter

Pipe Diameter		100% Chlorine		1% Chlorine Solution	
<i>in.</i>	<i>(mm)</i>	<i>lb</i>	<i>(g)</i>	<i>gal</i>	<i>(L)</i>
4	(100)	0.013	(5.9)	0.16	(0.6)
6	(150)	0.030	(13.6)	0.36	(1.4)
8	(200)	0.054	(24.5)	0.65	(2.5)
10	(250)	0.085	(38.6)	1.02	(3.9)
12	(300)	0.120	(54.4)	1.44	(5.4)
16	(400)	0.217	(98.4)	2.60	(9.8)

4. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for the application of liquid chlorine. (The danger of using direct-feed chlorinators is that water pressure in the main can exceed gas pressure in the chlorine cylinder. This allows a backflow of water into the cylinder, resulting in severe cylinder corrosion and the escape of chlorine gas.) The preferred equipment for applying liquid chlorine is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be made of material capable of withstanding the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

4.4.4 *Slug method.* The slug method consists of placing calcium hypochlorite granules in the main during construction; completely filling the main to eliminate air pockets; flushing the main to remove particulates; and slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L. The slow rate of flow ensures that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hr.

4.4.4.1 Placing calcium hypochlorite granules. Same as Sec. 4.4.3.1.

4.4.4.2 Preliminary flushing. Same as Sec. 4.4.3.2.

4.4.4.3 Chlorinating the main.

1. Same as Sec. 4.4.3.3(1).
2. At a point not more than 10 ft (3 m) downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 100 mg/L free chlorine. To ensure that this concentration is achieved, the chlorine concentration should be measured at regular intervals. The chlorine shall be applied continuously and for a sufficient period to develop a solid column, or slug, of chlorinated water that will, as it moves through the main, expose all interior surfaces to a concentration of approximately 100 mg/L for at least 3 hr.

3. The free chlorine residual shall be measured in the slug as it moves through the main. If at any time it drops below 50 mg/L, the flow shall be stopped; chlorination equipment shall be relocated at the head of the slug; and, as flow

resumes, chlorine shall be applied to restore the free chlorine in the slug to not less than 100 mg/L.

4. As the chlorinated water flows past fittings and valves, related valves and hydrants shall be operated so as to disinfect appurtenances and pipe branches.

Sec. 4.5 Final Flushing

4.5.1 *Clearing the main of heavily chlorinated water.* After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

4.5.2 *Disposing of heavily chlorinated water.* The environment to which the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, a neutralizing chemical shall be applied to the water to be wasted to thoroughly neutralize the residual chlorine (see Appendix C for neutralizing chemicals). Where necessary, federal, state, local, or provincial regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

Sec. 4.6 Final Connections to Existing Mains (Optional)*

As an optional procedure, if required by the purchaser, water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Sanitary construction practices must be followed during installation of the final connection so that there is no contamination of the new or existing water main with foreign material or groundwater.

4.6.1 *Connections equal to or less than one pipe length (≤ 18 ft [5.5 m]).* As an optional procedure (if required by the purchaser), the new pipe, fittings, and valve(s) required for the connection may be spray-disinfected or swabbed with a minimum 1–5 percent solution of chlorine just prior to being installed, if the total length of the

*Optional Sec. 4.6 is not included as part of the standard unless specifically identified by the purchase documents.

connection from the end of a new main to the existing main is equal to or less than 18 ft (5.5 m).

4.6.2 *Connections greater than one pipe length (>18 ft [5.5 m]).* As an optional procedure, if required by the purchaser, the pipe required for the connection must be set up aboveground, disinfected, and bacteriological samples taken, as described in Sec. 5, if the total length of the connection from the end of a new main to the existing main is greater than 18 ft (5.5 m). After satisfactory bacteriological sample results have been received for the predisinfected pipe, the pipe can be used in connecting the new main to the active distribution system. Between the time the satisfactory bacteriological sample results are received and the time that the connection piping is installed, the ends of the piping must be sealed with plastic wraps, watertight plugs, or caps.

Sec. 4.7 Disinfection Procedures When Cutting Into or Repairing Existing Mains

The following procedures apply primarily when existing mains are wholly or partially dewatered. After the appropriate procedures have been completed, the existing main may be returned to service prior to the completion of bacteriological testing in order to minimize the time customers are without water. Leaks or breaks that are repaired with clamping devices while the mains remain full of pressurized water may present little danger of contamination and therefore may not require disinfection.

4.7.1 *Trench treatment.* When an existing main is opened, either by accident or by design, the excavation will likely be wet and may be badly contaminated from nearby sewers. Liberal quantities of hypochlorite applied to open trench areas will lessen the danger from this pollution. Tablets have the advantage in this situation, because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

4.7.2 *Swabbing with hypochlorite solution.* The interior of pipe and fittings (particularly couplings and sleeves) used in making the repair shall be swabbed or sprayed with a 1 percent hypochlorite solution before they are installed.

4.7.3 *Flushing.* Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.

4.7.4 *Slug chlorination.* Where practical, in addition to the procedures previously described, the section of the main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as described in Sec. 4.4.4. The dose may be increased to as much as 300 mg/L and the contact time reduced to as little as 15 min. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the chlorine concentration in the water exiting the main is no higher than the prevailing water in the distribution system or that which is acceptable for domestic use.

4.7.5 *Bacteriological samples.* Bacteriological samples following procedures in 5.1.3 shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is unknown, then samples shall be taken on each side of the main break. If positive bacteriological samples are recorded, then the situation shall be evaluated by the purchaser who can determine corrective action. Daily sampling shall be continued until two consecutive negative samples are recorded.

Sec. 4.8 Special Procedure for Caulked Tapping Sleeves

Before a tapping sleeve is installed, the exterior of the main to be tapped shall be thoroughly cleaned, and the interior surface of the sleeve shall be lightly dusted with calcium hypochlorite powder.

Tapping sleeves are used to avoid shutting down the main. After the tap is made, it is impossible to disinfect the annulus without shutting down the main and removing the sleeve. The space between the tapping sleeve and the tapped pipe is approximately $\frac{1}{2}$ in. (13 mm), so that as little as 100 mg/ft² of calcium hypochlorite powder will provide a chlorine concentration of more than 50 mg/L.

SECTION 5: VERIFICATION

Sec. 5.1 Bacteriological Tests

5.1.1 *Standard conditions.* After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hr apart, shall be collected from the new main. (NOTE: The pipe, the water loaded into the pipe, and any debris exert a chlorine demand that can interfere with disinfection.) At least one set of samples shall be

collected from every 1,200 ft (366 m) of the new water main, plus one set from the end of the line and at least one set from each branch. Samples shall be tested for bacteriological (chemical and physical) quality in accordance with *Standard Methods for the Examination of Water and Wastewater*; and shall show the absence of coliform organisms; and, if required, the presence of a chlorine residual. Turbidity, pH, and a standard heterotrophic plate count (HPC) test may be required at the option of the purchaser because new material does not typically contain coliforms but does typically contain HPC bacteria.

5.1.2 *Special conditions.* If trench water has entered the new main during construction or if, in the opinion of the purchaser, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft (61 m), and the location shall be identified. Samples shall be taken of water that has stood in the new main for at least 16 hr after final flushing has been completed.

5.1.3 *Sampling procedure.* Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate, as required by *Standard Methods for the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples. (NOTE: For pipe repairs, if no other sampling port is available, well-flushed fire hydrants may be used with the understanding that they do not represent optimum sampling conditions.) A suggested combination blowoff and sampling tap used for mains up to and including 8-in. (200-mm) diameter is shown in Figure 2. There should be no water in the trench up to the connection for sampling. The sampling pipe must be dedicated and clean and disinfected and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

5.1.4 *Sample results.* If sample results from the lab indicate a measured HPC greater than 500 colony-forming units (cfu) per mL, flushing should be resumed and another coliform and HPC set of samples should be taken until no coliforms are present and the HPC is less than 500 cfu/mL.

5.1.5 *Record of compliance.* The record of compliance shall be the bacteriological test results certifying that the water sampled from the new water main is free of coliform bacteria contamination and is equal to or better than the bacteriologic water quality in the distribution system.

Sec. 5.2 Redisinfection

If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be reflushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained—that being two consecutive sets of acceptable samples taken 24 hr apart.

NOTE: High velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine the source of turbidity.

SECTION 6: DELIVERY

This standard has no applicable information for this section.

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APPENDIX A

Chlorine Residual Testing

This appendix is for information only and is not a part of ANSI/AWWA C651.

SECTION A.1: DPD DROP DILUTION METHOD (FOR FIELD TEST)

The N, N-diethyl-p-phenylenediamine (DPD) drop dilution method of approximating total residual chlorine is suitable for concentrations above 10 mg/L, such as those applied in the disinfection of water mains or tanks.

Sec. A.1.1 Apparatus

1. A graduated cylinder for measuring distilled water.
2. An automatic or safety pipette.
3. Two dropping pipettes that deliver a 1-mL sample in 20 drops. One pipette is for dispensing the water sample, and the other is for dispensing the DPD and buffer solutions. The pipettes should not be interchanged.
4. A comparator kit containing a suitable range of standards.

Sec. A.1.2 Reagents

1. DPD indicator solution. Prepare as prescribed in *Standard Methods for the Examination of Water and Wastewater*.

Sec. A.1.3 Procedure

1. Add 10 drops of DPD solution and 10 drops of buffer solution (or 20 drops of combined DPD–buffer solution) to a comparator cell.
2. Fill the comparator cell to the 10-mL mark with distilled water.
3. With a dropping pipette, add the water sample one drop at a time, mix until a red color is formed that matches one of the color standards.
4. Record the total number of drops used and the final chlorine reading obtained (that is, the chlorine reading of the matched standard).
5. Calculate the milligrams per liter of free residual chlorine as follows:

$$\text{mg/L chlorine} = \frac{\text{reading} \times 200}{\text{drops of sample}}$$

SECTION A.2: HIGH-RANGE CHLORINE TEST KITS

Several manufacturers produce high-range chlorine test kits that are inexpensive, easy to use, and satisfactory for the precision required.

APPENDIX B

Chlorine Dosages

This appendix is for information only and is not a part of ANSI/AWWA C651.

Table B.1 Amounts of chemicals required to produce various chlorine concentrations in 100,000 gal (378.5 m³) of water*

Desired Chlorine Concentration in Water <i>mg/L</i>	Liquid Chlorine Required <i>lb (kg)</i>		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
			5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
			<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>lb (kg)</i>	<i>lb (kg)</i>
2	1.7	(0.77)	3.9	(14.7)	2.0	(7.6)	1.3	(4.9)	2.6	(1.18)
10	8.3	(3.76)	19.4	(73.4)	9.9	(37.5)	6.7	(25.4)	12.8	(5.81)
50	42.0	(19.05)	97.0	(367.2)	49.6	(187.8)	33.4	(126.4)	64.0	(29.03)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.

Table B.2 Amounts of chemicals required to produce chlorine concentration of 200 mg/L in various volumes of water*

Volume of Water		Liquid Chlorine Required		Sodium Hypochlorite Required						Calcium Hypochlorite Required	
				5% Available Chlorine		10% Available Chlorine		15% Available Chlorine		65% Available Chlorine	
				<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>gal (L)</i>	<i>lb (g)</i>	<i>lb (g)</i>
10	(37.9)	0.02	(9.1)	0.04	(0.15)	0.02	(0.08)	0.02	(0.08)	0.03	(13.6)
50	(189.3)	0.1	(45.4)	0.2	(0.76)	0.1	(0.38)	0.07	(0.26)	0.15	(68.0)
100	(378.5)	0.2	(90.7)	0.4	(1.51)	0.2	(0.76)	0.15	(0.57)	0.3	(136.1)
200	(757.1)	0.4	(181.4)	0.8	(3.03)	0.4	(1.51)	0.3	(1.14)	0.6	(272.2)

*Amounts of sodium hypochlorite are based on concentrations of available chlorine by volume. For either sodium hypochlorite or calcium hypochlorite, extended or improper storage of chemicals may have caused a loss of available chlorine.

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APPENDIX C

Disposal of Heavily Chlorinated Water

This appendix is for information only and is not a part of ANSI/AWWA C651.

1. Check with the local sewer department for the conditions of disposal to the sanitary sewer.
2. Chlorine residual of water being disposed will be neutralized by treating with one of the chemicals listed in Table C.1.

Table C.1 Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal (378.5 m³) of water*

Residual Chlorine Concentration <i>mg/L</i>	Sulfur Dioxide (SO ₂)		Sodium Bisulfite (NaHSO ₃)		Sodium Sulfite (Na ₂ SO ₃)		Sodium Thiosul- fate (Na ₂ S ₂ O ₃ · 5H ₂ O)		Ascorbic Acid [†] (C ₆ O ₈ H ₆)	
	<i>lb</i>	<i>(kg)</i>	<i>lb</i>	<i>(kg)</i>	<i>lb</i>	<i>(kg)</i>	<i>lb</i>	<i>kg</i>	<i>lb</i>	<i>kg</i>
1	0.8	(0.36)	1.2	(0.54)	1.4	(0.64)	1.2	(0.54)	2.1	(0.95)
2	1.7	(0.77)	2.5	(1.13)	2.9	(1.32)	2.4	(1.09)	4.2	(1.90)
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	12.0	(5.44)	20.9	(9.47)
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60.0	(27.22)	104	(47.11)

*Except for residual chlorine concentration, amounts are in pounds (kilograms).

†User should confirm required dosage with chemical supplier.

AWWA is the authoritative resource for knowledge, information, and advocacy to improve the quality and supply of water in North America and beyond. AWWA is the largest organization of water professionals in the world. AWWA advances public health, safety, and welfare by uniting the efforts of the full spectrum of the entire water community. Through our collective strength we become better stewards of water for the greatest good of the people and the environment.



October 17, 2018

Project Number: 18-0858

Ms. Lauren Grouws
M/I Homes
5354 Parkdale Drive
St. Louis Park, Minnesota 55416

**RE: Geotechnical Exploration Report, North St. Paul Residential Development
3rd Street North, North St. Paul, Minnesota**

Dear Ms. Grouws:

We have completed the geotechnical exploration report for the proposed Residential Development located east of McKnight Road North, west of 3rd Street North and south of the Gateway Corridor in North St. Paul, Minnesota. A brief summary of our results and recommendations is presented below. Additional details regarding our procedures, results and recommendations follow in the attached geotechnical exploration report.

Eight (8) test pits were excavated and eleven (11) soil borings were completed for this evaluation. The test pits and soil borings generally encountered existing Fill that extended to depths ranging from about ½ to 9 feet. The existing Fill consisted of a variety of both granular (sand) and cohesive (clay) soil types ranging from poorly graded sands to lean clay. Pieces of concrete block and concrete debris were observed in each of the eight test pits that extended to depths ranging from about 1 to 5 feet with an average depth of about 2 feet. Below the existing Fill, the borings and test pits predominantly encountered silty sand and clayey sand glacial till and glacial outwash sand soils with some clayey glacial till. One of the test pits encountered about 1 foot of peat below the existing Fill and some soft and loose soils were encountered in some of the borings.

The topsoil, existing Fill, swamp deposits and soft clay soils are not suitable for house, roadway or utility support and will need to be removed and replaced with suitable compacted engineered fill. The underlying native glacially deposited soils are generally suitable for house, roadway and utility support.

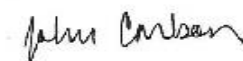
Thank you for the opportunity to assist you on this project. If you have any questions or need additional information, please contact John Carlson at 612-979-3542 or Ashley Yellick at 612-391-6173.

Sincerely,

Haugo GeoTechnical Services, LLC



Ashley L. Yellick, G.I.T.
Staff Geologist



John T. Carlson, P.E.
Senior Engineer

GEOTECHNICAL EXPLORATION REPORT

PROJECT:

North St. Paul Residential Development
3rd Street North
North St. Paul, Minnesota

PREPARED FOR:

M/I Homes
5354 Parkdale Drive
St. Louis Park, Minnesota 55416

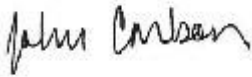
PREPARED BY:

Haugo GeoTechnical Services, LLC
2825 Cedar Avenue South
Minneapolis, Minnesota 55407

Haugo GeoTechnical Services Project: 18-0858

October 17, 2018

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



John Carlson, P.E.
Senior Engineer
License Number 20663
Expires June 2020



2825 Cedar Avenue S, Minneapolis, MN 55407

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1.0 INTRODUCTION

1.1 Project Description

M/I Homes is proposing to construct a residential development located west of 3rd Street North, east of McKnight Avenue and south of the Gateway Trail in North St. Paul, Minnesota. M/I Homes requested a geotechnical exploration to characterize subsurface soil and groundwater conditions with respect to foundation design and construction of the proposed residential development.

1.2 Purpose

The purpose of this geotechnical exploration was to characterize subsurface soil and groundwater conditions and provide recommendations for foundation design, pavement design and construction and estimated soil infiltration rates for stormwater pond/infiltration basin design and construction.

1.3 Site Description

The proposed residential development consists of thirteen parcels totaling approximately 10 acres and is located east of McKnight Road, west of 3rd Street North and south of Gateway Trail in North St. Paul, Minnesota. The largest parcel generally consists of the southern portion of the former Anchor Block Company site, the remaining parcels include 10 lots on the east side of 3rd Street and 2 City owned properties. The overall project site was vacant at the time of our exploration.

Former Anchor Block Co Parcel(s) The former Anchor Block Company parcels west of 3rd Street were undeveloped and vacant and were surrounded by a chain link fence. Access to the properties was via a locked gate off 3rd Street. A dense tree line and vegetation existed along the north, west, and south sides of the properties. The elevation across the properties varied with the southeast portion (upper yard) of the property at a higher elevation than the remainder of the property (lower yard). The slope between the upper and lower yards was covered with tree growth. A bituminous driveway provided access between the upper and lower yards. The driveway continued to the west along the property's northern boundary. A bike/walking trail (Gateway State Trail) was observed north of the fence. The remaining portions of the lower yard, which extended further south of the asphalt driveway, was covered by vegetation. Partially buried concrete blocks were observed on the southern portion of the lower yard and within the slope between the upper and lower yards.

Parcels East of 3rd Street. The 10 lots/parcels located east of 3rd Street were vacant and densely covered with small to slightly-mature trees. The ground surface elevation varied, with elevation changes up to an estimated 5 to 7 feet in places. These hilly areas appeared to be old fill. Partially buried concrete blocks or concrete were observed sporadically throughout this forested area.

City-Owned Parcels. The two City-owned parcels were located on the northeast and northwest corner of the intersection of 3rd Street North and South Street/7th Avenue. The parcels were vacant and contained several mature trees. Remnants of concrete and asphalt paving, possibly associated with former driveways, were observed on the parcels.

1.4 Scope of Services

Our services were performed in accordance with our cost estimate dated September 5, 2018 and under the terms of our General Conditions.

Our scope of services was limited to the following tasks:

- Completing eleven (11) standard penetration test borings each to a nominal depth of 21 feet.
- Observing the excavation of eight (8) backhoe test pits.
- Obtaining ground surface elevations and GPS coordinates at the soil boring and test pit locations.
- Visually/manually classifying samples recovered from the soil borings.
- Perform laboratory tests on select soil samples.
- Completing two (2) double ring infiltration tests in the pond areas.
- Preparing soil boring logs describing the materials encountered and the results of groundwater level measurements.
- Preparing an engineering report describing soil and groundwater conditions and providing recommendations for foundation design, pavement design and construction and estimated soil infiltration rates for stormwater pond design and construction.

Our scope of services included completing two (2) double ring infiltrometer tests. Test pits were excavated at each of the proposed double ring test locations. Groundwater was encountered in the base of one of the test pits and clayey soils were encountered in the base of the other test pit. Because of the site conditions, the double ring infiltrometer tests were not completed.

1.5 Documents Provided

We were provided with an ALTA/NSPS Land Title Survey prepared by Alliant Engineering and dated August 23, 2018. The Survey showed the current condition of the project site as well as segregation of the various parcels.

We were also provided with a concept plan showing current topography of the site west of 3rd Street as well as proposed townhome, road and infiltration basin locations.

1.6 Locations and Elevations

The soil boring locations were selected by M/I Homes and staked in the field by Pioneer Engineering. The test pit locations were also selected by M/I Homes. Ground surface elevations and GPS coordinates at the test pit locations were obtained by HGTS using GPS technology.

The approximate locations of the soil borings and test pits are shown on Figure 1, "Soil Boring Location Sketch," in the Appendix. The sketch was prepared by HGTS using the ALTA Survey as a base.

2.0 FIELD PROCEDURES

The standard penetration test borings were advanced on September 24, 25, and 27, 2018 by HGTS with a rotary drilling rig, using continuous flight augers to advance the boreholes. Representative samples were obtained from the borings, using the split-barrel sampling procedures in general accordance with ASTM Specification D-1586. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel spoon is driven into the ground with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampling spoon the last 12 inches of an 18-inch penetration is recorded as the standard penetration resistance value, or "N" value. The results of the standard penetration tests are indicated on the boring log. The samples were sealed in containers and provided to HGTS for testing and soil classification.

The test pits were completed on September 12, 2018 using a track mounted backhoe operated by Arnt Construction and observed by HGTS.

Soil samples recovered for the soil boring and test pits were classified in general accordance with ASTM D 2488, "Description and Identification of Soils (Visual-Manual Procedure)".

A field log of each boring and test pit was prepared by HGTS. The logs contain visual classifications of the soil materials encountered during drilling or test pit excavation, as well as the driller's interpretation of the subsurface conditions between samples and water observation notes. The final logs included with this report represent an interpretation of the field logs and include modifications based on visual/manual method observation of the samples.

The soil boring and test pit logs, general terminology for soil description and identification, and classification of soils for engineering purposes are also included in the appendix. The soil boring logs identify and describe the materials encountered, the relative density or consistency based on the Standard Penetration resistance (N-value, "blows per foot") and groundwater observations.

The strata changes were inferred from the changes in the samples and auger cuttings. The depths shown as changes between strata are only approximate. The changes are likely transitions, variations can occur beyond the location of the boring or test pit.

3.0 RESULTS

3.1 Soil Conditions

Test Pits Test pits TP-1 and TP-2 encountered about 6 to 12 inches of aggregate and test pits TP-3 thru TP-8 encountered about ½ to 1 ½ feet of clayey or sandy topsoil. The aggregate or topsoil was underlain by existing Fill materials that extended to depths of about 2 to 7 feet. The upper portions of the Fill consisted of aggregate base and pieces of concrete block and block debris and ranged in thickness from about 1 ½ to 3 feet but on average we estimate it was about 2 feet thick.

Below the aggregate base and concrete block debris, Test Pits TP-1, TP-2, TP-6 and TP-7 encountered Fill materials consisting of buried topsoil (lean clay with organics), peat (swamp deposit), sandy lean clay, lean clay, poorly graded sand with silt, poorly graded sand and clayey sand. Additional concrete block debris and pieces of concrete block was observed in Test Pit TP-2 from about 2 to 5 feet below the ground surface.

Below the Fill, the test pits predominantly encountered native glacial till deposits composed of clayey sand, silty sand, poorly graded sand with silt and poorly graded sand. Lesser amounts of alluvial clay (lean clay) was encountered in test pit TP-6.

The native glacial till was reddish brown in color and extended to the termination depth of the test pits except at TP-6 which terminated in lean clay at a depth of about 9 feet below the ground surface.

Standard Penetration Borings Boring SB-2 encountered about 8 inches of aggregate base and borings SB-3 thru SB-9 and SB-11 encountered about ½ to 1 ½ feet of clayey or sandy topsoil. The aggregate or topsoil was generally underlain by existing Fill materials that extended to depths of about 1 to 9 feet at seven (7) of the eleven (11) soil borings. The existing Fill consisted of a variety of both granular (sand) and cohesive (clay) soil types ranging from poorly graded sands to lean clay. Four of the soil borings (SB-3, SB-7, SB-8, and SB-9) did not encounter existing Fill.

Below the aggregate, topsoil and/or existing Fill, the borings encountered sandy and clayey glacial till and glacial outwash sands that extended to the termination depth of the borings. The glacial till and outwash soils were composed of clayey sand, silty sand, poorly graded sand and poorly graded sands with silt.

The exception was boring SB-9 which encountered a layer of alluvial silty clay that extended from about 1 to 4 feet below the ground surface. The penetration resistance values (N-Values), shown as blows per foot (bpf) on the boring logs, within silty clay alluvium was 5 bpf indicating a rather soft consistency.

The penetration resistance values (N-Values) within the clayey Fill (silty clay) ranged from 4 to 5 indicating a rather soft consistency. The N-Values within the granular Fill (silt, silty sand, clayey sand, poorly graded sand and poorly graded sand with silt) ranged from 5 to 26 bpf indicating a loose to medium dense relative density. However most of the values ranged from 5 to 9 bpf indicating a loose relative density.

The N-Values within the native granular glacial soils (clayey sand, silty sand, poorly graded sand with silt and poorly graded sand) ranged from 5 bpf to 50 blows per 5 inches. These values indicate the soils had a loose to very dense relative density. However most of the values ranged from 11 to 30 bpf indicating a medium dense relative density.

The N-Values within the native cohesive glacial soils (sandy lean clay and lean clay) ranged from 7 to 13 bpf. These values indicate the soils had a medium to stiff consistency.

3.2 Groundwater

Groundwater was encountered in nine of the eleven soil at depths ranging from 8 to 20 feet below the ground surface during or after drilling which correspond to elevations ranging from about 933 ½ to 979 ½ feet above mean sea level (msl), respectively. Groundwater was also observed in one of the test pits (TP-3) at a depth of about 8 feet.

Groundwater was not encountered in soil borings SB-1 or SB-8 while drilling or after removing the augers from the boreholes or in the test pits TP-1, TP-2 and TP-4 thru TP-8. Water levels are summarized in Table 1.

Table 1 Summary of Groundwater Levels

Boring (SB) Test Pit (TP) Number	Surface Elevation (feet)	Approximate Depth to Groundwater (feet)*	Approximate Groundwater Elevation (feet) *
SB-1	966.0	NE	-
SB-2	966.0	13 ½ - 15	951 - 952 ½
SB-3	950.7	8	943
SB-4	950.0	10	940
SB-5	948.8	14	935
SB-6	950.7	12	939
SB-7	952.6	19	933 ½
SB-8	977.5	NE	-
SB-9	988.0	8 ½	979 ½
SB-10	975.6	18 ½	957 ½
SB-11	968.9	18	951
TP-1	966.9	NE	-
TP-2	967.8	NE	-
TP-3	950.8	8	943
TP-4	949.5	NE	-
TP-5	949.9	NE	-
TP-6	949.1	NE	-
TP-7	969.5	NE	-
TP-8	969.9	NE	-

* = Depths and elevations were rounded to the nearest ½ foot.

NE = Not Encountered

Water levels were measured on the dates as noted on the boring logs and the period of water level observations was relatively short. However, given the cohesive nature of the soils encountered, it is possible that insufficient time was available for groundwater to seep into the borings and rise to its hydrostatic level. Groundwater monitoring wells or piezometers would be required to more accurately determine water levels. Seasonal and annual fluctuations in the groundwater levels should be expected.

3.3 Laboratory Testing

Laboratory moisture content and P-200 content tests were performed on selected samples recovered from the soil borings. The P-200 content is a measure of “fines” in a soil sample and directly affects soil infiltration rates. In very general terms the more “fines” in a sample the less permeable the soil will be. Table 2 below summarizes the results of the laboratory tests. Results of the laboratory moisture content tests are shown on the boring logs adjacent to the sample tested.

Table 2. Summary of Laboratory Tests

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)*	P-200 (%)
SB-1	2	2.5	3	-
SB-2	11	5	19	-
SB-3	19	5	15	2 ½
SB-4	27	5	6 ½	17
SB-5	35	5	22	-
SB-5	36	7.5	10 ½	31 ½
SB-6	43	5	10	-
SB-7	50	2.5	11 ½	-
SB-7	52	7.5	7 ½	-
SB-8	59	5	9 ½	32
SB-9	66	2.5	20	-
SB-10	74	2.5	13	-
SB-10	76	7.5	4 ½	-
SB-11	83	5	9 ½	-

*Moisture content and P-200 tests were rounded to the nearest ½ percent.

3.4 OSHA Soil Classification

The soils encountered in the borings consisted predominantly of granular Fill soils and native granular soils (poorly graded sand, poorly graded sand with silt, silty sand and clayey sand) corresponding to the ASTM Classification SP, SP-SM, SM and SC). These soils will generally be Type C soils under Department of Labor Occupational Safety and Health Administration (OSHA) guidelines.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Proposed Construction

The project will include constructing a new residential development along with the associated streets and underground utilities. Based on the concept plan provided the development is anticipated to include about 22 multi-unit townhomes west of 3rd Street with single-family homes on the portion of the site east of 3rd Street. We understand that the project is in the design stage and because of that specific construction plans were not available at the time of this report but we anticipate that homes will likely be slab on-grade structures but could possibly include walk-out or look-out style foundations.

We assume the homes will include one or two stories above grade and will include an attached garage. The new homes are assumed to consist of cast-in-place concrete or masonry foundation walls supported on concrete spread footings. The above grade construction will likely consist of wood framing, a pitched roof and asphalt shingles.

Based on the assumed construction we estimate wall loadings will range from about 1 to 2 kips (1,000 to 2,000 pounds) per lineal foot and column loads, if any, will be less than 50 kips (50,000 pounds).

We anticipate the project will also include installing new underground water, sanitary and storm sewer utilities. We were not provided specific utility information but anticipate typical pipe burial depths ranging from about 7 to 10 feet below the ground surface.

4.2 Discussion

The vegetation and topsoil encountered in the test pits and soil borings is not suitable for foundation, roadway or utility support and will need to be removed from within those areas.

Each of the test pits encountered existing Fill containing pieces of concrete block and concrete debris that extended to depths ranging from about 2 to 7 feet below the ground surface, with an estimated average thickness of about 2 to 3 feet across the proposed development site. Pieces of concrete block and concrete debris was generally not observed in the Fill encountered in the soil borings, however, the drilling augers may have “pushed” the block aside as they were advanced and pieces larger than approximately 2 inches would likely not be captured in the split spoon sampler. Although pieces of concrete block or concrete debris were not identified in the soil borings, it is likely it will be encountered during construction.

As noted in Section 1.3, Site Description partially buried concrete blocks were observed on the southern portion of the lower yard and within the slope between the upper and lower yards.

Depending, in part, on the total quantity of the concrete block pieces and concrete debris it may be cost effective to crush the material on-site and reuse it as aggregate base below the streets and parking areas. Alternately the material could be transported off-site, processed and returned to the site for reuse. We understand TA Schifsky & Sons, Inc, located within a few blocks of the site, may be able to provide that service. If the quantity of material is not enough to make recycling cost effective, then it should be properly disposed of off-site. To the best of our knowledge the concrete block and concrete debris can be disposed of at a demolition landfill, but the landfill may require some environmental testing prior to accepting the material.

Aside from the pieces of concrete block and debris, some of the borings and test pits encountered Fill materials that extended to depths up to about 9 feet below the ground surface. The Fill contained soft clays as well as loose or very loose sandy soils which are not suitable for foundation support in their current condition. It may be possible to reuse a portion of these materials provided they are free of debris, organic soils or other unsuitable materials. Portions of the soils, if reused, will likely require moisture conditioning (drying or wetting). Summer months are typically more favorable for drying wet soils. Soils that cannot be moisture conditioned and compacted to densities meeting project specifications will need to be removed and replaced with suitable compacted engineered fill.

An approximate 1-foot layer of peat was encountered in test pit TP-6 at about 7 feet below the ground surface. The peat is not suitable for foundation, roadway or utility support and will need to be removed and replaced with suitable compacted engineered fill.

Organic soils and soils that are black in color are not suitable for foundation, roadway or utility support. These materials, if encountered will need to be removed from within the proposed house,

roadway, utility and oversize areas. Suitable engineered fill would then be placed to attain site grades.

The underlying native glacial till and outwash soils, in our opinion, are generally suitable for house, roadway and utility support.

Groundwater was encountered in nine of the eleven soil at depths ranging from about 8 to 20 feet below the ground surface and in one of the test pits at a depth of about 8 feet corresponding to elevations ranging from about 933 ½ to 979 ½ feet msl, respectively.

Assuming the homes will be slab on grade structures we do not anticipate that groundwater will be encountered during construction and do not anticipate that dewatering will be required. However, groundwater could be encountered during deeper utility installations and during deeper soil corrections and dewatering could be required.

4.3 Building Pad Preparation

Excavation We recommend all vegetation, topsoil, existing Fill, swamp deposits (peat), soft clays or otherwise unsuitable soils, if encountered, be removed from the proposed building, roadway, utility and oversize areas. We recommend that all building remnants from any former structures such as footings, floor slabs, foundation walls, underground utilities be removed from within the building and oversize area. Table 3 below summarizes the anticipated excavation depths at the boring and test pit locations. Excavation depths may vary and could be deeper.

Table 3. Anticipated Excavation Depths

Boring Number	Measured Surface Elevation (feet)	Anticipated Excavation Depth (feet)*	Anticipated Excavation Elevation (feet)*	Approximate Groundwater Elevation (feet)*
SB-1	966.0	1	965	NE
SB-2	966.0	8	958	952 ½
SB-3	950.7	½	950	943
SB-4	950.0	2	948	940
SB-5	948.8	6	943	935
SB-6	950.7	9	941 ½	939
SB-7	952.6	1	951 ½	933 ½
SB-8	977.5	1 ½	976	NE
SB-9	988.0	4	984	979 ½
SB-10	975.6	2	973 ½	957 ½
SB-11	968.9	2	967	951
TP-1	966.9	4 - 7	960 - 963	NE
TP-2	967.8	5	963	NE
TP-3	950.8	2 ½	948 ½	942 ½
TP-4	949.5	3	946 ½	NE
TP-5	949.9	2	948	NE
TP-6	949.1	8	941	NE
TP-7	969.5	4	965 ½	NE
TP-8	969.9	2	968	NE

* = Depths and elevations were rounded to the nearest ½ foot. NE = Not Encountered

Oversizing If the excavation extends below the proposed footing elevation, the excavation requires oversizing. We recommend the perimeter of the excavation be extended a foot outside the proposed footprint for every foot below footing grade (1H:1V oversizing). The purpose of the oversizing is to provide lateral support of the foundation.

Fill and Backfilling We recommend that backfill placed to attain site grades be compacted to a minimum of 95 percent of its standard Proctor density (ASTM D 698). Fill should be placed within 3 percentage points above and 1 percentage point below its optimum moisture content as determined by the standard Proctor. All fill should be placed in thin lifts and be compacted with a large self-propelled vibratory compactor operating in vibratory mode.

Granular fill classified as SP or SP-SM (with less than 12% passing the #200 sieve), if used, should be placed within 65 percent to 105 percent of its optimum moisture content as determined by the standard Proctor.

Fill placed above the water table may consist of any debris-free, non-organic mineral soil. Fill placed below or within 3 feet of the groundwater table should consist of granular soils (sand) with less than 5 percent passing the number 200 sieve and at least 50 percent retained on the number 40 sieve.

The on-site native soils consisting appear to be generally suitable for use as engineered fill but could require moisture conditioning (drying or wetting) to achieve the recommended compaction requirements.

As discussed in Section 4.2, the existing on-site Fill contained soft clays as well as loose or very loose sandy soils which are not suitable for foundation support in their current condition. It may be possible to reuse a portion of these material provided they are free of debris, organic soils or other unsuitable materials. Clayey soils, if reused will likely require moisture conditioning (drying). Summer months are typically more favorable for drying wet soils. Soils that cannot be moisture conditioned and compacted to densities meeting project specifications will need to be removed and replaced with suitable compacted engineered fill.

Peat, organic soils and soils that are black in color are not suitable for reuse as structural fill below foundations, roadways or utilities. It may be possible to reuse these materials in green areas such as landscaping berms.

Foundations We recommend the perimeter footings bear a minimum of 42 inches below the exterior grade for frost protection. Interior footings may be placed immediately below the slab provided construction does not occur during below freezing weather conditions. Foundation elements in unheated areas (i.e. deck or porch footings) should bear at least 5 feet below exterior grade for frost protection.

We anticipate the foundations and floor slabs will bear on compacted engineered fill or native glacially deposited soils

With the building pads prepared as recommended, it is our opinion the footings can be designed for a net allowable bearing pressure up to 2,000 pounds per square foot (psf).

We anticipate total and differential settlement of the foundations will be less than 1 inch and ½ inch, respectively, across an approximate 30-foot span.

4.4 Groundwater Separation Considerations & Dewatering

We recommend the lowest floor grades be constructed to maintain at least a 4-foot separation between the lowest floor slab and the observed groundwater and at least a 2-foot separation between the lowest floor slab and the 100-year flood level of adjacent wetland or other bodies of surface water.

Groundwater was encountered in nine of the eleven soil at depths ranging from about 8 to 20 feet below the ground surface and in one of the test pits at a depth of about 8 feet corresponding to elevations ranging from about 933 ½ to 979 ½ feet msl, respectively.

Assuming the homes will be slab on grade structures we do not anticipate that groundwater will be encountered during construction and do not anticipate that dewatering will be required. However, groundwater could be encountered during deeper utility installations and during deeper soil corrections and dewatering could be required.

If dewatering is required, we recommend the groundwater level be temporarily lowered to a minimum of 2 feet below the lowest anticipated excavation elevation to allow for construction. In sand soils we do not recommend attempting to dewater from within the excavation. Upward seepage will loosen and disturb the excavation, resulting in a "quick condition". Rather, we recommend groundwater be drawn down below the anticipated excavation bottom.

We recommend that a dewatering contractor be consulted to review the soil boring logs, develop a dewatering plan and evaluate the impact of dewatering on adjacent structures.

Perched groundwater, if encountered, can likely be removed with sumps and pumps.

4.5 Interior Slabs

The anticipated floor subgrade is granular fill (sand cushion) overlying native soils or compacted engineered fill. It is our opinion a modulus of subgrade reaction, k, of 150 pounds per square inch of deflection (psi) may be used to design the floor.

If floor coverings or coatings less permeable than the concrete slab will be used, we recommend that a vapor retarder or vapor barrier be placed immediately beneath the slab. Some contractors prefer to bury the vapor barrier or vapor retarder beneath a layer of sand to reduce curling and shrinkage, but this practice often traps water between the slab and vapor retarder or barrier. Regardless of where the vapor retarder or vapor barrier is placed, we recommend consulting the floor covering manufacturer regarding the appropriate type, use and installation of the vapor retarder or vapor barrier to preserve the warranty.

We recommend following all state and local building codes with regards to a radon mitigation plan beneath interior slabs.

4.6 Below Grade Walls

Foundation walls or below grade (basement) walls will have lateral loads from the surrounding soil transmitted to them. We recommend general waterproofing of the below grade walls. We recommend either placing drainage composite against the backs of the exterior walls or backfilling adjacent to the walls with sand having less than 50 percent of the particles by weight passing the #40 sieve and less than 5 percent of the particles by weight passing the #200 sieve. The sand backfill should be placed within 2 feet horizontally of the wall. We recommend the balance of the backfill for the walls consist of sand however the sand may contain up to 20 percent of the particles by weight passing the #200 sieve.

We recommend installing drain tile behind the below grade walls, adjacent to the wall footing and below the slab elevation. Preferably the drain tile should consist of perforated pipe embedded in gravel. A geotextile filter fabric should encase the pipe and gravel. The drain tile should be routed to a storm sewer, sump pump or other suitable disposal site.

Active earth pressures can be used to design the below grade walls if the walls are allowed to rotate slightly. If wall rotation cannot be tolerated, below grade wall design should be based on at-rest earth pressures. We recommend soil parameters found below in Table 4, be used for below grade/retaining wall design. These design parameters are based on the assumptions that the walls are drained, there are no surcharge loads within a horizontal distance equal to the height of the wall and the backfill is level.

Table 4. Soil Parameters

Soil Type	Estimated Unit Weight (pcf)	Estimated Friction Angle (degrees)	At-Rest Pressure (pcf)	Active Soil Pressure (pcf)	Passive Soil Pressure (pcf)
Sands (SP, SP-SM)	120	32	55	35	400
Silty and Clayey Soils (CL, CL-ML, SC, SM)	135	28	70	50	405

Resistance to lateral earth pressures will be provided by passive resistance against the wall footings and by sliding resistance along the bottom of the wall footings. We recommend a sliding coefficient of 0.35. This value does not include a factor of safety.

4.7 Exterior Slabs

Exterior slabs will likely be underlain by a variety of silty and clayey soils which are moderately to highly frost susceptible. If these soils become saturated and freeze, frost heave may occur. This heave can be a nuisance in front of doors and at other critical grade areas. One way to help reduce the potential for heaving is to remove the frost-susceptible soils below the slabs down to bottom of footing grades and replace them with non-frost-susceptible backfill consisting of sand having less than 5 percent of the particles by weight passing the number 200 sieve.

If this approach is used and the excavation bottoms terminate in non-free draining granular soil we recommend a drain tile be installed along the bottom outer edges of the excavation to collect and remove any water that may accumulate within the sand. The bottom of the excavation should be graded away from the building.

If the banks of the excavations to remove the frost-susceptible soils are not sloped, abrupt transitions between the frost-susceptible and non-frost-susceptible backfill will exist along which unfavorable amounts of differential heaving may occur. Such transitions could exist between exterior slabs and sidewalks, between exterior slabs and pavements and along the slabs themselves if the excavations are confined to only the building entrances. To address this issue we recommend sloping the excavations to remove frost-susceptible soils at a minimum 3:1 (horizontal:vertical) gradient.

Another alternative for reducing frost heave is to support the slabs on frost depth footings. A void space of at least 4 inches should be provided between the slab and the underlying soil to allow the soil to heave without affecting the slabs.

4.8 Site Grading and Drainage

We recommend the site be graded to provide positive run-off away from the proposed building. We recommend landscaped areas be sloped a minimum of 6 inches within 10 feet of the building and slabs be sloped a minimum of 2 inches. In addition, we recommend downspouts with long splash blocks or extensions.

4.9 Utilities

New underground utilities will be installed as part of the project. We anticipate that the utilities will be supported on the native glacial till and outwash soils or compacted engineered following soil correction which in our opinion are suitable for pipe support. We recommend removing all vegetation, topsoil, organic, soft, loose or other unsuitable soils, if encountered, beneath utilities prior to utility placement.

We recommend bedding material be thoroughly compacted around the pipes. We recommend trench backfill above the pipes be compacted to a minimum of 95 percent beneath pavements, the exception being within 3 feet of the proposed pavement subgrade, where 100 percent of standard Proctor density is required. In landscaped areas we recommend a minimum compaction of 90 percent.

Groundwater was encountered in nine of the eleven soil at depths ranging from about 8 to 20 feet below the ground surface and in one of the test pits at a depth of about 8 feet corresponding to elevations ranging from about 933 ½ to 979 ½ feet msl, respectively.

We do not anticipate that groundwater will be encountered during construction and do not anticipate that dewatering will be required. However, groundwater could be encountered during deeper utility installations and dewatering could be required. See section 4.4 for information regarding dewatering.

4.10 Pavement Recommendations

We recommend that the roadway(s) be constructed in accordance with City of North St. Paul Standard plates. The following paragraphs provide recommendations in the absence of City of North St. Paul standard plates.

Traffic We were not provided specific traffic information but assume the streets will predominantly accommodate automobiles and light trucks with weekly use by heavier vehicles such as garbage trucks and delivery vehicles such as UPS or FED/EX. Based on the assume traffic types we estimate the street will be subjected to a maximum of 50,000 Equivalent Single Axle loads (ESAL's) over a 20-year design life.

R-Value R-Value testing was beyond the scope of this project. The soil borings encountered a variety of silty, sandy and clayey soils near the surface. Because of the variety of soils encountered it is our opinion that an R-Values of 20 can be used for pavement design.

Subgrade Preparation We recommend removing all vegetation, topsoil, organic, soft clay and other unsuitable materials from beneath the pavement subgrades. Prior to placing the aggregate base (Class 5) we recommend observing a test roll of the subgrade soils with a loaded tandem truck to identify soft, weak, loose or unstable areas that may require additional subcuts.

Fill placed to attain pavement subgrade elevation can consist of the existing fill soils provided it is free of appreciable organic topsoil material or other deleterious materials. We recommend compacting the backfill at moisture contents within a range of 1 percentage point below and 3 percentage points above its optimum moisture content. Granular fill classified as SP or SP-SM, if used, can be placed within 65 percent to 105 percent of its optimum moisture content as determined by the standard Proctor. The upper 3 feet of fill and backfill should be compacted to a minimum of 100 percent of its standard Proctor maximum dry density.

Pavement Section For roadways subjected to a maximum of 50,000 ESAL's and an assumed subgrade R-Value of 20, we recommend a minimum of 3 ½ inches of bituminous and a minimum of 8 inches of Class 5 aggregate base.

Materials We recommend aggregate base meeting MN/DOT specification 3138 for Class 5 aggregate base. We recommend the aggregate base be compacted to 100 percent of its maximum standard Proctor dry density.

We recommend that the bituminous wear and base courses meet the requirement of MN/DOT specification 2360. We recommend the bituminous pavements be compacted to at least 92% of the maximum theoretical density.

The new pavement areas will include concrete curb and gutter. We recommend specifying concrete that has a minimum 28 day compressive strength of 3,900 psi. We recommend specifying 5 to 8 percent entrained air for exposed concrete to provide resistance to freeze-thaw deterioration. We recommend slump, air content and compressive strength test of Portland cement concrete.

4.11 Stormwater Ponds & Infiltration Basins

Granular soils meeting the ASTM Classification SP-SM are relatively permeable soils and generally well suited for stormwater infiltration.

For stormwater pond design we recommend using the infiltration rates presented in Table 5 below, which were obtained from Table 12.BIO.8 of the "Minnesota Storm Water Manual", Revised December 16, 2013, for infiltration basin design.

Table 5. Design Infiltration Rates

In-situ soils	Soil Description	Design Infiltration Rate (in/hr)
SP	Poorly Graded Sand	0.8
SP-SM	Poorly Graded Sand with Silt	0.8
SM	Silty Sand	0.45
SC	Clayey Sand	0.06

Field tests (double ring infiltrometer) can be performed within the proposed infiltration basin area to verify infiltration rates of the in-situ soils. We would be pleased to provide these services if required or requested.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Excavation

The soils encountered in the borings consisted predominantly of Fill soils and granular soils (poorly graded sand, poorly graded sand with silt, silty sand and clayey sand) corresponding to the ASTM Classification SP, SP-SM, SM and SC). These soils will generally be Type C soils under Department of Labor OSHA guidelines.

Temporary excavations in Type C soils should be constructed at a minimum of 1 ½ foot horizontal to every 1 foot vertical within excavations. Slopes constructed in this manner may still exhibit surface sloughing. If site constraints do not allow the construction of slopes with these dimensions, temporary shoring may be required.

5.2 Observations

A geotechnical engineer or qualified engineering technician should observe the excavation subgrade to evaluate if the subgrade soils are similar to those encountered in the borings/test pits and adequate to support the proposed construction.

5.3 Backfill and Fills

Site soils that will be excavated and reused as backfill and fill appear to be below their assumed optimum moisture content. We anticipate it will be necessary to moisture condition (dry or wet) these soils to achieve the recommended compaction. We recommend that fill and backfill be placed in lifts not exceeding 4 to 12 inches, depending on the size of the compactor and materials used.

5.4 Testing

We recommend density tests of backfill and fills placed during mass grading, utility and pavement construction. Samples of the proposed materials should be submitted to our laboratory prior to placement for evaluation of their suitability and to determine their optimum moisture content and maximum dry density (Standard Proctor).

5.5 Winter Construction

If site grading and construction is anticipated to proceed during cold weather, all snow and ice should be removed from cut and fill areas prior to additional grading and placement of fill. No fill should be placed on frozen soil and no frozen soil should be used as fill or backfill.

Concrete delivered to the site should meet the temperature requirements of ASTM and/or ACI. Concrete should not be placed on frozen soil. Concrete should be protected from freezing until the necessary strength is obtained. Frost should not be permitted to penetrate below the footings.

6.0 PROCEDURES

6.1 Soil Classification

The drill crew chief visually and manually classified the soils encountered in the borings and test pits in general accordance with ASTM D 2488, "Description and Identification of Soils (Visual-Manual Procedure)." Soil terminology notes are included in the Appendix. The samples were returned to our laboratory for review of the field classification by a geotechnical engineer. Samples will be retained for a period of 30 days.

6.2 Groundwater Observations

Immediately after taking the final samples in the bottom of the borings, the hole was checked for the presence of groundwater. Again, at the end of the drilling day, the borings were re-checked for the presence of groundwater with the levels and time delay being noted on the boring logs.

7.0 GENERAL

7.1 Subsurface Variations

The analyses and recommendations presented in this report are based on data obtained from a limited number of soil borings and test pits. Variations can occur away from the borings and test pits, the nature of which may not become apparent until additional exploration work is completed or construction is conducted. A re-evaluation of the recommendations in this report should be made after performing on-site observations during construction to note the characteristics of any variations. The variations may result in additional excavation costs and it is suggested that a contingency be provided for this purpose.

It is recommended that we be retained to perform the observation and testing program during construction to evaluate whether the design is as expected, if any design changes have affected the validity of our recommendations, and if our recommendations have been correctly interpreted and implemented in the designs, specifications and construction methods. This will allow correlation of the soil conditions encountered during construction to the soil borings and will provide continuity of professional responsibility.

7.2 Review of Design

This report is based on the design of the proposed structures as related to us for preparation of this report. It is recommended that we be retained to review the geotechnical aspects of the design and specifications. With the review, we will evaluate whether any changes have affected the validity of the recommendations and whether our recommendations have been correctly interpreted and implemented in the design and specifications.

7.3 Groundwater Fluctuations

We made water level measurements in the borings at the times and under the conditions stated on the boring logs. The data was interpreted in the text of this report. The period of observation was relatively short and fluctuations in the groundwater level may occur due to rainfall, flooding, irrigation, spring thaw, drainage, and other seasonal and annual factors not evident at the time the observations were made. Design drawings and specifications and construction planning should recognize the possibility of fluctuations.

7.4 Use of Report

This report is for the exclusive use of M/I Homes and their design team to use to design the proposed structures and prepare construction documents. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. The data, analysis and recommendations may not be appropriate for other structures or purposes. We recommend that parties contemplating other structures or purposes contact us.

7.5 Level of Care

Haugo GeoTechnical Services, LLC has used the degree of skill and care ordinarily exercised under similar circumstance by members of the profession currently practicing in this locality. No warranty expressed or implied is made.

APPENDIX

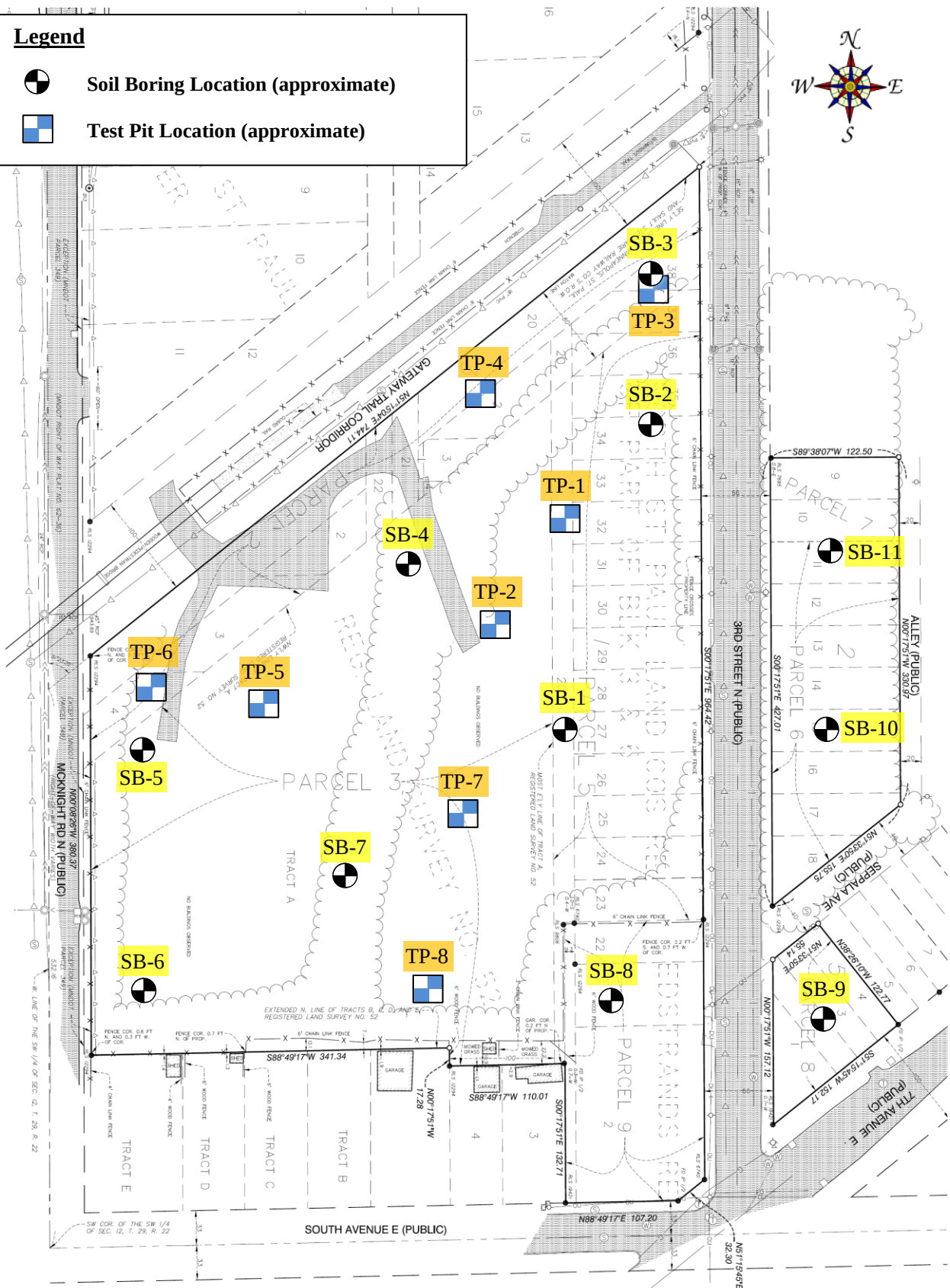
Legend



Soil Boring Location (approximate)



Test Pit Location (approximate)



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Minneapolis, MN 55407

Soil Boring Location Sketch North St. Paul Residential Development St. Paul, Minnesota

Figure #: 1
Drawn By: ALY
Date: 10/2/18
Scale: None
Project #: 18-0858

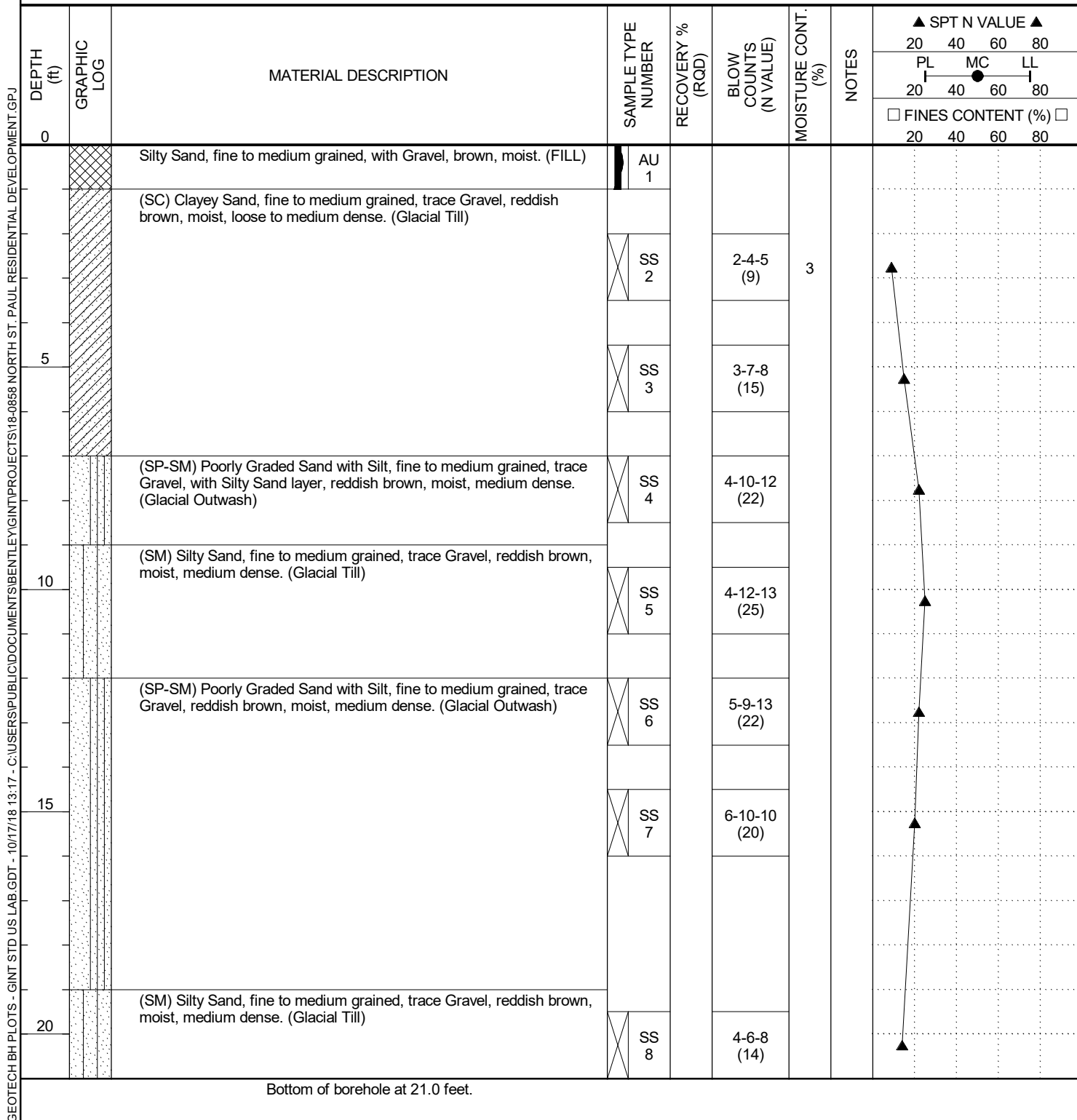


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BORING NUMBER SB-1

PAGE 1 OF 1

CLIENT M/I Homes	PROJECT NAME North St. Paul Residential Development
PROJECT NUMBER 18-0858	PROJECT LOCATION North St. Paul, MN
DATE STARTED 9/24/18 COMPLETED 9/24/18	GROUND ELEVATION 966 ft HOLE SIZE 3 1/4 inches
DRILLING CONTRACTOR HGTS	GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING --- Not Encountered
LOGGED BY MS CHECKED BY JC	AT END OF DRILLING --- Not Encountered
NOTES Borehole grouted.	AFTER DRILLING --- Not Encountered with Cave-In Depth of 17.5 feet





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BORING NUMBER SB-2

PAGE 1 OF 1

CLIENT M/I Homes

PROJECT NAME North St. Paul Residential Development

PROJECT NUMBER 18-0858

PROJECT LOCATION North St. Paul, MN

DATE STARTED 9/24/18

COMPLETED 9/24/18

GROUND ELEVATION 966 ft

HOLE SIZE 3 1/4 inches

DRILLING CONTRACTOR HGTS

GROUND WATER LEVELS:

DRILLING METHOD Hollow Stem Auger/Split Spoon

▽ AT TIME OF DRILLING 15.00 ft / Elev 951.00 ft

LOGGED BY MS

CHECKED BY JC

▼ AT END OF DRILLING 13.90 ft / Elev 952.10 ft

NOTES Borehole grouted.

▼ AFTER DRILLING 13.60 ft / Elev 952.40 ft with Cave-In Depth of 14 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0								20	40	60	80
		8 inches Aggregate Base.	AU 9								
		Poorly Graded Sand with Silt, fine to medium grained, with Gravel, brown to grey, moist. (FILL)									
		Silty Sand, fine to medium grained, trace Roots, trace Wood, grey, moist. (FILL)	SS 10		2-3-6 (9)						
5		Silt, trace rust staining, with brown Silty Clay at 6 feet, grey, moist. (FILL)	SS 11		3-4-4 (8)	19					
		Silty Sand, fine to medium grained, trace Gravel, brown, moist. (FILL)	SS 12		3-5-15 (20)						
		(SP-SM) Poorly Graded Sand with Silt, fine to coarse grained, trace Gravel, brown, moist, medium dense. (Glacial Outwash)	SS 13		6-14-16 (30)						
10		(SC) Clayey Sand, fine to medium grained, trace Gravel, reddish brown, medium dense. (Glacial Till)	SS 14		3-4-12 (16)						
		(SM) Silty Sand, fine to medium grained, trace Gravel, with Silt at 16 feet, reddish brown, wet, medium dense. (Glacial Till)	SS 15		5-10-12 (22)						
15											
		(SP) Poorly Graded Sand, medium to coarse grained, trace Gravel, reddish brown, moist, medium dense. (Glacial Outwash)	SS 16		6-9-11 (20)						
20											
Bottom of borehole at 21.0 feet.											

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:17 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858 NORTH ST. PAUL RESIDENTIAL DEVELOPMENT.GPJ

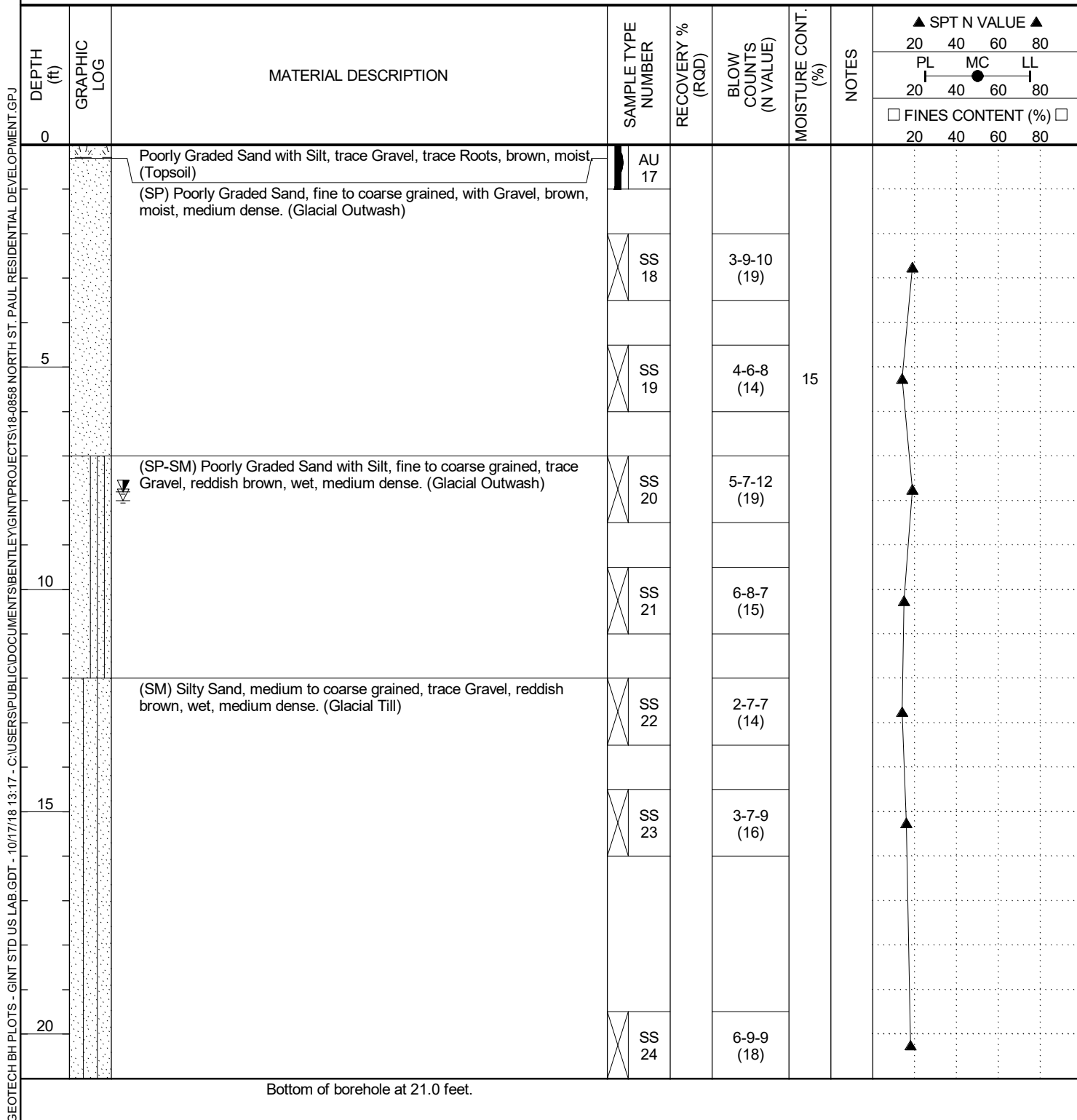


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BORING NUMBER SB-3

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/24/18	COMPLETED	9/24/18
GROUND ELEVATION	950.7 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING	8.00 ft / Elev 942.70 ft
LOGGED BY	MS	CHECKED BY	JC
NOTES	Borehole grouted.		
		AT END OF DRILLING	--- Not Encountered
		AFTER DRILLING	7.80 ft / Elev 942.90 ft with Cave-In Depth of 9 feet



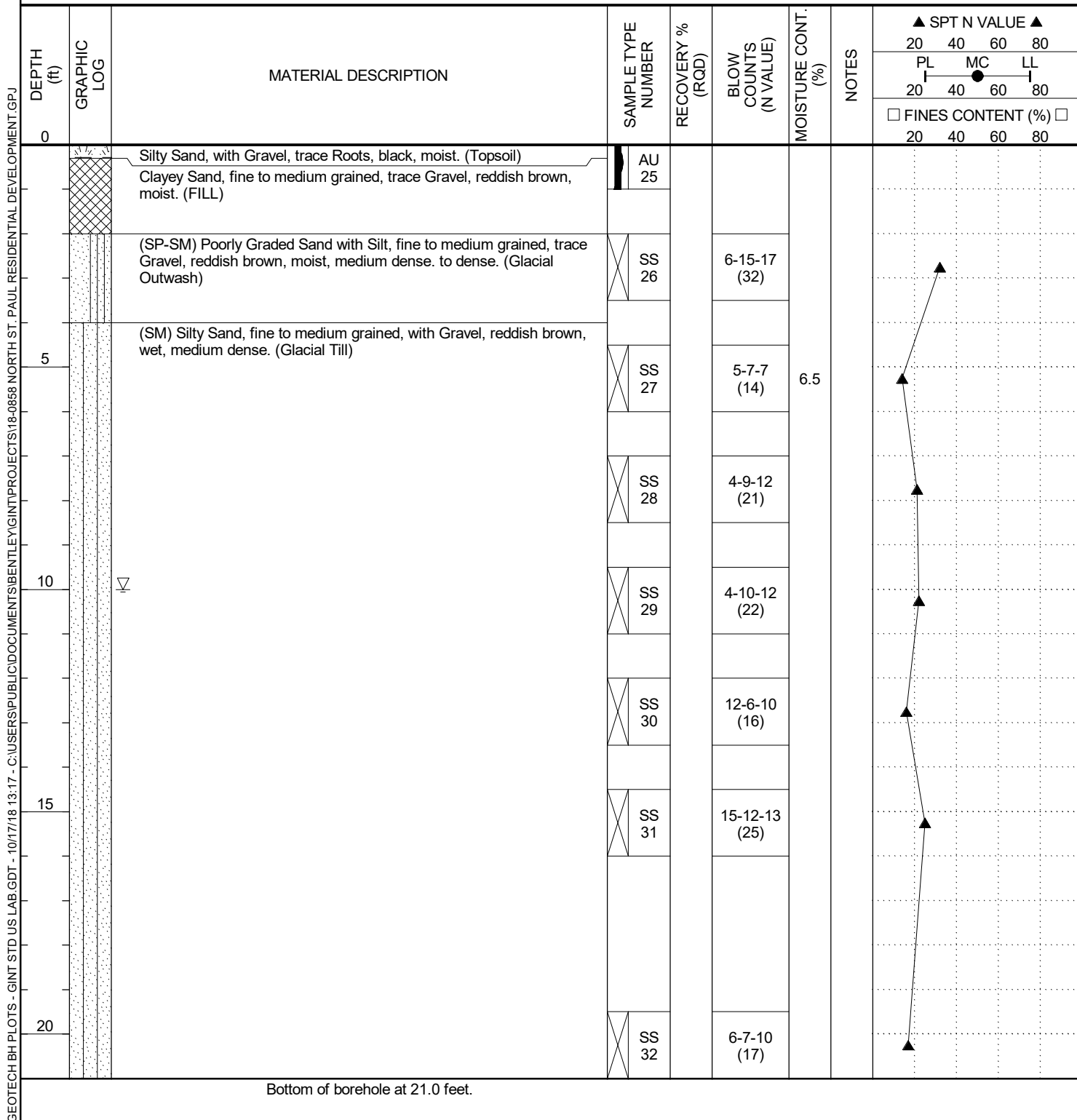


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BORING NUMBER SB-4

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/24/18	COMPLETED	9/24/18
GROUND ELEVATION	950 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	▽ AT TIME OF DRILLING	10.00 ft / Elev 940.00 ft
LOGGED BY	MS	CHECKED BY	JC
AT END OF DRILLING	--- Not Encountered		
NOTES	Borehole grouted.		
AFTER DRILLING	--- Not Encountered with Cave-In Depth of 8 feet		





PAGE 1 OF 1

PROJECT NAME North St. Paul Residential Development

PROJECT LOCATION North St. Paul, MN

GROUND ELEVATION 948.8 ft **HOLE SIZE** 3 1/4 inches

GROUND WATER LEVELS:

 AT TIME OF DRILLING 14.00 ft / Elev 934.80 ft

AT END OF DRILLING --- Not Encountered

AFTER DRILLING --- Not Encountered with Cave-In Depth of 17.9 feet

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
								20	40	60	80
□ FINES CONTENT (%) □											
20 40 60 80											
0		Silty Sand, trace Roots, black, moist. (Topsoil)	AU 33								
		Silt, trace Roots, black, moist. (FILL)									
			SS 34		4-3-3 (6)						
		Silty Clay, grey, moist. (FILL)									
5			SS 35		4-2-3 (5)	22					
		(SC) Clayey Sand, fine to medium grained, trace Gravel, dark brown to grey at 13 feet, moist, loose. (Glacial Till)									
			SS 36		2-2-3 (5)	10.5					
10			SS 37		3-3-3 (6)						
			SS 38		1-2-3 (5)						
15		(SP-SM) Poorly Graded Sand with Silt, medium to coarse grained, brown, waterbearing, medium dense. (Glacial Outwash)									
		(SM) Silty Sand, fine to medium grained, trace Gravel, brown, wet, medium dense. (Glacial Till)	SS 39		3-5-6 (11)						
20			SS 40		4-5-6 (11)						
Bottom of borehole at 21.0 feet.											

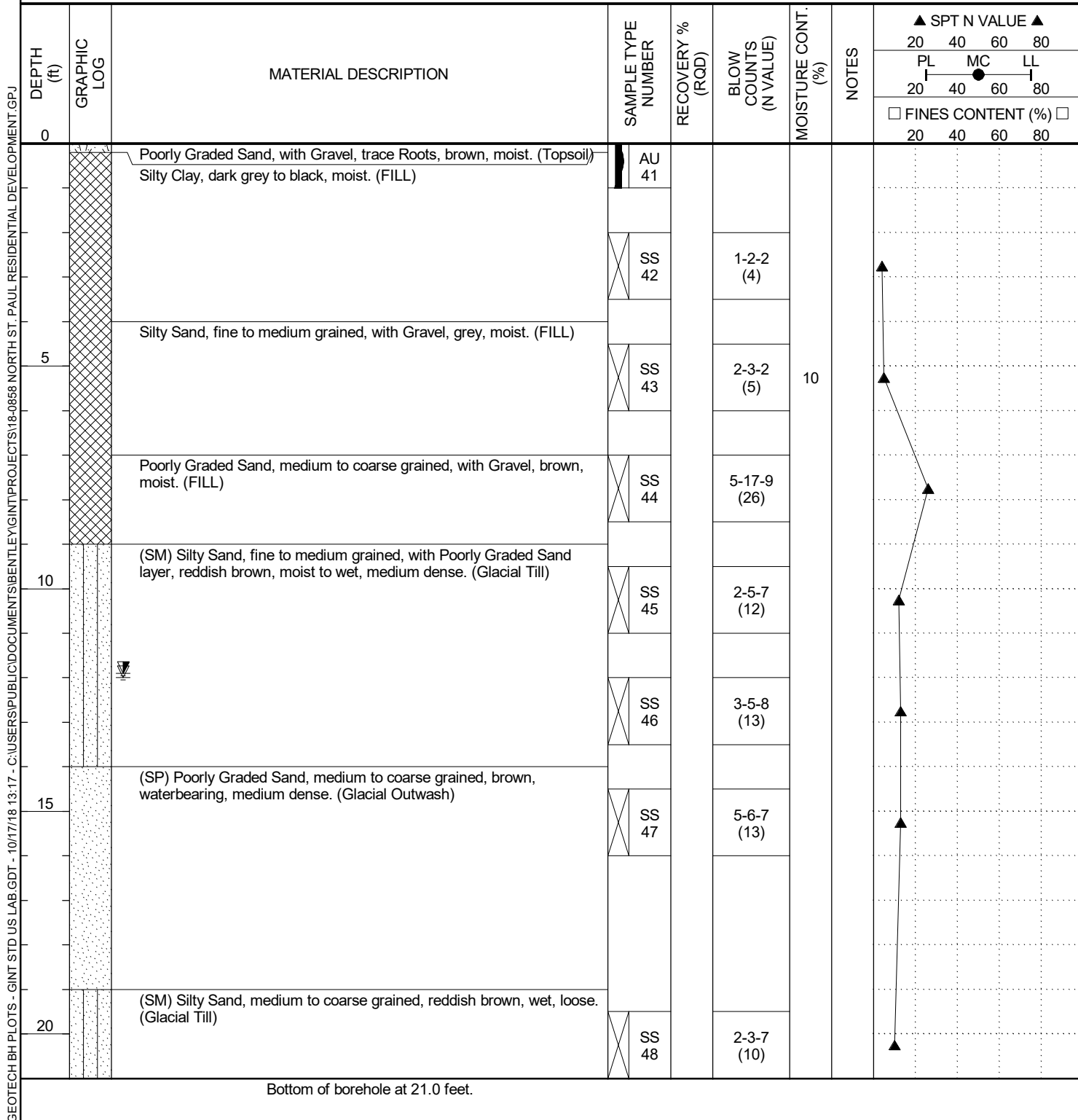


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BORING NUMBER SB-6

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/25/18	COMPLETED	9/25/18
GROUND ELEVATION	950.7 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING	12.00 ft / Elev 938.70 ft
LOGGED BY	MS	CHECKED BY	JC
NOTES	Borehole grouted.		
		AT END OF DRILLING	--- Not Encountered
		AFTER DRILLING	11.90 ft / Elev 938.80 ft with Cave-In Depth of 13 feet



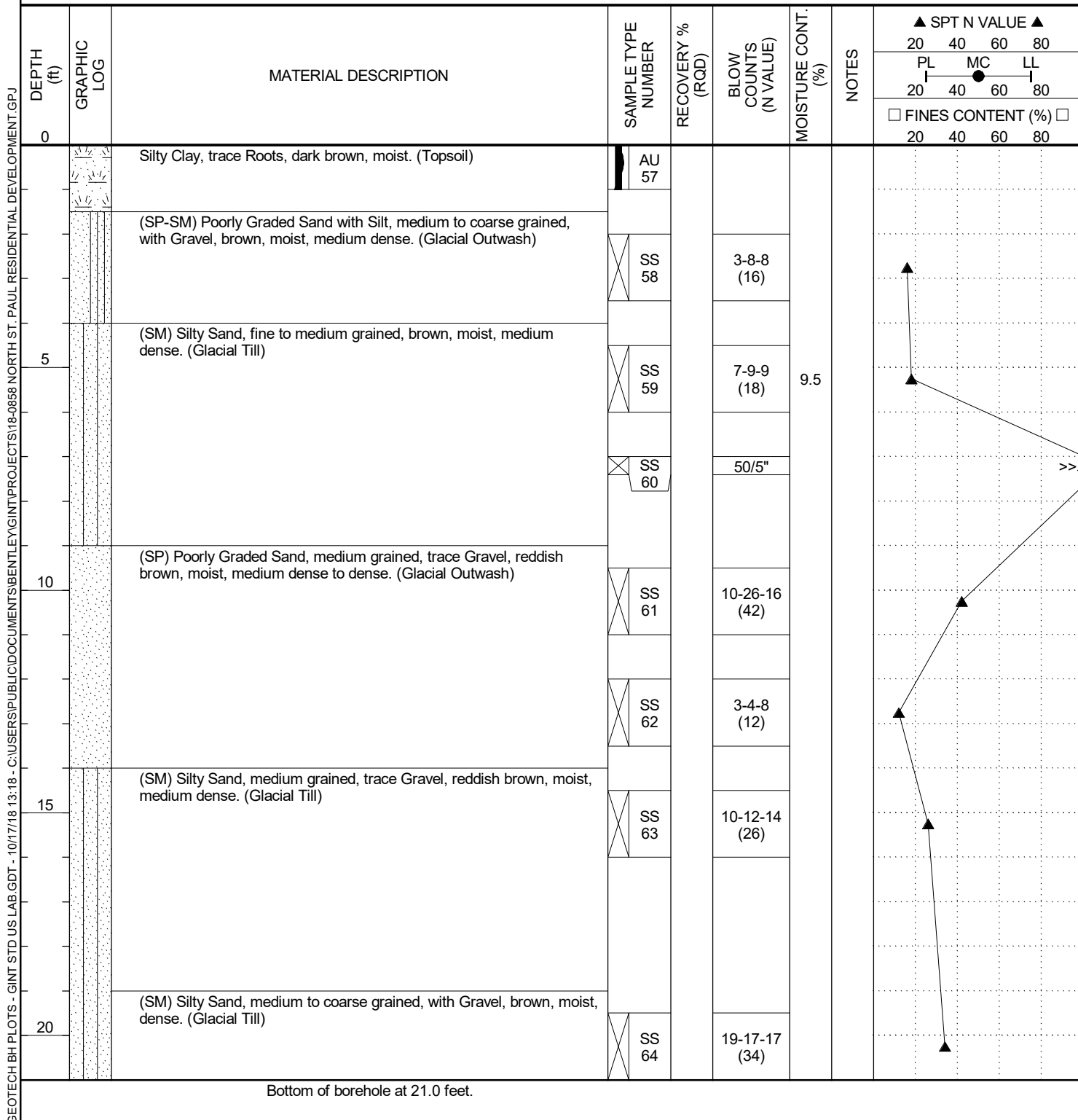


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BORING NUMBER SB-8

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/25/18	COMPLETED	9/25/18
GROUND ELEVATION	977.5 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING	--- Not Encountered
LOGGED BY	MS	CHECKED BY	JC
NOTES	Borehole grouted.		
		AT END OF DRILLING	--- Not Encountered
		AFTER DRILLING	--- Not Encountered with Cave-In Depth of 18 feet



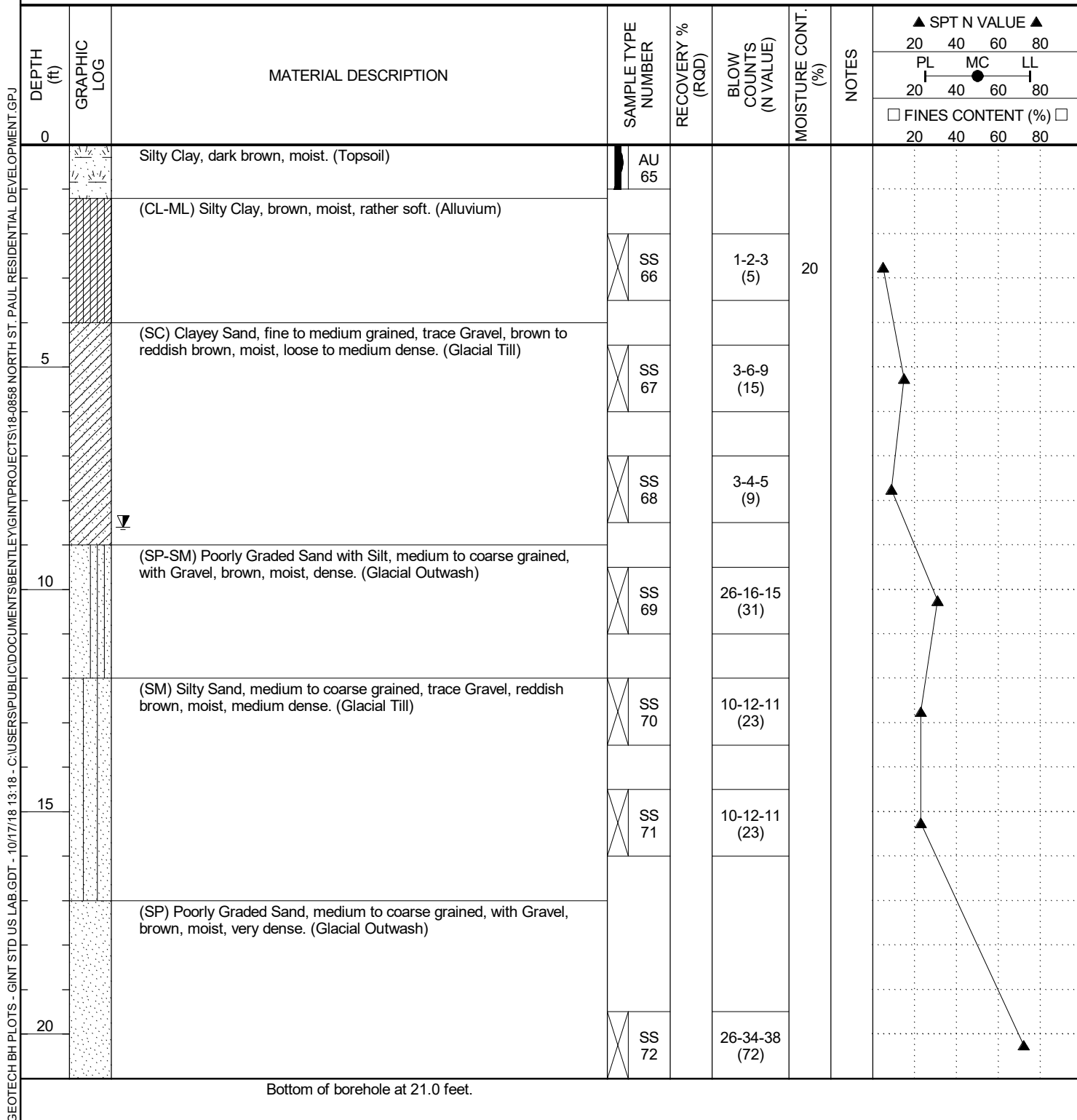


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BORING NUMBER SB-9

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/25/18	COMPLETED	9/25/18
GROUND ELEVATION	988 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING	--- Not Encountered
LOGGED BY	MS	CHECKED BY	JC
NOTES	Borehole grouted.		
		AT END OF DRILLING	--- Not Encountered
		AFTER DRILLING	8.60 ft / Elev 979.40 ft with Cave-In Depth of 8.7 feet



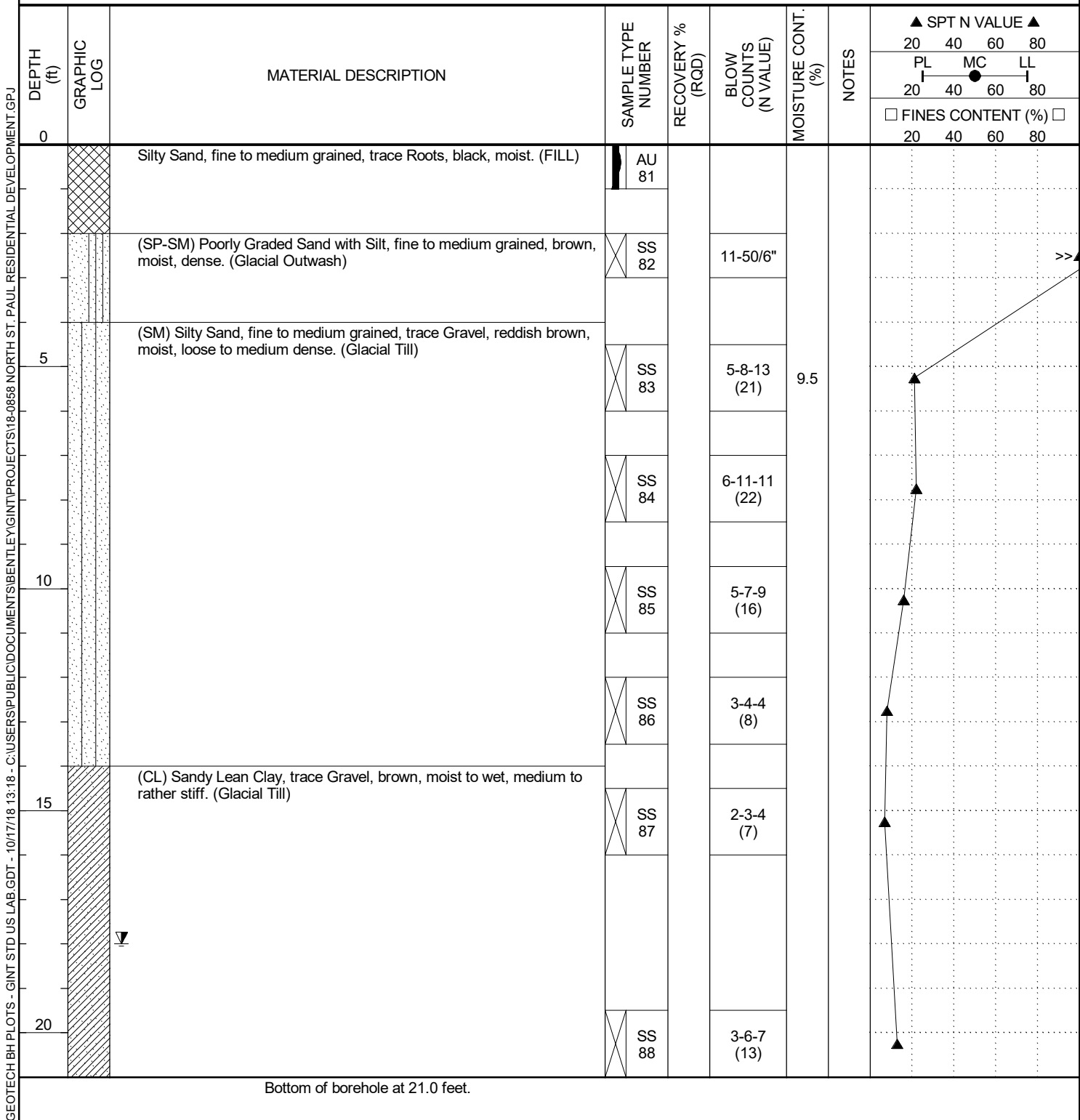


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BORING NUMBER SB-11

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/27/18	COMPLETED	9/27/18
GROUND ELEVATION	968.9 ft	HOLE SIZE	3 1/4 inches
DRILLING CONTRACTOR	HGTS	GROUND WATER LEVELS:	
DRILLING METHOD	Hollow Stem Auger/Split Spoon	AT TIME OF DRILLING	--- Not Encountered
LOGGED BY	MS	CHECKED BY	JC
NOTES	Borehole grouted.		
		AFTER DRILLING	18.00 ft / Elev 950.90 ft with Cave-In Depth of 19 feet





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TEST PIT NUMBER TP-1

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858A	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/12/18	COMPLETED	9/13/18
EXCAVATION CONTRACTOR	HGTS	GROUND ELEVATION	966.9 ft
EXCAVATION METHOD	Test Pit	TEST PIT SIZE	inches
LOGGED BY	PG	CHECKED BY	PG
NOTES			
GROUND WATER LEVELS:		AT TIME OF EXCAVATION	
		--- Not Encountered	
		AT END OF EXCAVATION	
		--- Not Encountered	
		AFTER EXCAVATION	
		--- Not Encountered	

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:11 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858A NORTH ST. PAUL RESIDENTIAL DEVELOPMENT TEST PITS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
0.0		Crushed Limestone. (Aggregate Base)									
		Silty Sand, with Concrete Debris, grey, moist. (FILL)									
2.5		Lean Clay, with Organics, dark grey, moist. (Buried Topsoil/FILL)									
		Poorly Graded Sand with Silt, brown to reddish brown, moist. (Possible FILL)									
5.0											
		(SC) Clayey Sand, trace Gravel, reddish brown, moist. (Glacial Till)									
7.5											

Bottom of test pit at 8.0 feet.



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TEST PIT NUMBER TP-2

PAGE 1 OF 1

CLIENT M/I Homes

PROJECT NAME North St. Paul Residential Development

PROJECT NUMBER 18-0858A

PROJECT LOCATION North St. Paul, MN

DATE STARTED 9/12/18 COMPLETED 9/13/18

GROUND ELEVATION 967.8 ft TEST PIT SIZE inches

EXCAVATION CONTRACTOR HGTS

GROUND WATER LEVELS:

EXCAVATION METHOD Test Pit

AT TIME OF EXCAVATION --- Not Encountered

LOGGED BY PG CHECKED BY PG

AT END OF EXCAVATION --- Not Encountered

NOTES _____

AFTER EXCAVATION --- Not Encountered

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:11 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858A NORTH ST. PAUL RESIDENTIAL DEVELOPMENT TEST PITS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0.0								20	40	60	80
		Aggregate base, with Concrete Debris. (FILL)									
		Sandy Lean Clay, brown, moist. (FILL)									
2.5		Poorly Graded Sand, with Concrete Block and Debris, brown and grey, moist. (FILL)									
5.0		(SP-SM) Poorly Graded Sand with Silt, fine to coarse grained, with Gravel, reddish brown, moist. (Glacial Till)									
7.5		(SC) Clayey Sand, trace Gravel, reddish brown, moist. (Glacial Till)									

Bottom of test pit at 8.0 feet.



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TEST PIT NUMBER TP-5

PAGE 1 OF 1

CLIENT	M/I Homes	PROJECT NAME	North St. Paul Residential Development
PROJECT NUMBER	18-0858A	PROJECT LOCATION	North St. Paul, MN
DATE STARTED	9/12/18	COMPLETED	9/13/18
EXCAVATION CONTRACTOR	HGTS	GROUND ELEVATION	949.9 ft
EXCAVATION METHOD	Test Pit	TEST PIT SIZE	inches
LOGGED BY	PG	CHECKED BY	PG
NOTES			
GROUND WATER LEVELS:		AT TIME OF EXCAVATION	
		--- Not Encountered	
		AT END OF EXCAVATION	
		--- Not Encountered	
		AFTER EXCAVATION	
		--- Not Encountered	

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:11 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858A NORTH ST. PAUL RESIDENTIAL DEVELOPMENT TEST PITS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0.0								20	40	60	80
		Silty Sand, with Roots, brown, dry. (Topsoil/FILL)									
		Silty Sand, with Concrete Debris, trace Bituminous Debris, brown and grey, moist. (FILL)									
2.5		(SM) Silty Sand, trace Gravel, reddish brown, moist. (Glacial Till)									
5.0											
7.5											

Bottom of test pit at 8.0 feet.



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TEST PIT NUMBER TP-6

PAGE 1 OF 1

CLIENT M/I Homes
PROJECT NUMBER 18-0858A
DATE STARTED 9/12/18 **COMPLETED** 9/13/18
EXCAVATION CONTRACTOR HGTS
EXCAVATION METHOD Test Pit
LOGGED BY PG **CHECKED BY** PG
NOTES _____

PROJECT NAME North St. Paul Residential Development
PROJECT LOCATION North St. Paul, MN
GROUND ELEVATION 949.1 ft **TEST PIT SIZE** inches
GROUND WATER LEVELS:
AT TIME OF EXCAVATION --- Not Encountered
AT END OF EXCAVATION --- Not Encountered
AFTER EXCAVATION --- Not Encountered

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:12 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858A NORTH ST. PAUL RESIDENTIAL DEVELOPMENT TEST PITS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
								PL	MC	LL	
0.0								20	40	60	80
		Silty Sand, with Roots, dark brown, moist. (Topsoil/FILL)									
		Silty Sand, with Concrete Debris, brown and grey, moist. (FILL)									
		Sandy Lean Clay, brown, moist. (FILL)									
2.5											
		Lean Clay and Silty Sand, greyish brown, moist. (FILL)									
5.0											
		Peat, black, wet. (Swamp Deposit)									
7.5											
		(CL) Lean Clay, grey, wet. (Alluvium)									

Bottom of test pit at 9.0 feet.



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TEST PIT NUMBER TP-7

PAGE 1 OF 1

CLIENT <u>M/I Homes</u>	PROJECT NAME <u>North St. Paul Residential Development</u>
PROJECT NUMBER <u>18-0858A</u>	PROJECT LOCATION <u>North St. Paul, MN</u>
DATE STARTED <u>9/12/18</u> COMPLETED <u>9/13/18</u>	GROUND ELEVATION <u>969.5 ft</u> TEST PIT SIZE <u>inches</u>
EXCAVATION CONTRACTOR <u>HGTS</u>	GROUND WATER LEVELS:
EXCAVATION METHOD <u>Test Pit</u>	AT TIME OF EXCAVATION <u>--- Not Encountered</u>
LOGGED BY <u>PG</u> CHECKED BY <u>PG</u>	AT END OF EXCAVATION <u>--- Not Encountered</u>
NOTES _____	AFTER EXCAVATION <u>--- Not Encountered</u>

GEOTECH BH PLOTS - GINT STD US LAB.GDT - 10/17/18 13:12 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINT\PROJECTS\18-0858A NORTH ST. PAUL RESIDENTIAL DEVELOPMENT TEST PITS.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONT. (%)	NOTES	▲ SPT N VALUE ▲			
								20	40	60	80
0.0		Silty Sand, with Roots, dark brown, dry. (Topsoil/FILL)									
		Silty Sand, with Concrete Debris, brown and grey, moist. (FILL)									
2.5		Clayey Sand, trace Gravel, brown, moist. (FILL)									
5.0		(SM) Silty Sand, trace Gravel, reddish brown, moist. (Glacial Till)									
7.5											

Bottom of test pit at 8.0 feet.

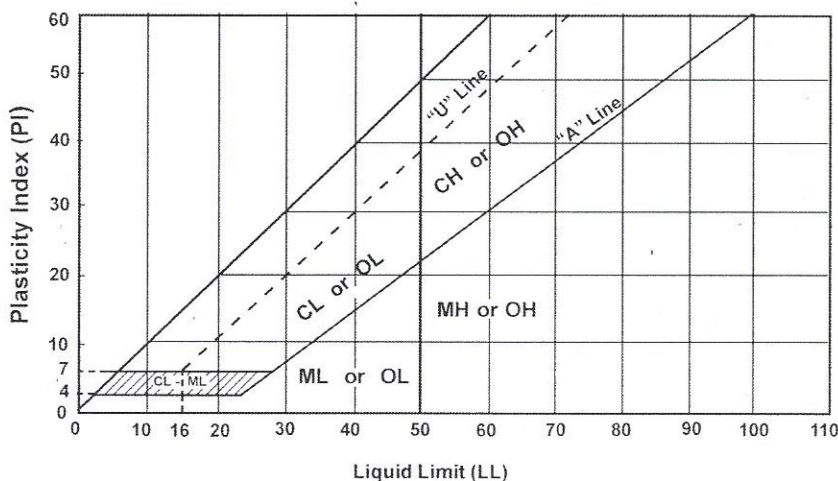


Standard D 2487 - 00

Classification of Soils for Engineering Purposes
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^a					Soils Classification	
					Group Symbol	Group Name ^b
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse- fraction retained on No. 4 sieve	Clean Gravels 5% or less fines ^e	$C_u \geq 4$ and $1 \leq C_c \leq 3$ ^c	GW	Well-graded gravel ^d	
			$C_u < 4$ and/or $1 > C_c > 3$ ^c	GP	Poorly graded gravel ^d	
		Gravels with Fines More than 12% fines ^e	Fines classify as ML or MH	GM	Silty gravel ^{d,f,g}	
			Fines classify as CL or CH	GC	Clayey gravel ^{d,f,g}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands 5% or less fines ⁱ	$C_u \geq 6$ and $1 \leq C_c \leq 3$ ^c	SW	Well-graded sand ^h	
			$C_u < 6$ and/or $1 > C_c > 3$ ^c	SP	Poorly graded sand ^h	
		Sands with Fines More than 12% ⁱ	Fines classify as ML or MH	SM	Silty sand ^{f,g,h}	
			Fines classify as CL or CH	SC	Clayey sand ^{f,g,h}	
Fine-grained Soils 50% or more passed the No. 200 sieve	Silt and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line ^j	CL	Lean clay ^{k,l,m}	
			PI < 4 or plots below "A" line ^j	ML	Silt ^{k,l,m}	
		Organic	Liquid limit - oven dried < 0.75	OL	Organic clay ^{k,l,m,n}	
			Liquid limit - not dried	OL	Organic silt ^{k,l,m,o}	
	Silt and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{k,l,m}	
			PI plots below "A" line	MH	Elastic silt ^{k,l,m}	
		Organic	Liquid limit - oven dried < 0.75	OH	Organic clay ^{k,l,m,p}	
			Liquid limit - not dried	OH	Organic silt ^{k,l,m,q}	
Highly Organic Soils		Primarily organic matter, dark in color and organic odor		PT	Peat	

- a. Based on the material passing the 3-in (75mm) sieve.
b. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
c. $C_u = D_{60}/D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
d. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
e. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
f. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
g. If fines are organic, add "with organic fines" to group name.
h. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
i. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
j. If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
n. PI ≥ 4 and plots on or above "A" line.
o. PI < 4 or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcf	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limit, %	ϕ	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf

Particle Size Identification

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3"
Fine	No. 4 to 3/4"
Sand	
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Silt	< No. 200, PI < 4 or below "A" line
Clay	< No. 200, PI ≥ 4 and on or above "A" line

Relative Density of Cohesionless Soils

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

Consistency of Cohesive Soils

Very soft	0 to 1 BPF
Soft	2 to 3 BPF
Rather soft	4 to 5 BPF
Medium	6 to 8 BPF
Rather stiff	9 to 12 BPF
Stiff	13 to 16 BPF
Very stiff	17 to 30 BPF
Hard	over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers unless noted otherwise. Jetting water was used to clean out auger prior to sampling only where indicated on logs. Standard penetration test borings are designated by the prefix "ST" (Split Tube). All samples were taken with the standard 2" OD split-tube sampler, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous-flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface and are, therefore, somewhat approximate. Power auger borings are designated by the prefix "B."

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn. Hand auger borings are indicated by the prefix "H."

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

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

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

TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.