

DE PERE[®]



DEPARTMENT OF PUBLIC WORKS

2024 STANDARD SPECIFICATIONS

JANUARY 8, 2024

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CITY OF DE PERE

SECTION 00 70 00
GENERAL CONDITIONS

DEFINITIONS AND TERMS

Whenever any of the following listed terms appear in the contract documents, the intent and meaning shall be interpreted as follows:

AASHTO - American Association of State Highway Transportation Officials.

Addenda - All revisions of and supplements to the plans and specifications incorporated in or attached to and becoming an integral part of the contract documents.

Advertisement for Bids - The official notice inviting bids for proposed improvements.

Agreement - The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

ANSI - American National Standards Institute, Inc.

ASTM - American Society for Testing and Materials.

AWWA - American Water Works Association.

Bid - The offer or bid of the Bidder, submitted on the prescribed bid form, setting forth the prices of the work to be performed.

Bidder - Any individual, partnership or corporation submitting a bid for work contemplated, acting directly or through a duly authorized representative.

Bid Form - The approved form on which the City requires formal bids to be prepared and submitted for the work.

Bidding Documents - The Bidding Requirements and the proposed Contract Documents (including all Addenda).

Bidding Requirements - The advertisement or invitation to bid, Instructions to bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

Board of Public Works – The Board of Public Works of the City of De Pere

Board of Park Commissioners - The Board of Park Commissioners of the City of De Pere.

City - The City of De Pere, a municipal corporation of the State of Wisconsin, located in the County of Brown.

Completion Date - The calendar date shown in the bid on or before which the work contemplated under the contract shall be completed.

Contract - The written agreement between the City and the Contractor setting the obligations of the parties thereto. The contract includes the advertisement for bids, bid, contract form and contract bond, specifications, special provisions, plans, and notice to proceed, also any contract change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

Contract Bond - The approved form of security, executed by the Contractor and his surety or sureties, guaranteeing the faithful performance of the contract and the payment to persons entitled thereto, of all claims.

Contract Change Order - A written order, authorization or agreement executed by the Contractor and the City covering work not otherwise provided for, revisions in or amendments to the contract, or conditions specifically prescribed in the specifications as requiring contract change orders. Such document becomes a part of the contract when executed by the contracting parties.

Contract Time - The number of calendar days shown in the bid representing time allowed for the completion of the work contemplated under the contract.

Contractor - The party of the second part to the contract; the individual, partnership, joint venture, corporation or agency undertaking the execution of the work under the terms of the contract and acting directly or through a duly authorized representative.

Director of Public Works - The Director of Public Works of the City of De Pere or authorized designee.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

Engineer - The City Engineer of the City of De Pere or authorized designee.

Inspector - The authorized representative of the Engineer assigned to make detailed inspection of any or all portions of the work or materials therefore.

Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

Notice to Proceed - A written notice to the Contractor of the time within which to begin the prosecution of the work.

Owner - The City of De Pere, Wisconsin.

Plans - All contract drawings, including reproductions and revisions thereof, pertaining to the work covered by the contract.

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.

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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

Special Provisions - Special directions, provisions or requirements peculiar to the project under consideration and not otherwise thoroughly or satisfactorily detailed or set forth in the specifications. Special provisions set forth the final contractual intent as to the matter involved, and shall prevail over these specifications and plans whenever in conflict therewith.

Specifications - The body of directions, provisions and requirements contained herein, together with written agreements and all documents of any description, made or to be made, pertaining to the method of manner of performing the work, the quantities, and the quality of materials to be furnished under the contract.

Subcontractor - Any individual, partnership, joint venture or corporation to whom the Contractor sublets any part of the contract.

Successful Bidder - The Bidder submitting a responsive Bid to whom Owner makes an award.

Supplier - A manufacturer, fabricator, supplier, distributor, material man, 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 Subcontractor.

Surety - The corporate body bound with and for the Contractor to insure acceptable performance of the contract and payment of all obligations pertaining to the work.

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 those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

Work - Work shall be understood to mean the furnishing of all labor, materials, equipment and other incidentals necessary or convenient to the successful completion of the project, or a particular part of the project, in accordance with the requirements of the contract.

BIDDING REQUIREMENTS

BID FORMS. Bid forms for bidding may be obtained from the office of the Director of Public Works.

All papers bound with or attached to the bid form are considered a part thereof and shall not be detached or altered when the bid is submitted. The plans, specifications and other documents designated in the bid form will be considered a part of the bid whether attached or not.

INTERPRETATION OF QUANTITIES. A schedule of quantities of work to be done or materials to be furnished is given in the Bid Form.

Itemized quantities of work are to be considered as approximate and for the comparison of bids only. After the contract is awarded, the quantities of work listed may be increased or decreased a reasonable amount without invalidating the bid prices.

EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK. The bidder is required to examine carefully the work site, bid form, plans, specifications, special provisions and contract forms for the work contemplated. The submission of a bid will be considered conclusive evidence that the bidder has made such examination and is satisfied to all conditions and contingencies.

No extra payment will be made over and above the contract price and no performance of the Contractor will be excused on account of any difference between the information relating to soil conditions provided by the City and the conditions disclosed at the site of the work during the progress of the contract.

INTERPRETATION OF CONTRACT DOCUMENTS. No oral representations or interpretations will be made to any bidder as to the meaning of the contract documents. Requests for an interpretation shall be made in writing and delivered to the Engineer at least ten (10) days before the time announced for opening the bids. Interpretations by the Engineer will be in the form of an addendum to the contract documents and, when issued, will be sent as promptly as is practical to all parties to whom the bid documents have been issued. All such addenda shall become part of the contract.

PREPARATION OF THE BID. The bidder shall submit its bid on forms included with the Bidding Documents. The bid shall be properly executed, and shall clearly specify a unit price for each item listed therein and shall also show the products of the respective unit prices and quantities, and the total amount of the bid obtained by adding the amounts of the several items.

In case of conflict between a unit bid price and the corresponding extended amount, the unit bid price will govern.

A bid submitted by an individual shall be signed by the bidder or by a duly authorized agent. A bid submitted by a partnership shall be signed by a member or a duly authorized agent thereof. A bid

submitted by a corporation shall be signed by an authorized officer or duly authorized agent of such corporation, and the bid shall show the name of the State under the laws of which said corporation was chartered.

REJECTION OF BIDS. Bids may be rejected if they show any alterations of form, additions or amendments not called for, conditional bids, incomplete bids, erasures, or irregularities of any kind. Bids in which the unit prices for some items are out of proportion to the prices for other items, or bids in which unit prices are not submitted for each item of work listed may be rejected.

BID GUARANTEE. No bid will be considered unless accompanied by a certified check, bank's draft, bank's check, or a surety bond payable to the City of De Pere as designated in the Advertisement for Bids.

SUBMISSION OF BIDS. The bid and Bid Guarantee shall be submitted electronically and/or hard copy as required in the bidding documents. For hard copy submittals, each bid shall be placed, together with the Bid Guarantee, in a sealed envelope, so marked as to indicate the project number and the name and address of the bidder.

Bids will be received at the office of the Director of Public Works until the hour of the date designated in the Advertisement for Bids.

WITHDRAWAL OF BIDS. All bids filed with the Director of Public Works will be kept secure and unopened and may not be withdrawn, except on written request of the bidder or authorized representative made prior to expiration of the time set for receiving bids. If such withdrawal is made, the prospective bidder shall not be entitled to bid on the contract at hand unless the same is re-advertised and the bid will be returned unopened to such bidder after the public opening of bids.

OPENING OF BIDS. Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids.

The City of De Pere reserves the right to postpone the date and time for opening of bids at any time prior to the date and time announced in the advertisement.

PREQUALIFICATION OF BIDDERS. Each bidder shall pre-qualify by submitting Proof of Responsibility on forms furnished by the Director of Public Works. Such forms shall be filed with the Director of Public Works not later than the time and date indicated in the Advertisement for Bids. Bidders are required to complete 30% of the Work with their own forces.

COMPETENCY OF BIDDERS. Any one or more of the following may be considered as sufficient for the rejection of the bid or bids and disqualification of the bidder: Developments subsequent to establishment of bidder's competency and qualifications which would reasonably be construed as affecting the responsibility of the bidder. Conviction of a violation of a State or Federal law or regulation relating to or reflecting on the competency of the bidder.

- (a) More than one bid for the same work from an individual, partnership, or corporation under the same or different names.

- (b) Evidence of collusion among bidders.
- (c) Lack of responsibility as shown by past work for the City.
- (d) Noncompliance with terms of previous or existing contracts.
- (e) Uncompleted work, which might hinder or prevent the prompt completion of additional work if awarded.
- (f) Uncompleted work on which the actual time used has exceeded the contract time set therefore, or on which work the performance or progress is not satisfactory.

AWARD AND EXECUTION OF CONTRACT

CONSIDERATION OF BIDS. The bids received will be compared on the basis of the summation of the products of the quantities of work listed and the contract unit prices offered.

In case of discrepancy between the gross sum shown in the bid and that obtained by adding the products of the quantities of work and the unit prices, the unit prices will govern, and any errors found in said products and summation will be corrected.

The City reserves the right to reject any or all bids, to waive any technicalities, to re-advertise for bids, or to proceed to do the work otherwise, if in its judgment, the best interest of the City will thereby be served.

AWARD OF CONTRACT. The award of contract, if it be awarded, will be to the lowest responsible bidder whose bid complies with all necessary requirements.

Should no award be made within 60 days after the date of opening bids, the lowest responsible bidder may, upon the expiration of such period, request in writing that the award be made within a stipulated time, not less than 10 days, exclusive of Sundays and holidays, after the date of his request. Should no award be made within the time so stipulated, the bidder will thereby be relieved of his obligation to execute a contract and contract bond.

RETURN OF BID GUARANTEE. The bid guaranty of all except the three lowest responsible bidders will be returned promptly after the bids are checked and tabulated.

The bid guarantee of the lowest responsible bidder will be returned as soon as the contract, contract bond, and other documents required to be filed by the bidder has been properly executed and submitted in proper form to the City; provided, however, that in the event no award is made within the extended time stipulated by the lowest responsible bidder, the bidder's guarantee will be returned promptly upon expiration of such extended time.

The bid guarantees of the second and third lowest responsible bidders will be returned as soon as the contract, contract bond, and other documents required have been properly executed by the successful bidder and submitted in proper form to the City; provided that the guarantees of such second and third

bidders will not be retained longer than 70 days after the date of opening of bids without their express consent.

CONTRACT BOND. The successful bidder, at the time of submitting the contract for execution by the City shall deposit with the Director of Public Works a good and sufficient Performance Bond in the full amount of the contract and a Payment Bond in the amount of 100 percent of the contract. Forms for the contract bond are those included in the Bidding Documents.

INSURANCE. The Contractor shall provide the following insurance:

General. All insurance is the responsibility of the Contractor. The Contractor and each separate Subcontractor shall purchase and maintain such insurance as will protect him/her, and indemnify and safe harmless the City from any and all claims for General and Automobile Liability and Worker's Compensation/Employer's Liability, including claims for damages resulting in bodily injury, including but not limited to death, and property damage and arising out of or resulting from the Contractor's direct or indirect operations under this contract, whether such operations be performed by himself/herself or by a Subcontractor or anyone directly or indirectly employed by any of them.

This insurance shall be written for not less than any limit of liability specified herein, or required by law, whichever is the greater, notwithstanding that the policy may have lower limits of liability applying elsewhere in the policy, and shall include contractual liability insurance as applicable to the Contractor's obligations.

The Contractor's and Subcontractor's insurance shall always be primary with respect to the City's responsibilities under this contract. Contractor shall name the City as an additional insured under all policies required hereunder (except Worker's Compensation).

The Contractor's and Subcontractor's insurance shall contain a provision that provides 30 days written notice of cancellation or change to the City.

No insurance required under the Contract shall be carried with an insurer not authorized to do business in Wisconsin by the Office of the Insurance Commissioner. All insurance providers must have an AM Best Rating of A-VII or higher. The City reserves the right to disapprove any insurance company.

The Contractor shall provide the City with a certificate of insurance outlining the required coverage and naming the City as an additional insured thereunder for purposes of the Contract.

Types of Insurance

(a) General Liability

- (1) Coverage Form must be the most recent version of the Commercial General "Occurrence" policy, including:

- (a) Premises and Operations
- (b) Products and Completed Operations
- (c) Advertising and Personal Injury
- (d) Explosion, Collapse and Underground Hazard Coverage
- (e) Contractual Insurance
- (f) Broad Form Property Damage
- (g) Coverage for Independent Contractors
- (h) Care, Custody and Control coverages for City-owned materials at the worksite
- (i) Endorsement naming the City of De Pere, its employees, agents and assigns as Additional Insureds as respects work performed by the Contractor/Subcontractor for the City/Owner.

(2) Limits of Liability:

Bodily Injury/Property Damage Combined Single Limits:

Per Occurrence	\$1,000,000
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Products/Completed Operations Aggregate	\$1,000,000
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Personal Injury/ Advertising Injury	\$1,000,000
Medical Payments Limits	\$10,000
General Aggregate	\$1,000,000
Excess or Umbrella Liability	\$5,000,000

(b) Automobile Liability

(1) Coverages must include the following extensions:

Comprehensive Form

- (a) All Owned Autos
- (b) All Hired Autos
- (c) All Non-Owned Autos
- (d) Mobile Equipment
- (e) Specialized Equipment
- (f) Contractual Liability
- (g) Uninsured Motorists to Limit of Policy
- (h) Additional Insured Endorsement naming City of De Pere, its employees, agents and assigns

(2) Limits of Liability:

Combined Single Limit/Bodily Injury and Property Damage:

\$1,000,000 per person/per accident

Uninsured/Underinsured Motorists: Limits Equal to Above Combined Single Limit

(c) Aircraft Insurance

When Contractors or Subcontractors use their own, non-owned or hired aircrafts in operations of their business, they must provide evidence of Aircraft Liability and Property Damage Insurance equal to \$1,000,000 in limits per aircraft seat. The City/Owner, its employees, agents and assigns must be named as Additional Insured's as respects the particular project for which the craft is flown.

(d) Worker's Compensation and Employers' Liability Insurance

Limits of Liability: Statutory

(e) Professional Liability: \$3,000,000

(Errors and Omissions or other relevant coverage)

(f) All required liability insurances shall be written on an "occurrence" policy form. Any deductibles or self-insured retentions shall be identified to the City and shall not exceed \$10,000 per occurrence.

Indemnification. The Contractor shall indemnify and hold harmless the City, its officers, agents and employees from and against all claims, damage, losses, and expenses including reasonable attorney's fees arising out of or resulting from the performance of the work specified in this Contract, provided that any such claim damage, loss or expense is caused in whole or in part by any negligent or intentional act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a part indemnified hereunder.

In any and all claims against the City, its officers, agents and 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 under this section shall not be limited in any way by any limitation of the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workers' Compensation Acts, disability benefit acts or other employee benefit acts.

Builders' Risk Insurance. (This does not apply to additions and/or alterations on existing structures.)

Unless otherwise provided, the City shall purchase and maintain fire insurance, extended coverage, vandalism and malicious mischief upon the entire structure on which the work of this contract is to be done equal to 100% of the insurable value (Builders' Risk-Completed Value).

The City may at its discretion, purchase All Risk Builders' Risk Coverage.

Waiver of Subrogation. The City, Contractor and Subcontractor waive all rights of subrogation against each other for damages caused by fire and other perils covered by insurance provided for under the terms of the Contract, except such rights as they may have to the proceeds of the

insurance held by the City as trustee. The loss, if any, is to be made adjustable with and payable to the City as trustee for the insured Contractor and Subcontractor as their interests may appear, except in such cases as may require payment of all or a proportion of said insurance to be made to the Mortgagee as his interest may appear.

EXECUTION OF CONTRACT. The Contract shall be executed by the Bidder, and the Contract Bond shall be executed by the principal and the sureties, and both shall be presented to the Director of Public Works within 10 days after the date of Notice of the Award of the Contract.

No contract will be considered binding upon the City until the final execution of the contract agreement. The date of final execution of the Contract shall be the date on which the final signature is affixed.

FAILURE TO EXECUTE CONTRACT. Failure on the part of the Successful Bidder to execute a Contract and an acceptable Contract Bond, within 10 days after the date of Notice of Award of

the Contract will be just cause for the annulment of the award and the forfeiture of the proposed guarantee to the City, not as a penalty but in payment of liquidated damages sustained as a result of said failure.

RIGHT OF BIDDER TO NULLIFY BID. Should the City fail to execute a Contract within 60 days after the filing by the Bidder of the Contract, together with Contract Bond and other documents required to be filed, all in proper form and order, the Bidder may nullify its acceptance of the Contract by filing due notice of such intent. Such notice shall be in writing and may be filed at any time after the expiration of 60 days after the filing by the Bidder of the required Contract Documents. Said notice shall stipulate the maximum number of days, not less than 10, exclusive of Sundays and holidays, within which the contract shall be executed by the City. Failure on the part of the City to execute the contract within the time so stipulated, shall be construed to be an acceptance on the part of the City of the nullification of the bid, and the bidder and surety will be relieved of all obligations to the City that may have been incurred under said contract and contract bond.

Said nullification is a purely voluntary act of the Bidder. Therefore, no liability or obligation toward the Bidder, surety, or any other party who may have an interest, directly or indirectly in such contract, will be incurred by the City.

Unless and until the bidder files such notice of nullification, and until such notice becomes effective, if filed, the contract may be executed by the City without prejudice to any of the terms and conditions thereof.

SCOPE OF WORK

INTENT OF PLANS AND SPECIFICATIONS. It is the intent of the plans and specifications to provide for the construction, execution and completion of a complete work or improvement, which the Contractor undertakes to do in full compliance with the plans, specifications, special provisions and contract. The Contractor shall perform all items of work covered and stipulated in the bid and perform altered and extra work and shall furnish, unless otherwise provided in the contract, all materials, implements, machinery, equipment, tools, supplies, transportation, and labor necessary to the prosecution and completion of the work.

INCREASED OR DECREASED QUANTITIES. It is agreed and understood that the quantities of any items of work shown on the plans or in the bid are subject to increase or decrease during the progress of the work. The Director of Public Works reserves the right to increase or decrease the quantities of any items of work, including increase or decrease of quantities by revision of plans, as may be considered necessary or desirable during the progress of the work to satisfactorily complete the construction. Such increases or decreases in quantities shall not be considered as a waiver of any conditions of the contract nor invalidate any of the provisions thereof.

REVISION OF PLANS. The right is reserved at any time during which the contract is in force to make such revisions in the plans or revisions in the terms of the contract as may be necessary. Revisions of the plans shall, insofar as practical, be ordered in writing before starting work on such revisions.

The work involved in such revisions shall be paid for at contract unit prices except as portions of it may qualify as extra work.

OMITTED ITEMS. The right is reserved to omit from the work any item or portion thereof found unnecessary to the improvement and such omission shall not be considered as a waiver of any conditions of the contract nor invalidate any of the provisions thereof. The Contractor will be paid for all work done toward the completion of the item or part thereof prior to such omission.

EXTRA WORK. The Director of Public Works may, at any time during the progress of the work covered by the contract, order other work or materials incidental thereto. All such work and materials that do not appear in the bid or contract as a specific item accompanied by a unit price, and which are not included under the price bid for other items in the contract, shall be designated as extra work. The Contractor hereby agrees to perform extra work whenever it is deemed necessary or desirable by the Director of Public Works to complete the project as originally contemplated, or as subsequently altered, and it shall be done in accordance with the requirements herein set forth.

Extra work shall be done under the supervision of the Engineer, whose decision shall be final and binding.

The Contractor shall not perform any extra work until a contract change order has been authorized. Claims for compensation for extra work performed which has not been authorized and not covered by a contract change order may be rejected.

The method of determining the basis of payment for extra work will be by unit bid price named in the bid for like items of work or by a supplemental schedule of prices bid by the Contractor in the bid when such bids are requested and when the unit bid price is not applicable. In the event that neither of the foregoing methods are applicable, the method of determining the basis of payment for extra work will be by unit prices submitted by the Contractor and accepted by the Director of Public Works, by a lump sum price submitted by the Contractor and accepted by the Director of Public Works, or by a cost plus 15% basis. Cost is hereby defined as including the actual cost of labor, foreperson over labor actually employed upon the extra work, labor liability insurance, the Contractor's payroll taxes, if any, and materials delivered upon and forming a part of the extra work, but excluding all administration and clerical expenses, all supervision and superintendents above foreperson and use and upkeep of small tools, plant and machinery and rent of storage yard. Prevailing rental rates on special tools and equipment and actual cost of special services will

be allowed the Contractor without the above-specified 15% added thereto. The 15% basis shall not be charged on the Contractor's equipment rates. Contractor equipment shall only be paid when it is in use for construction of the extra work as determined by the Engineer.

In the event that additional work is performed by Subcontractors, the method for determining the basis of payment shall be the same as the Contractor in the paragraph above. The Contractor may include a Subcontractor cost plus 5% basis.

INGRESS AND EGRESS. The Contractor shall at all times conduct the work in such a manner as to insure the least possible obstruction to pedestrian and vehicular traffic serving abutting properties along the project and to that end shall, at its own expense, provide and maintain in reasonably passable condition such temporary roads and temporary approaches as are deemed reasonable and practical by the Engineer.

CONTROL OF WORK

AUTHORITY OF ENGINEER. All work shall be done under the supervision of and performed to the satisfaction of the Engineer. The Engineer shall decide all questions which arise as to the quality and acceptability of materials furnished, work performed, manner of performance (excluding safety), rate of progress of the work, interpretation of the plans and specifications, acceptable fulfillment of the contract, compensation, and disputes and mutual rights between Contractors under the specifications. The Engineer shall determine the amount and quantity of work performed and materials furnished, and the decision of the Engineer estimates shall be final. The Engineer's estimate in such event shall be a condition precedent to the right of the Contractor to receive money due under the contract.

The Engineer shall have executive authority to enforce and make effective such decisions and orders as the Contractor fails to carry out promptly and, in case of failure on the part of the Contractor to execute work ordered by the Engineer, the Engineer may, after giving notice in writing to the Contractor, proceed to execute such work as may be deemed necessary and the cost thereof shall be deducted from compensation due or which may become due the Contractor under the contract.

COORDINATION OF PLANS, SPECIFICATIONS AND SPECIAL PROVISIONS. These specifications, the plans, special provisions and all supplemental documents are essential parts of the contract and a requirement occurring in one is as binding as though occurring in all. They are intended to be cooperative, to describe and provide for a complete work. In the case of a discrepancy between the plans and the specifications, the plans shall govern; between the special provisions and the specifications or the plans, the special provisions shall govern.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications, and the Engineer shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications.

LINE AND GRADE. The Engineer will furnish and set the construction survey stakes or reference points necessary to establish the alignment and grade for all types of work. These stakes and points shall constitute the field control by and in accordance with which the Contractor shall govern and execute the work. The Contractor shall furnish, at its own expense, such other facilities and labor as may be required by

the Engineer in establishing such points and lines necessary to the prosecution of the work after the work is started. The Contractor shall furnish free of charge all additional stakes and other material necessary for making and maintaining the points and lines given. The Contractor shall set and shall be responsible for all additional stakes or markings needed to facilitate layout or construction of the work.

The Contractor shall be responsible for the preservation of all stakes and points, and if any of these survey stakes or points have been carelessly or willfully destroyed or disturbed by the Contractor, the cost to the City of replacing them may be charged against the Contractor and be deducted from the payment of the work.

COOPERATION OF CONTRACTOR. The City reserves the right at any time to contract for and perform other or additional work on or near the Work covered by any contract.

The Contractor shall control construction operations in such a manner as to minimize the extent of the land area disturbed during construction. Areas that are disturbed and are not needed in construction operations shall be restored by the Contractor and no payment shall be made to the Contractor for this resolution.

The Contractor shall arrange and conduct work so as not to interfere with the operations of other Contractors engaged upon or near the work and to join work to that of others in a proper manner, and in accordance with the spirit of the plans and specifications, and to perform work in the proper sequence in relation to that of other work, all as may be directed by the Engineer. The Contractor shall be held responsible for any damage done by it or its agents to the work performed by another Contractor.

In case of a dispute arising between two or more Contractors engaged on the same improvement as to the respective rights of each under the specification, the Engineer shall determine the matter at issue and shall define the respective rights of the various interests involved in order to secure the completion of all parts of the work in general harmony and with satisfactory results. The Engineer's decision shall be final and binding on all parties concerned and shall not in any way be a cause for claims for extra compensation by any of the parties.

The Contractor shall have at all times during the progress of construction, irrespective of the amount of work sublet, a competent superintendent or designated representative capable of reading and thoroughly understanding the plans and specifications, as agent on the work, who shall receive instructions from the Engineer or authorized representatives. The superintendent or designated representative shall have full authority to execute the orders or directions of the Engineer without delay and to supply promptly such materials, tools, plans, equipment, and labor as may be required to properly perform the work.

REMOVAL OF UNAUTHORIZED AND UNACCEPTABLE MATERIALS AND WORKMANSHIP. Work performed without lines and grades being given, work performed beyond the lines and grades shown on the plans, or as given, except as herein provided, or any extra work performed without authority, will be considered as unauthorized and may not be measured or paid for by the City. Work so done may be ordered removed or replaced at the Contractor's expense.

Work which is not within reasonably close conformity with the plans and specifications and which results in an inferior or unsatisfactory product will be considered as unacceptable work.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause, found to exist prior to the final acceptance of the work, shall be immediately removed and acceptably replaced or otherwise satisfactorily corrected by and at the expense of the Contractor.

OWNER MAY CORRECT UNACCEPTABLE WORK. If Contractor fails within a reasonable time after written notice from Engineer to correct unacceptable Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Plans and Specifications Documents, or if Contractor fails to comply with any other provision of the Contract documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

In exercising the rights and remedies, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, 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.

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) incurred or sustained by Owner in exercising the rights and remedies will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work and the Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefore. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work others destroyed or damaged by correction, removal, or replacement of Contractor's unacceptable Work.

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 right and remedies.

ACCEPTANCE OF WORK. The Engineer will make an inspection of any section of work included in the contract as soon as practicable after notification by the Contractor and confirmation by the Inspector that such work has in their opinion been completed and final cleaning up performed. Whenever any section of the work constructed by the Contractor shall have been satisfactorily completed at the time of final inspection, the Engineer shall give written notice of final acceptance to the Contractor.

Should the inspection disclose any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of the same, and the Contractor shall immediately comply with and execute such instructions for corrections of the same. Upon correction of the work, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed. In such event, the Engineer will make the final acceptance and notify the Contractor in writing of his acceptance as of the date of final inspection.

In the event that the testing of materials is incomplete at the time of final inspection and the work is satisfactorily completed, the Engineer shall give a written notice of partial acceptance, pending receipt of satisfactory test reports; whereupon, the final acceptance shall be given without any additional inspection.

CONTROL OF MATERIALS

SOURCE OF SUPPLY AND QUALITY. The specifications require the use of new, high quality materials throughout the work, except as may specifically be provided elsewhere in the

specifications, on the plans, or in the special provisions, incorporated in the work in such a manner as to produce completed construction which is workmanlike and acceptable in every detail.

PLANT INSPECTION. The Engineer may undertake the inspection of materials at the plant, if deemed necessary or desirable, or the Engineer may designate another agency for the purpose.

RIGHT TO INSPECT AND TEST MATERIALS. To ascertain if materials comply with contract requirements, samples shall, at the discretion of the Engineer, be taken at the source or at job destination, and as often as the Engineer deems it advisable or necessary.

The Contractor shall furnish without charge all samples required by the Engineer and shall afford such facilities as may be required for collecting and forwarding them.

The Contractor may be required to furnish, when requested by the Engineer, a written statement giving the origin, composition or process of manufacture of a material.

Unless otherwise provided in the contract, it shall be the intent of these specifications that conformity of materials to the specified requirements shall be met at the time, or just prior to the time, they are incorporated into the work.

All tests shall be made in accordance with the method described and designated herein or in the contract. References to ASTM specifications shall be understood to mean the Standards or Tentative Standards of the American Society for Testing and Materials. Reference to the AASHTO specifications shall be understood to mean the Standard or Interim Specifications for Highway Materials and Methods of Sampling and Testing of the American Association of State Highway Transportation Officials. Unless otherwise designated, references to various standard specifications and test methods shall be understood to mean the specification or test method which is current on the date of the advertisement for bids.

Test results obtained on samples of materials furnished by the Contractor shall be available to the Contractor.

The City reserves the right to deduct from monies which are due or may become due the Contractor any costs incurred in the sampling and testing of materials not used under the contract.

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

If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, 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, furnishing all necessary labor, material, and equipment.

If it is found that the uncovered Work is defective, 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 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 Owner shall be entitled to an appropriate decrease in the Contract Price.

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.

STORAGE OF MATERIALS. Materials shall be so stored as to insure the preservation of their quality and suitability for the work. Stored materials, even though approved before storage, shall be subject to an inspection prior to their use in the work and shall meet the requirements of the contract at the time they are used. Stored materials shall be located so as to facilitate inspection.

DEFECTIVE MATERIALS. All materials that are not in reasonably close conformity with the requirements of the specifications shall be considered defective and shall be rejected. Rejected materials shall be removed from the site of the work unless otherwise permitted by the Engineer. Any defective materials, which have been subsequently corrected, shall not be used or accepted until re-evaluated and approved by the Engineer. Materials which have been incorporated in the work and subsequently found to be defective may, with the permission of the Engineer, after a determination that reasonably acceptable work has been produced, be left in place. An appropriate adjustment will be made in the contract price for such materials or for the work in which such materials are incorporated.

LEGAL RELATIONS AND PUBLIC RESPONSIBILITY

LAWS TO BE OBSERVED. The Contractor shall at all times observe and comply with all federal, state, and local laws, regulations and ordinances which are in effect or which may be placed in effect during the contract period and which in any manner affect the conduct of the work. The Contractor shall indemnify and save harmless the City and all of its officers, agents and employees against any claim or liability arising from or based on the violation of any such law, ordinance, or regulation, whether by himself or his employees, subcontractors, or agents.

DESCRIPTION. The vendor/contractor agrees that, in performing under this purchase order/contract with the City of De Pere, it will not discriminate against any employee, applicant for employment or any other person or member of the public on the basis of age, race, creed, color, disability, marital status, sex, national origin, ancestry, arrest record, conviction record, military service, use or non-use of lawful products off the employer's premises during nonworking hours, declining to attend a meeting or to

participate in any communication about religious matters or political matters, or any other basis provided under Wis. Stats. §111.321.

PERMITS AND LICENSING. The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.

PATENTED DEVICES, MATERIALS AND PROCESSES. It is mutually understood and agreed that without exception contract prices are to include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work. The Contractor and the surety in all cases shall indemnify and save harmless the City from any and all claims for infringement by reason of the use of any such patented design, device, material or process to be involved under the contract, and shall indemnify the City for any cost, expenses, and damages which it may be obliged to pay, by reason of any such infringement, at any time during the prosecution or after the completion of the work.

SAFETY, HEALTH AND SANITATION. The Contractor shall comply with all federal, state and local laws governing the safety, health and sanitation, and shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on his own responsibility or as the Engineer may determine, reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

PUBLIC CONVENIENCE AND SAFETY. The Contractor shall avoid as far as possible the maintenance of any condition, which might be deemed at law to be an attractive nuisance. Where such condition is unavoidable or where apparent or potential hazards occur, incident to conduct of the work, the Contractor shall maintain a proper watch or provide other reasonable safeguards. The Contractor and its surety shall be responsible for all damage, bodily injury, or death arising through his negligence, either in maintaining an attractive nuisance or otherwise.

The Contractor shall notify the Engineer, the Police Chief and the Fire Chief at least 24 hours before it becomes necessary to blockade a street.

The Contractor shall notify the De Pere Water Department, the Wisconsin Public Service Corporation, Railroad Companies, and the owners of all other property that may be affected by the Contractor's operations at least 72 hours before breaking ground.

The Contractor shall not hinder or interfere with any persons in the protection of such property, or with the operation of utilities, at any time. The Contractor shall obtain all necessary information in regard to existing utilities. The Contractor shall protect such utilities from injury and shall avoid unnecessary exposure so that they will not cause injury to the public.

The Contractor shall obtain a permit from the De Pere Water Department for the use of City water.

BARRICADES, WARNING SIGNS AND FLAGGERS. When any section of a street is closed to traffic, the Contractor shall furnish, erect, and maintain barricades at each end of the closed section and at all intersecting streets. The Contractor shall furnish, erect, and maintain at these locations such warning signs and lights as may be deemed necessary by the Engineer. The Contractor shall place additional barricades,

warning signs and lights as may be necessary to protect the work and safeguard vehicular and pedestrian traffic. All signing and barricading will be done in accordance with the latest WisDOT Manual of Traffic Control Devices.

Where it is necessary to maintain a street open to traffic, the Contractor shall furnish, erect and maintain such barricades, warning signs, warning lights, and flaggers as may be necessary to protect the work and safeguard vehicular and pedestrian traffic.

The Contractor shall maintain the roadway in such condition that the public can travel the same in convenience and safety.

The Contractor will be held responsible for all damages to the work due to failure of barricades, warning signs, warning lights, flaggers and other workers assigned to protect it, and whenever evidence of such damage is found prior to acceptance, the Engineer may order the damaged portion immediately removed and replaced by the Contractor at the Contractor's expense, if, in the Engineer's opinion, such action is justified.

USE OF EXPLOSIVES. The Contractor shall observe the utmost care and shall limit the number and size of the charges to as not to endanger life and property. All explosives shall be stored in a secure manner and all such storage places shall be marked clearly **EXPLOSIVES**, and shall be in care of competent workers at all times. The methods of use, storing and handling of explosives and highly inflammable material shall conform with all state and local laws and regulations.

PROTECTION AND RESTORATION OF PROPERTY. The Contractor shall notify, in writing, the owners of all corporate or private property, which interferes with the work, advising them of the nature of the interference, and shall arrange with them for the disposition of such property. The Contractor shall furnish the Engineer upon request with copies of all such notifications and final agreements.

The Contractor shall use every reasonable precaution to prevent the damage or destruction of corporate or private property. The Contractor shall protect and carefully preserve all property marks until the City or an authorized surveyor or agent has witnessed or otherwise referenced their locations or relocation.

The Contractor shall be responsible for the damage or destruction of property of any character resulting from neglect, misconduct, or omission in manner or method of execution or non-execution of the work, or caused by defective work or the use of unsatisfactory materials, and shall restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or replacing it as may be directed, or shall otherwise make good such damage or destruction in an acceptable manner. Upon the Contractor's failure to do so, the Engineer may, after the expiration of a period of 48 hours after giving written notice, proceed to repair, rebuild or otherwise restore such property as may be deemed necessary, and the cost thereof shall be deducted from any compensation due or which may become due the Contractor under this contract.

RESPONSIBILITY FOR DAMAGE CLAIMS. The Contractor and its surety shall indemnify and save harmless the City and all of its officers, officials, agents and employees from all suits, actions or claims of any character brought because of any injuries or damages received or

sustained by any person, persons, or property on account of the operations of the said Contractor; or on account of or in consequence of any neglect in safeguarding the work, or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect or misconduct of said Contractor; or because of any claims or amount recovered for any infringement of patent, trademark or copyright; or from any claims or amounts arising or recovered under the worker's compensation law; or any other law, ordinance, order or decree; and so much of the money due the said Contractor under and by virtue of this contract as shall be considered necessary by the Board of Public Works for such purposes, may be retained for the use of the City; or, in case no money or insufficient money is retained, the Contractor's surety shall be held.

The City shall not be liable to the Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

It shall be the Contractor's responsibility to see that all of the contract operations incidental to the completion of this contract are covered by public liability and property damage liability insurance in order that the general public or any representative of the contracting authority may have recourse against a responsible party for injuries or damages sustained as a result of said contract operations. This requirement shall apply with equal force, whether the work is performed by the Contractor, or by a Subcontractor or by anyone directly or indirectly employed by either of them.

CONTRACTOR'S RESPONSIBILITY FOR WORK. Until acceptance of the Work by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements, or from any other cause, whether arising from the execution or non-execution of the Work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before acceptance and shall bear the expense thereof, except damage to the Work due to unforeseeable causes beyond control of and without the fault

or negligence of the Contractor, including but not restricted to acts of God, of public adversaries or of governmental authorities. In case of suspension of work from any cause whatever, the Contractor prior to suspension shall take such precautions as may be necessary to prevent damage to the project, provide for normal drainage and shall erect any necessary temporary barricades, signs or other facilities, at the Contractor's expense, as directed by the Engineer.

PERSONAL LIABILITY OF PUBLIC OFFICIALS. In carrying out any of the provisions of this contract or in exercising any power or authority granted to them thereby, there shall be no personal liability upon the City, its officers, officials, agents and employees, it being understood that in such matters they act as agents and representatives of the City. Any right of action by the Contractor against the City, or its agents or employees, is hereby expressly waived.

PROSECUTION AND PROGRESS

SUBLETTING OR ASSIGNMENT OF CONTRACT. The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or any portion thereof, or of its right, title or interest therein, without written consent of the Engineer.

Consent to sublet any portion of the contract shall not be construed to relieve the Contractor of any responsibility for the fulfillment of the contract or to release the Contractor of liability under the contract and bond.

In case such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with its own organization work amounting to at least one-third of the original contract amount, unless a larger portion is specified in the contract.

Requests for permission to sublet any portion of the contract shall be in writing and accompanied by a Qualification Statement showing that the organization, which will perform the work, is experienced and equipped for such work.

PROSECUTION OF THE WORK. The Contractor shall not begin the work to be performed under the contract before receiving written notification from the Engineer to do so, and shall thereupon begin the work within ten days after the date of such written notice.

Notice of intention to start work shall be given to the Engineer at least 72 hours in advance of beginning work.

The Contractor shall employ an ample workforce and provide a construction plant properly adapted to the Work, of sufficient capacity and efficiency to accomplish the Work in a safe and workmanlike manner at the rate of progress specified.

The Contractor shall give personal attention to and shall supervise the Work to the end that it shall be prosecuted faithfully, and when not personally present on the Work, shall at all times be represented by a competent superintendent who shall receive and obey all instructions or orders given under the contract, and who shall have full authority to execute the same, and to supply materials, tools and labor without delay, and who shall be the legal representative of the Contractor. The Contractor shall be liable for the faithful observance of any instructions delivered to it or to its authorized representative.

In the event Work is prosecuted during adverse weather conditions, the Contractor will be required to exercise such precautions, necessary to produce satisfactory work, and shall protect the finished Work from the elements. It is agreed and understood that the cost thereof has been included in the unit prices bid for the various items of Work in the Contract and that no extra compensation will be allowed therefore.

OVERTIME WORK. Overtime and shift work may be established as a regular procedure. The Contractor may request overtime and shift work periodically to accommodate construction sequencing and/or weather delays. The Engineer shall evaluate the request and make a determination on approval. If approved, the Engineer will issue written permission. Such permission may be revoked at any time. No work other than overtime and shift work established as a regular procedure shall be done between the hours of 6:00 P.M. and 7:00 A.M., nor on Saturdays, Sundays, or legal holidays, except such work as is necessary for the proper care and protection of the work already performed or except in case of an emergency.

All costs for overtime inspection, except those occurring as a result of overtime and shift work established as a regular procedure, and other approved circumstances, shall be paid by the Contractor. Overtime inspection shall include inspection required during holidays, Saturdays, Sundays, and any weekday between the hours of 6:00 P.M. and 7:00 A.M. Such costs will include but will not necessarily be limited to engineering, inspection, general supervision and other overhead expenses, which are directly chargeable to the overtime work. All such charges shall be deducted by the City from payment due the Contractor.

LIMITATION OF OPERATIONS. At any time when, in the judgment of the Engineer, the Contractor has obstructed the safe and convenient movement of vehicular and pedestrian traffic, or is carrying on operations on a greater portion of the project than is necessary for the proper prosecution of the Work, the Engineer may require the Contractor to finish the sections in which Work is in progress before Work is started on any additional section.

WORKFORCE. The Contractor shall at all times employ sufficient supervision and labor for prosecuting and several classes of work to full completion in the manner and time requested by the Contract.

All superintendents, forepersons and workers shall have sufficient skill and experience to properly perform the Work assigned. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or by any Subcontractor who, in the opinion of the Engineer does not perform in a proper and skillful manner (or is intemperate or disorderly) shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

METHODS AND EQUIPMENT. The Contractor shall provide and furnish all machinery, equipment, and tools necessary to perform the Work, which shall be in such condition and of such capacity as will produce Work of satisfactory quality within the contract time.

Failure on the part of the Contractor to provide adequate equipment, maintained in proper working order, may be sufficient cause for suspension of specific operations until compliance is obtained or may constitute cause for default of Contract.

Any plan or method of work suggested by the Engineer to the Contractor but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor; and the City shall assume no responsibility therefore.

SUSPENSION OF WORK. The Engineer shall have the authority to order the partial or complete suspension of operation for such period or periods as may be deemed necessary, in the interest of public safety and convenience, or due to unsuitable weather and such other conditions as are considered unfavorable for prosecution of satisfactory work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or to perform any or all of the provisions of the contract. Authorizations or orders to suspend work shall be in writing. Unless otherwise specifically provided, no additional or extra compensation or additional contract time will be allowed due to such suspensions of operations.

DETERMINATION AND EXTENSION OF CONTRACT TIME. The time for completion of the Work contemplated under the Contract will be calendar days or completion date. For calendar day contracts, work will be specified in the Bid as a specific number of calendar days including Sundays and holidays on or before which the Work shall be completed. For completion date contracts, work will be specified in the bid as a date. Fifteen (15) percent of the contract time as specified is allocated to bad weather, which will not warrant an extension of contract time.

The Contract starting date, for purposes of determining contract time and extensions, will be construed to be the date construction operations are started or the tenth day following the date of written notification by the Engineer to the Contractor to begin work, whichever is earlier.

Contract time will not be charged during periods of complete suspension of operations, when ordered by the Engineer suspending operations.

Contract time will be extended by an amount as is mutually agreed upon by the Engineer and the Contractor, on the basis of contract change orders involving alterations in the contract affecting the prosecution of work, or involving extra or additional work, when such alterations are necessary for the purposes or convenience of the Engineer, or when such extra or additional work is of such character or is ordered to be done at such a time that the amount of time reasonably necessary to perform such work is disproportionate to the contract time originally set up in the bid.

Should the Contractor find it impossible to complete the Work on or before the time for completion as specified in the Contract, or extended as above set forth, the Contractor may, at any time prior to 3 days after completion of Work under the Contract, make a written request to the Engineer for an extension of time, setting forth therein reasons to justify the granting of the request. If the Engineer finds that the work was delayed because of conditions beyond the control of the Contractor, it may grant an extension of time for completion in such amount as it finds to be warranted and justified.

LIQUIDATED DAMAGES. Should the Contractor fail to complete the work within the time agreed upon in the contract, interim completion dates included in the work sequence, or within such extra time as may have been allowed by extensions, there shall be deducted from any monies due or that may become due the Contractor, for each and every calendar day, including Sundays and holidays, that the work shall remain uncompleted, a sum specified as follows:

LIQUIDATED DAMAGES		
ORIGINAL CONTRACT AMOUNT		DAILY CHARGE
FROM MORE THAN	TO AND INCLUDING	CALENDAR DAY
\$0	\$150,000	\$470
\$150,000	\$300,000	\$600
\$300,000	\$500,000	\$815
\$500,000	\$1,000,000	\$1160
\$1,000,000	_____	\$1505

This sum shall be considered and treated not as a penalty but as fixed, agreed and liquidated damages due the City from the Contractor by reason of inconvenience to the public, added cost of engineering and

supervision, and other items which have caused an expenditure of public funds resulting from the Contractor's failure to complete the Work within the time specified in the Contract.

Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the City of any of its rights under the contract.

DEFAULT ON CONTRACT. If the Contractor fails to begin the Work under the Contract within the time specified, or discontinues the prosecution of the work, or for any other cause whatsoever fails to carry on the work in an acceptable manner, the Engineer shall give notice in writing to the Contractor and the Contractor's surety of such delay or default, specifying the same.

If the Contractor, within a period of 10 days after the date of such notice, shall not proceed in accordance therewith, then the Board of Public Works or Director of Public Works shall have full power and authority to forfeit the rights of the Contractor and at its option, to call upon the surety to complete the work in accordance with the terms of the contract; or it may take over the work, including any or all materials and equipment on the ground as may be suitable and acceptable, and may complete the work by or on its own force account, or may enter into a new agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods such as, in its opinion, shall be required for the completion of said Contract in an acceptable manner. All costs and charges incurred by the City, together with the cost of completing the work under contract, shall be deducted from any monies due or which may become due on such Contract. In case the expenses so incurred by the City shall be less than the sum which would have been payable under the contract if it had been completed by said Contractor, then said Contractor shall be entitled to receive the difference subject to any claims for liens thereon which may be filed with the City, or any prior assignment filed with it, and in case such expense shall exceed the sum which would have been payable under the contract, the Contractor and the surety shall be liable and shall pay to the City the amount of such excess.

TERMINATION OF THE CONTRACTOR'S RESPONSIBILITY. Whenever the improvement contemplated and covered by the contract shall have been completely performed on the part of the Contractor and all parts of the Work had been approved and accepted by the Engineer, according to the contract, and the final estimate paid, the Contractor's obligations shall then be considered fulfilled, except as set forth in the contract bond.

EMERGENCY DEFERMENT OR CANCELLATION OF CONTRACT. The City and the Contractor, in the event of national emergency or a shortage of materials, labor, or equipment, beyond the control of the Contractor may upon a finding by the City that such emergencies or shortages do exist, and by reason of which such Contractor is unable to proceed with the construction contract, defer such construction in whole or in part, or cancel such construction contract, or any part thereof.

MEASUREMENT AND PAYMENT

TAX EXEMPT STATUS. The City of De Pere is tax exempt under Wis. Stats§77.54(9m), sales tax is not included for the storage, use, and consumption of tangible personal property sold to a Contractor which becomes a component of a facility that is owned by the City. A facility is defined as building, shelter,

parking lot, parking garage, athletic field, athletic park, storm sewer, water supply system, or sewerage and waste water treatment facility, but does not include a highway, street or road. Payments for components utilized in the above constructed facilities shall not include a sales tax.

MEASUREMENT OF QUANTITIES. All work completed under the contract will be measured for final payment by the Engineer to determine the quantities of work performed, except when agreements have been made providing for compensation on the basis of plan quantities or when contract change orders have been executed providing for other methods of measurement. The Contractor will be paid for the actual amount of work performed in accordance with the contract, as shown by the final measurements or upon the basis of plan quantities.

SCOPE OF PAYMENT. The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, labor, tools and equipment necessary for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the work or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Engineer; and for all insurance, compensation and risks of every description connected with the prosecution of the Work; also for all expenses incurred in consequence of the suspension or discontinuance of the Work as herein specified; and for any infringement of patent, trademark, or copyright; and for completing the Work according to the Contract.

The payment of any current estimate prior to final acceptance of the Work by the City shall in no way constitute an acknowledgment of the acceptance of the Work, nor in anyway prejudice or affect the obligation of the Contractor, at its expense, to repair, correct, renew or replace any defects or imperfections in the construction or in the strength or quality of the materials used in or about the construction of the Work under Contract and its appurtenances, or any damage due or attributable to such defects, which defects, imperfections or damage shall have been discovered on or before the final inspection and acceptance of the Work. The Engineer shall be the sole judge of such defects, imperfections or damage and the Contractor shall be liable to the City for failure to correct the same as provided herein.

No monies otherwise payable under the Contract shall become due and payable if the City so elects until the Contractor shall satisfy the City that it has fully settled or paid for all materials used in or upon the work and labor done in connection therewith.

INCREASED OR DECREASED QUANTITIES. Whenever the quantity of any item of work as given in the bid shall be increased or decreased as required to satisfactorily complete the work, payment for such item of work shall be made on the basis of the actual quantity completed at the original contract unit price.

Compensation for alterations in plans for quantities or work requiring contract change orders shall be as stipulated in such agreements.

EXTRA WORK. When extra work has been partially or completely performed, the Engineer may compute the amount thereof, which has been completed and may include such amount in partial payment estimated and in the final estimate certified to the Board of Public Works.

OMITTED ITEMS. The City shall have the right to cancel the portions of the contract relating to the construction of any items therein by the payment to the Contractor of a fair and equitable amount to be agreed upon by contract change order covering all items of cost incurred prior to the date of cancellation or suspension of the Work by order of the Engineer.

Acceptable materials ordered by the Contractor and not canceled prior to the date of cancellation of the Work by order of the Engineer and which are delivered on the work will be paid for at the actual cost to the Contractor and shall thereupon become the property of the City.

PARTIAL PAYMENTS. Partial payments based on the value of the Work performed or materials furnished, at contract or agreed unit or lump sum prices, will be made to the Contractor as the work progresses, except that partial payments will not be made as long as the Contractor fails to comply with any order of the Engineer in accordance with the Contract.

Once each month, provided that a payment of \$5,000 or more becomes due, the Engineer will make an estimate of the quantities of work performed and the value thereof at contract or agreed unit or lump sum price.

The Engineer may, upon presentation by the Contractor of receipted bills, freight bills or other satisfactory evidence of payment, include in the estimate prepared for partial payment the value of non-perishable materials which are to form a part of the completed work, produced or purchased, and delivered and stored in the vicinity of the work at such locations where they will be available for ready incorporation into the work.

From the total amount of the estimate, determined as provided above, the City shall, after deducting previous payments made, pay to the Contractor 95% of the amount of the approved invoice, retaining 5% of the estimate of work done until 50% of the work has been completed. At 50% completion of the work, the previous retainage shall not yet be paid, but further partial payments shall be made in full to the Contractor without additional retainage being taken unless the Engineer certifies that the work is not proceeding satisfactorily. If the work is not proceeding satisfactorily, additional amounts may be retained. After substantial completion, an amount retained may be paid to the Contractor, keeping retained only such amount as is needed for the remaining work.

Should any defective work or material be discovered, or should a reasonable doubt arise as to the integrity of any part of the work completed previous to the final acceptance and payment, there will be deducted from the first estimate rendered after the discovery of such work an amount equal in value to the defective or questioned work, and this work will not be included in a subsequent estimate until the defects have been remedied or the causes for doubt removed.

All material and work covered by partial payments made thereupon become the property of the City, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the City to require the fulfillment of all terms of the contract.

ACCEPTANCE AND FINAL PAYMENT. When the project has been finally accepted, the Engineer will prepare the final estimate of the quantities of Work performed. After review of such final estimate, the Contractor will be paid the entire sum found to be due after deducting all previous payments and all amounts to be deducted under the provisions of the Contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

ASSIGNMENT OF PAYMENTS. All monies payable under the Contract, or any part thereof, shall be paid to the Contractor in accordance with the provisions of this Section, and no assignment or order executed by the Contractor directing payment of any portion or all of such funds to any other person or persons shall be recognized by the City.

CLAIMS FOR ADJUSTMENT IN COMPENSATION. Should the Contractor deem that an adjustment in compensation is due for work or materials not clearly covered in the Contract or not ordered by the Engineer as an extra, the Contractor shall notify the Engineer in writing the Contractor's intention to make claim for such adjustment before proceeding with the work involved in such claim.

Should the Contractor encounter physical conditions at the site of the work of any unusual nature, differing materially from those which might be reasonably encountered and generally recognized as inherent in work of the character provided for or implied in the plans and specifications, promptly, and before such conditions are unduly disturbed, the Engineer shall be notified, in writing, of the Contractor's intent to claim an adjustment in compensation. The Engineer shall thereupon promptly investigate the conditions, and, if the Engineer finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or the time required for performance of the contract, the contract will be modified in writing and an equitable adjustment made in accordance with the requirements of extra work.

Should the Contractor fail to give the Engineer written and timely notice of intent to claim an adjustment in compensation as hereinbefore provided and to afford the Engineer the opportunity to investigate any changed conditions claimed before they are unduly disturbed, Contractor thereby expressly waives such claim. In any event, the determination of the validity of the claim will rest with the City or its authorized representative.

GUARANTEE

GUARANTEE OF MATERIALS AND WORKMANSHIP. The Contractor shall guarantee all materials furnished and all work performed under the Contract against all defects in materials and workmanship for a period of one year following the date of acceptance of the Work, which date shall be understood to be the date of which final payment of all monies due the Contractor under the contract is authorized by the Director of Public Works.

Should any defect appear during the guarantee period, the Contractor shall make the required repairs or replacement upon receipt of written notification from the Director of Public Works to do so.

END OF SECTION

SECTION 01 45 23.10

TESTING AND INSPECTION OF PIPELINE & APPURTENANCES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Low pressure air test.
 - 2. Televising gravity pipelines.
 - 3. Deflection test for gravity pipelines that are not reinforced concrete pipe (PVC and other).
 - 4. Pressure and leakage test for pressurized pipelines.
 - 5. Continuity testing.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 2. ASTM F679S Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
 - 3. ASTM C1107 Spec. for Packaged Dry, Hydraulic –Cement Grout (Nonshrink)
- B. American Water Works Association (AWWA)
 - 1. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
 - 2. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
 - 3. AWWA C651-14 Disinfecting Water Mains

1.3 SUBMITTALS

- A. Quality Control Submittals
 - 1. Test reports and results.
 - 2. Proposed method to correct deficiencies.
 - 3. Record of deficiency repair method and location.

1.4 PROJECT/SITE CONDITIONS

- A. Notify Engineer a minimum of 48 hours prior to any testing.
- B. Notify Engineer when testing equipment is setup and ready for testing.
- C. Testing shall be performed in the presence of the Engineer.

- D. Provide access to test equipment to enable the Engineer to monitor and record test results.
- E. Repeat failed test after correction of deficiencies until satisfactory tests are obtained.
- F. Proposed correction of deficiencies shall be approved by Engineer prior to correction.
- G. Repair visible leaks within the pipeline and/or pipeline appurtenances.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- A. Low Pressure Air Test
 - 1. Inflatable pipe lugs.
 - 2. Bracing.
 - 3. Compressor.
 - 4. Hose and fittings.
 - 5. Pressure gauge.
- B. Televising of Pipelines
 - 1. Cleaning Equipment:
 - a. Mechanically operated cleaning equipment shall be of the movable dam type constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the pipe.
 - i. Sewer cleaning balls or other such equipment which cannot be collapsed instantly is not acceptable cleaning equipment.
 - ii. Provide the movable dam with equal diameter as the pipe being cleaned.
 - iii. Provide a flexible scraper around the outer periphery to insure total removal of grease.
 - b. Truck mounted hydraulically propelled high velocity cleaning equipment.
 - i. Provide a minimum of 500 feet of ¾ inch I.D. high pressure hose with a selection of two or more high velocity nozzles.
 - ii. 60 GPM nozzle capacity at a working pressure of 1000 to 1500 pound psi capable of producing a scouring action from 15° to 45° in all size pipe lines designated to be cleaned.
 - iii. Provide a high velocity gun adjustable from fine spray to narrow stream with a flow rate of 3 ½ to 27 GPM operating between 200 and 800 psi. for washing and scouring manhole walls and floors.
 - iv. Provide a 1500 gallon water tank capable of holding corrosive or caustic cleaning or sanitizing chemicals, if required by the Engineer, auxiliary engines and pumps, and hose reel.
 - 2. Provide television equipment including:
 - a. Vehicle with cable and winch equipment for pulling camera through pipeline and equipment for placing pull cable.
 - b. Suitable mobile van or trailer enclosure for viewing closed circuit televising.

- c. Camera and reeled transmitting cable.
 - i. Provide a television camera with a minimum of 600 lines resolution specifically designed and constructed for such pipeline inspection.
 - ii. Provide lighting for the camera which will be suitable for a clear picture for the entire periphery of the pipe.
 - iii. Picture quality and definition shall be suitable for a clear view of the entire pipeline.
- d. Closed circuit transmitter, receiver station, video recorder with audio capability and T.V. monitor.
- e. Engineer's on-site use of televisions, video tape player and television monitor during inspection and for a reasonable time after televising has been completed (but not to exceed 21 days).
- f. Still camera for photos from T.V. monitor.

C. Deflection Test

1. The deflection test is required for all sewer main that is not reinforced concrete pipe.
2. Mandrel sizes for these mains shall be in accordance to the following tables that are used for PVC:
3. PVC SDR 35 (ASTM D3034)

	Base ID (Inches)	Mandrel Size (Inches)
8	7.67	7.28
10	9.56	9.08
12	11.36	10.79
15	13.90	13.20

4. PVC (ASTM F679)

Nominal Pipe Size (Inches)	Wall Thickness	Base ID (Inches)	Mandrel Size (Inches)
18	T-1A	16.98	16.13
18	T-2B	17.06	16.20
21	T-1A	20.00	19.00
21	T-2B	20.10	19.09
24	T-1A	22.48	21.36
24	T-2B	22.59	21.46
27	T-1A	25.33	24.06
27	T-2B	25.45	24.17

D. Standard Pressure and Leakage Test

1. High pressure pump with electric or gas engine drive with capacity in excess of test conditions.
2. Provide calibrated vessel for measuring water pumped into the main to replace leakage.
3. Provide certified pressure gauge calibrated in pounds per square inch of sufficient capacity to conduct test.

PART 3 – EXECUTION**3.1 PREPARATION OF PIPELINE BEFORE TESTING**

- A. Clean pipeline of any debris, soils, and construction material.
- B. Repair or replace piping, valves, fittings, manholes, inlets, and other parts of the piping system which have visible defects or leakage, before commencing tests, even though amount of leakage or pressure loss may be below the allowable limit.
- C. Provide traffic control and other safety equipment including confined space entry equipment, if required.

3.2 LOW PRESSURE AIR TEST

- A. Provide either the low pressure air test or the water infiltration test for sanitary sewers submerged by ground water.
- B. Preparation
 - 1. For testing consistency, wet interior pipe surface.
 - 2. Install appurtenances including, but not limited to, wyes, tees, laterals, stubs, and structure prior to test to ensure the system is being tested.
 - 3. Plug pipe outlets (including laterals) adequately to retain testing pressure.
 - 4. Visually inspect pipeline and repair visible defective joints and leaks.
- C. Testing Procedure
 - 1. Determine test time as follows:
 - a. Test times for pipeline segments with uniform pipe size shall be taken from test timetable list below.
 - b. Test times for pipeline segments longer than those shown and/or of non-uniform pipe size shall be calculated utilizing appropriate formulas in ASTM C828.

Test Timetable

Pipe Diameter "D" in Inches											
	8	10	12	15	18	21	24	27	30	36	42
25	0.30	0.37	0.45	0.52	0.60	0.74	0.89	1.04	1.19	1.50	1.82
50	0.59	0.74	0.89	1.04	1.20	1.49	1.78	2.08	2.39	3.01	3.64
75	0.89	1.11	1.34	1.57	1.80	2.23	2.67	3.12	3.58	4.51	5.45
100	1.19	1.48	1.78	2.09	2.40	2.97	3.56	4.16	4.77	6.01	7.27
125	1.48	1.86	2.23	2.61	3.01	3.72	4.45	5.20	5.96	7.51	9.09
150	1.78	2.23	2.67	3.13	3.61	4.46	5.34	6.24	7.16	9.02	10.91
Pipe Diameter "D" in Inches											
	8	10	12	15	18	21	24	27	30	36	42
175	2.08	2.60	3.12	3.65	4.21	5.21	6.23	7.28	8.35	10.52	12.73
200	2.37	2.97	3.56	4.17	4.81	5.95	7.12	8.32	9.54	12.02	14.54
225	2.67	3.34	4.01	4.70	5.41	6.69	8.01	9.36	10.73	13.52	16.36
250	2.97	3.71	4.45	5.22	6.01	7.44	8.90	10.40	11.93	15.03	18.18
275	3.26	4.08	4.90	5.74	6.61	8.18	9.79	11.44	13.12	16.53	20.00
300	3.56	4.45	5.34	6.26	7.21	8.92	10.68	12.48	14.31	18.03	21.81
325	3.86	4.82	5.79	6.78	7.81	9.67	11.58	13.52	15.50	19.53	23.63
350	4.16	5.19	6.23	7.30	8.41	10.41	12.47	14.56	16.70	21.04	25.45
375	4.45	5.57	6.68	7.83	9.02	11.16	13.36	15.60	17.89	22.54	27.27
400	4.75	5.94	7.12	8.35	9.62	11.90	14.25	16.64	19.08	24.04	29.09
425	5.05	6.31	7.57	8.87	10.22	12.64	15.14	17.68	20.27	25.54	30.90
450	5.34	6.68	8.01	9.39	10.82	13.39	16.03	18.72	21.47	27.05	32.72
475	5.64	7.05	8.46	9.91	11.42	14.13	16.92	19.76	22.66	28.55	34.54
500	5.94	7.42	8.90	10.43	12.02	14.87	17.81	20.80	23.85	30.05	36.36
525	6.23	7.79	9.35	10.96	12.62	15.62	18.70	21.84	25.04	31.55	38.18
550	6.53	8.16	9.79	11.48	13.22	16.36	19.59	22.88	26.24	33.06	39.99
575	6.83	8.53	10.24	12.00	13.82	17.10	20.48	23.93	27.43	34.56	41.81
600	7.12	8.90	10.68	12.52	14.42	17.85	21.37	24.97	28.62	36.06	43.63
I. Specified test time (minutes) required for pressure drop from 3 ½ to 2 ½ psi when testing one pipe diameter only.											
II. Interpolate test times for segment lengths not specifically listed.											

2. Pressurize pipeline to 4.0 psi and allow to stabilize (stabilization of air temperature may cause pressure drop).
3. When pressure has stabilized, start test at 3.5 psi and record time.
4. If pressure drops more than 1.0 psi during the determined test time, the test will be considered failed.
5. If the test section is below the ground water level, determine the height of the groundwater above the spring line of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe spring line, increase the gage test pressures by 0.43 pounds per square inch.

3.4 TELEVISIONING GRAVITY PIPELINES

A. Preparation of Pipeline Before Televising

1. Clean pipelines and manholes to be televised to degree to allow visual inspection of sewer interior.
2. Completely block off water or sewage from both upstream and downstream of section being televised providing bypass pumping, if necessary to prevent sewage backup.
3. Stop any dewatering operations a sufficient time before televising to allow groundwater elevation to reach its normal level, but not less than 72 hours before televising.
 - a. Provide the following equipment and services:
 - i. Street signs, barricaded detours, flashers.
 - ii. Traffic control personnel.
 - iii. Permits to work in public streets.
 - iv. Safety equipment including safety equipment for confined entry.
4. Provide utilities required to perform the work such as water, electricity, etc.

B. Televising the interior surface of the pipeline by pulling a camera through the pipeline showing on a T.V. monitor and recorded on video tape.

1. Record on the audio system concurrently with the picture the following information:
 - a. Pipeline section being inspected designated by manhole numbers at each terminus of section.
 - b. Date of survey.
 - c. Type of pipe.
 - d. Owner of pipeline.
 - e. Name of televisor.
 - f. Principal client
 - g. Description of defect with location.
2. Superimpose on television image (and on tape) the following information:
 - a. Date.
 - b. Section being televised.
 - c. Footage from entering manhole.
3. Produce still photographs from monitor of any defective section of the pipeline.

C. Televising Operation

1. Move camera through the line in either direction at a uniform rate no greater than ½ foot per second by means of cable winches in each manhole.
2. Provide telephone or other suitable means of communications between the two winches, the pulling unit, and the monitor control.
3. Halt camera and video record for a minimum of five seconds at each joint, lateral connection, leak, unusual condition, roots, collapsed sections, presence of scale or other defect.
4. While video recording, provide an audio description of the line being televised, defects encountered, infiltration/inflow sources, etc.
5. Measure location of joints, connections or defects horizontal at the ground level by means of a target in front of the camera and a meter device accurate to 0.5 feet per 100 feet.

D. Televising Report

1. Provide the televising inspection report prepared by the televisor which includes the following items listed below. The report shall be provided in an electronic format approved by the Engineer.
 - a. Manhole section televised (using construction manhole numbering system with corresponding video tape number of manhole).
 - b. Photos with location and date photographed of all joints, lateral connections, roots, collapsed pipes, presence of scale or other observed defects, estimates of infiltration/inflow amounts, etc.

E. Correction of Damage Caused By Televising Operations

1. Correct any damage to surfaces such as landscaping, pavement, sidewalks, roads, etc.
2. Dig up and repair streets or property, to remove equipment lodged in sewers.
3. Cleanup and/or provide restitution for damage caused to private property and sewer systems as a result of cleaning, televising or bypass pumping.

3.5 DEFLECTION TEST FOR GRAVITY PIPELINES THAT ARE NOT REINFORCED CONCRETE PIPE (PVC, PP, AND OTHER)

A. Unless stated elsewhere, perform deflection tests per PVC gravity pipeline requirements for flexible pipes.

B. Pipe shall not exceed a deflection of 5%.

1. The following table shall be used for PP (polypropylene):

Pipe Type	Pipe Diameter (Inches)	Minimum Inside Diameter (Inches)	Inside Diameter With 5% Deflection (Inches)
Dual Wall	12	11.90	11.31
	15	14.85	14.11
	18	17.93	17.03
	21	20.79	19.75
	24	23.90	22.71
	30	29.79	28.30
Triple Wall	30	29.62	28.14
	36	35.40	33.63
	42	41.31	39.24
	48	47.31	44.94
	60	59.30	56.34

C. Conduct test after final backfill has been in place a minimum of 30 days unless a shorter timeframe is approved by the Engineer.

D. Pull test mandrel without mechanical pulling devices.

- E. Complete the mandrel test on sewer main prior to lateral installation if using Inserta Tees or other connections that prevent the use of the mandrel.
- F. The pipeline will pass the test when the mandrel passes through the entire section of pipe between manholes or other structures in one pass pulled by hand without use of excessive force.
- G. Any section of pipeline failing to pass this test is to be repaired and retested.

3.6 PRESSURE AND LEAKAGE TEST FOR PRESSURIZED PIPELINES

- A. Provide pressure and leakage tests for pressurized pipelines including but not limited to water main and sewage force main.
 - 1. Testing shall be in accordance with AWWA C605 for PVC pipe, as modified herein.
 - 2. Testing shall be in accordance with AWWA C600 for ductile iron pipe, as modified herein.
- B. Preparations
 - 1. Install temporary plugs or caps, as required, prior to testing.
 - 2. Install thrust restraints before testing including temporary plugs or caps.
 - a. If high-early cement concrete thrust restraints are used, then test after 36 hours of thrust restraint replacement.
 - b. If standard cement concrete thrust restraints are used, then test after 7 days of thrust restraint replacement.
 - 3. At a minimum provide bedding, cover material and partial back fill for buried pipe, except joints maybe left uncovered until testing is completed.
 - 4. Install appurtenances including, but not limited to, hydrants, valves, services and air release valves prior to testing to ensure the entire system is being tested.
 - 5. Filling and flushing with water.
 - a. The Water Department will fill each valved section with maximum velocity of 1 ft. /sec. venting air completely from the pipeline and appurtenances.
 - b. Where permanent air vents are not located at high points or dead ends, install 2" corporation stops/valves with galvanized piping and threaded ends to vent air as the line is filled with water.
 - i. Close all these corporation stops/valves before applying pressure or leakage tests.
 - ii. At the conclusion of the leakage and pressure test, remove and plug corporation stops/valves, or at the discretion of the Owner left in place.
 - c. Fill the main with water from the Municipal Service Center or from flushing the main to pressure the system to the testing pressure.
 - d. Discharge water without causing erosion, nuisance, or interruption of traffic.
 - 6. Provide test connections and pressurize the pipe to normal working pressure.
 - a. Inspect pipeline and repair visible leaks.
 - b. Re-pressurize pipeline to normal working pressure as many times as necessary until there are no visible leaks.

7. Provide backflow protection acceptable to the owner of the water system when existing water mains are used to supply test water.

C. Pressure Test

1. At the option of the Contractor, the pressure and leakage tests may be performed at the same time.
2. Test pressure at the lowest point of elevation of the segment being tested shall be not less than 150 (calculate 1.5 times the working pressure or 150 lbs. per sq. inch whichever is more) or at 10 lbs. per sq. inch less than the pressure rating of the pipe, if less than 150 lbs. per sq. inch.
3. Pressurize the system being tested to pressure required above by adding water with high pressure test pump.
4. Repair any visible leaks occurring due to test pressure application.
5. Repeat pressurizing of system to test pressure until no visible leaks can be found.
6. Test period shall be two continuous hours with no visible leaks occurring.
7. Measure pipeline pressure during test period.
8. Maintain system pressure within plus or minus 5 lbs. per sq. inch of the required test pressure by adding water with the test pump.
9. The pressure test shall be completed on all new mains up to the connection of the existing mains as approved by the Engineer. Place the new main immediately adjacent to the existing main.

D. Leakage Test

1. Perform a leakage test after satisfactory completion of the pressure test.
2. Test pressure at the lowest point of elevation of the segment being tested shall be not less than 150 lbs. per sq. inch or at 10 lbs. per sq. inch less than the pressure rating of the pipe, if less than 150 lbs. per sq. inch.
3. Leakage is defined as the quantity of water supplied into the pipe section being tested to maintain a pressure within 5 lbs. per sq. inch of the specified leakage test pressure after the pipe has been filled with water and the pipeline air has been expelled.
4. Provide gauges, measuring device, pump, piping, connections, container of water and all other apparatus required to perform the test.
5. Leakage shall not exceed the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

When:

L = Allowable Leakage in Gallons/Hr.

S = Total Length of Pipe Tested in Feet

D = Nominal Pipe Dia. In Inches

P = Average Test Pressure in lbs./sq. in.

6. When the section under test contains various diameters of pipe, the available leakage will be the sum of the computed leakage for each size of pipe.
7. Test period shall be two continuous hours without exceeding the allowable leakage.

8. Repair pipeline as required to meet allowable leakage requirements, repeating the test after each repair.

3.7 CONTINUITY TESTING

- A. Perform a continuity test on tracer wire.
- B. Provide a power source which will transmit a measurable amount of DC current the length of the tracer wire being tested or length of pipeline being tested.
- C. Take current readings with the test current “off”, then “on” to differentiate between test current and stray current.
- D. In the event continuity of the tracer wire or pipeline is not achieved, perform required repairs and repeat the test until continuity is achieved.

END OF SECTION

SECTION 02 41 13**SELECTIVE SITE DEMOLITION AND ABANDONMENT****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Pavements
2. Curb and Gutter
3. Sidewalks
4. Driveways
5. Concrete and Masonry Structures
6. Manholes
7. Catch Basins and Inlets
8. Pipe Culverts
9. Water Main, Hydrants, Valve Boxes, Curb Stops and Boxes

1.2 SUBMITTALS

- A. Provide tickets for the amount of slurry backfill or flowable fill inserted into pipes that are abandoned.

PART 2 – PRODUCTS**2.1 Materials**

- A. Granular backfill materials shall conform to the requirements of Soil Class C-5 or C-6 in section "Soils and Aggregates".
- B. Concrete for this section shall conform to the requirements of Class B concrete as follows:

Class	28-day Comp. Strength	Max. Size Coarse Aggregate (Inches)	Min. Cement Content (Bags/CY)	Air Content	Slump (Inches)	Max. Water/Cement Ratio
B	3000	1 1/2	4.75	6 +/- 1	3-4	.58

PART 3 – EXECUTION**3.1 BREAKING DOWN AND REMOVING STRUCTURES****A. General**

1. Existing structures, with attached parts and connections, shown on the drawings to be removed or that interfere with the new construction, shall be entirely removed within the limits shown.
 2. When a portion of an existing structure is to be retained, take care during construction operations so as to not damage the retained portion.
 - a. Complete operations necessary for the removal of any existing structure, which might endanger the new construction, prior to the construction of the new Work.
 - b. Do not use any equipment or devices which might damage structures, facilities, or property which are to be preserved and retained.
 3. Old casting shall be salvaged to the City.
- B. Pavement, Curb, Gutter, Sidewalk, Driveways, Crosswalk, and Similar Structures
1. Where portions of the existing structure are to be left in the surface of the finished Work, remove the structure to an existing joint, or saw cut the structure to a true line with a face perpendicular to the surface of the existing structure.
 2. Sufficient removal shall be made to provide for proper grades and connections in the new Work.
- C. Walls, Piers, Drains, Foundations, Concrete, and Masonry Structures
1. Remove entirely or break down to an elevation at least three (3) feet below the earth subgrade within the areas of a road bed and elsewhere to at least three (3) feet below the finished slopes or natural ground.
 2. Rebuild and reconnect live sewers for proper operations.
 3. Satisfactory by-pass service shall be maintained during construction operations.
- D. Manholes, Inlets, and Catch Basins
1. Remove entirely or break down to an elevation at least three (3) feet below the subgrade within the areas of a road bed and elsewhere to at least three (3) feet below the finished slopes or natural ground.
 2. Rebuild or reconnect live sewers for proper operation.
 3. Satisfactory by-pass service shall be maintained during construction operations.
- E. Pipe Culverts
1. Remove entirely all culverts that are to be removed, except as hereinafter provided for closing culverts.
 2. Remove sidewalls or substructure units in water to an elevation no higher than the elevation of the natural stream or lake bed.
 - a. Where grading of the channel is required, remove such units to the proposed finished grade of the stream or lake bed.
 - b. Remove all other sidewalls or substructure units down to at least two (2) feet below natural or finished ground.
 3. Where existing culverts are to be extended or otherwise incorporated into the new Work, remove only such part or parts of the existing culvert as necessary to provide a proper connection to the new Work.

4. Remove pipe culverts designated for salvage in a manner that will preclude damage to the culverts.

F. Hydrants, Valve Boxes, and Curb Stops and Boxes

1. Remove hydrants without damage at the hydrant lead and plug the lead with a plug fitting.
2. Remove valve boxes entirely or at least to three (3) feet below the earth subgrade and elsewhere to at least three (3) feet below the finished slopes or natural ground.
3. Remove curb boxes and the curb stop entirely. Plug end of water service by crimping, or with a standard plug fitting, as applicable.

3.2 ABANDONING STRUCTURES

A. Manholes, Catch Basins, Inlets

1. Thoroughly clean structures to be abandoned.
2. Plug existing pipe connections with brick or concrete block masonry and with concrete.
3. Remove the walls of the structures to an elevation at least three (3) feet below the finished grade line, or to such elevation that may be designated on the drawings.
4. Provide an outlet for water seepage at the bottom of the structure.
5. Fill the structure with soil type C-5 or C-6.

B. Water Main Pipe

1. Remove pipe to joint and plug end of pipe to be abandoned with a plug fitting.
2. Fill abandoned pipe with flowable fill, blow sand, or other approved material.
3. Provide air release locations and an access point for inserting the aggregate.

C. Sewer Pipe

1. Plug existing pipe to be abandoned with brick or concrete block masonry and with concrete.
2. Fill abandoned pipe with flowable fill, blow sand, or other approved material.
3. Provide air release locations and an access point for inserting the aggregate.

3.3 DISPOSAL OF MATERIALS

- A. Deliver materials designated for salvage to owner's storage facility.
- B. All other materials shall be hauled and disposed of at a site provided by the Contractor:
1. Method of disposal shall be in conformance with all governing authorities.
 2. There shall be no limit on haul distance.

3.4 BACKFILLING

- A. Fill all trenches, holes and pits resulting from the breaking down or removal of miscellaneous structures with granular or native backfill per Section 31 23 33, Trenching, Backfilling, and Compacting.

END OF SECTION

SECTION 31 05 10**SOILS AND AGGREGATES FOR EARTHWORK****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Engineered soils and aggregates materials
2. Bank run soils materials
3. Manufactured and special soils
4. Crushed concrete

1.2 REFERENCES**A. American Society for Testing and Materials (ASTM)**

1. ASTM C33 Spec. for Concrete Aggregates
2. ASTM C88 Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
3. ASTM C117 Test for Material Finer than No. 200 Sieve in Mineral Aggregates by Washing.
4. ASTM C131 Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Lost Angles Machine.
5. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates.
6. ASTM C144 Spec. for Aggregate for Masonry Mortar.
7. ASTM C207 Spec. for Hydrated Lime for Masonry Purposes.
8. ASTM C535 Test for Resistance to Degradation of Large-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
9. ASTM C602 Spec. for Agricultural Liming Materials.
10. ASTM D75 Sampling Aggregates.
11. ASTM D422 Particle Size Analysis of Soils.
12. ASTM D448 Spec for Standard Sizes of Coarse Aggregate for Highway Construction.
13. ASTM D1140 Test for Amount of Material in Soils Finer than the No. 200 Sieve.
14. ASTM D1241 Spec. for Materials for Soil;-Aggregate Sub-base, Base, and Surface Courses.
15. ASTM D2216 Laboratory Determination of Water (Moisture) content of Soil, Rock, and Soil Aggregate Mixtures.
16. ASTM D2487 Classification of Soils for Engineering Purposes.
17. ASTM D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity of Soils.
18. ASTM D5268 Standard Specification of Topsoil Used for Landscaping Purposes.

1.3 SUBMITTALS

- A. Provide test reports showing the results of required material testing.
- B. Provide technical data sheets for Engineered Soils.
- C. Provide topsoil analysis performed in accordance with ASTM D5268 and demonstrating the topsoil meets Soil Conservation Service specified soil types. Also, submit results of test for nutrient levels and provide recommendations for fertilizer type and application.
- D. Daily delivery tickets for each load of material delivered to the site.

1.4 QUALITY ASSURANCE

- A. The Engineer will provide an independent testing.

PART 2 – PRODUCTS

2.1 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS A)

A. General

- 1. Material shall be clean, sound, hard, dense, durable, field or quarry stone which is free from seams, cracks, or other structural defects. It shall be angular material from shot rock (blasted) or crushed rock having substantially all face of which have resulted from artificial crushing.
- 2. Loss due to sulfate soundness test shall not exceed 10 percent.
- 3. Loss due to abrasion test shall not exceed 40 percent.
- 4. Material shall not be frozen.

B. Gradation

- 1. Riprap dimensions shall confirm to the following:

AVERAGE DIMENSION RANGES FOR EACH RIPRAP GRADE (Inches)				
FRACTION OF GROSS IN-PLACE RIPRAP VOLUME OCCUPIED BY STONES	EXTRA HEAVY RIPRAP	HEAVY RIPRAP (A-1)	MEDIUM RIPRAP (A-2)	LIGHT RIPRAP (A-3)
0%	>30	>25	>20	>16
10%-14%	22-25	18-20	14-16	11-13
15%-21%	18-22	14-18	11-14	9-11
20%-28%	8-18	6.5-14	5-11	4-9
5%-7%	<8	<6.5	<5	<4
2% or less	<1	<1	<1	<1

- 2. Soil Class A-4 through A-5 Not Used.

3. Soil Class A-6 (1 ½ - inch Crushed Rock – ASTM D448-No.4) - Bedding Stone

Sieve Size	% Passing by Weight
2-inch	100
1 ½-inch	90-100
1-inch	20-55
¾-inch	0-15
3/8-inch	0-5

4. Soil Class A-7 (¾ –inch Crushed rock – ASTM D448-No. 67) – Bedding Stone

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	90-100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5

5. Soil Class A-8 (3/8-inch Crushed Rock Chips – ASTM D448-No.8) - Bedding Stone

Sieve Size	% Passing by Weight
½-inch	100
3/8-inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

2.2 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS C) OR CRUSHED CONCRETE

A. General

1. Stone shall be hard, durable, granular material of uniform quality resulting from crushed rock or crushed bank run sand and gravel.
2. Material shall be free from clay lump, organic matter, shale, excess, elongated or flat pieces, and other deleterious substances.
3. Forty-five percent of the particles retained on a No. 4 sieve shall have at least fractured face.
4. Wear shall not exceed 50 percent.
5. Loss due to sulfate soundness test shall not exceed 18 percent by weight.
6. Total moisture content shall not exceed 7 percent unless approved by the Engineer to obtain the optimum moisture content for compaction. The optimum moisture content will be determined based on the soil testing.
7. Filler for blending shall have a maximum liquid limit of 25 percent and a maximum plasticity index of 6.
8. Material shall not be frozen.
9. Crushed concrete shall meet the following requirements:
 - a. Be 90% free of steel reinforcement.
 - b. Contain less than 10% asphaltic pavement, surfacing, or base.
 - c. Be from a City project or a source approved by the Engineer.

B. Gradation

1. Soil Class C-1 (Crushed Stone or Concrete) – 1 ¼" Crushed Aggregate Base Course

Sieve Size	% Passing by Weight
1 ¼-inch	95-100
¾-inch	70-93
⅜-inch	42-80
No. 4	25-63
No. 10	16-48
No. 40	8-28
No. 200	2-12

2. Soil Class C-2 (Crushed Stone or Concrete) – ¾" Crushed Aggregate Base Course

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	95-100
⅜-inch	50-90
No. 4	35-70
No. 10	15-55
No. 40	10-35
No. 200	5-15

3. Soil Class C-3 (Crushed Gravel) – 1 ¼" Crushed Aggregate Base Course

Sieve Size	% Passing by Weight
1 ¼-inch	95-100
¾-inch	70-93
⅜-inch	42-80
No. 4	25-63
No. 10	16-48
No. 40	8-28
No. 200	4-10

4. Soil Class C-4 (Crushed Gravel) – ¾" Crushed Aggregate Base Course

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	95-100
⅜-inch	50-90
No. 4	35-70
No. 10	15-55
No. 40	10-35
No. 200	8-15

5. Soil Class C-5 (Crushed Stone, Gravel or Concrete)- Granular Backfill

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	85-100
3/8-inch	50-80
No. 4	35-60
No. 40	15-30
No. 200	5-15

2.3 ENGINEERED SOILS AND AGGREGATES (SLURRY BACKFILL)

A. General

1. Material shall be placed in a clean concrete mixer truck and thoroughly mixed.
2. No additional water will be allowed. The weights are damp weights.
3. Just prior to placing the slurry backfill, the mixer shall be run at mixing speed for one full minute to assure an even mixture.

B. Gradation/Mix Ratio

1. Slurry backfill ratio per cubic yard for structure abandonment and trench backfilling shall conform to the following table:

Per Cubic Yard	
Material	Weight/Amounts
Sand	1,350 lbs
A-7	750 lbs
A-6	1,150 lbs
Water	25 Gallons

2. Alternatives for the slurry backfill for pipe abandonment may be required due to site conditions and means and methods as determined by the Contractor. Changes in the slurry backfill shall be approved by the Engineer.
3. Sand for slurry backfill shall be a granular material having at least 90% passing the No. 4 Sieve and predominantly retained on the No. 200 Sieve.

2.4 ENGINEERED SOILS (BLOW SAND)

A. Blow Sand

1. Blow sand shall be M50 Grade Foundry Silica Sand or approved equal.

2.5 ENGINEERED SOILS (BENTONITE CLAY)

A. Bentonite Clay

1. Material shall be clean and dust free.
2. Material shall consist of a granular sodium bentonite between 3/8" and ¾" chips.

2.6 BANK RUN SOILS

A. Soil Class E-1 (Clay Soil)

1. Minimum 50 percent by weight passing the No. 200 sieve.
2. For the fraction passing the No. 40 sieve, the minimum plasticity index shall be 15.
3. Minimum Atterberg liquid limit of 30.
4. Free from organic material, boulders, cobbles, excessive amounts of gravel (greater than $\frac{3}{4}$ - inch), and other deleterious substances.

B. Soil Class F-1 (Topsoil)

1. Topsoil shall meet the definition and specification stated in ASTM D5268 and meets on of the following SCS (Soil Conservation Service) soil textures:
 - a. Loam.
 - b. Sandy loam.
 - c. Silt loam.
 - d. Silty clay loam.
 - e. Clay loam.
2. The topsoil shall consist of adequate mineral content to support the growth of the intended vegetation and shall not contain herbicides which would be detrimental for the intended use.
3. The topsoil shall have adequate fertility for quick establishment of vegetation.
4. The pH of the topsoil shall be between 6.0 and 7.0.
5. Topsoil shall be free from deleterious substance.
6. Pulverize and screen the topsoil such that 100 percent passed the 1-inch (25 mm) sieve and at least 90 percent passes the No. 10 (2.00 mm).

C. Soil Class G-1 (Clean Earth Fill)

1. Soil Class G-1 shall be any soil material excavated on the project site or obtained from borrow areas.
2. Soil materials unsuitable and, therefore, not approved for this classification are:
 - a. Soils with high organic contents such as: topsoil, peat, muck, organic silts, and clays, marls, etc.
 - b. Manmade or rubble filled soils containing such materials as: foundry sand, fly ash cinders, asphalt, and concrete rubble, etc.
 - c. Silty soils such as: rock flour, loess, etc.
 - d. Soils with gravel larger than 3-inch.
 - e. Silty clay or clays with high plasticity (CH soils as defined in ASTM D2487).
 - f. All soil contaminated with hazardous waste materials as defined by the EPA.

D. Soils Class G-2 (Clean Earth Fill)

1. Same as G-1 above except shall not contain gravel larger than 1 $\frac{1}{2}$ - inch.

2.7 SOURCE QUALITY CONTROL

- A. Provide documentation to establish acceptability of material for each soils class in accordance to the following standards:
 - 1. Soils Class A and C:
 - a. ASTM C88.
 - b. ASTM C131 (for coarse aggregates smaller than 1 ½ inches).
 - c. ASTM C136.
 - d. ASTM C535 (for coarse aggregates 1 ½ inches and larger).
 - e. ASTM C117 (use when aggregate contains materials finer than No. 200 sieve).
 - 2. Soils Class E:
 - a. ASTM C136 (test when gravel content is present).
 - b. ASTM D422.
 - c. ASTM D1140.
 - d. ASTM D4318.
 - e. ASTM D4318.
 - 3. Soils Class F:
 - a. ASTM D2487.
 - 4. Soils Class G:
 - a. ASTM D2487.
- B. Provide source samples all soils and aggregates in accordance with ASTM D75.
- C. Provide one (1) acceptable test for each type of material at each source.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Use the soil classification as specified or stated on Drawings.
- B. Place material in accordance with the Drawings and appropriate Specification Sections for the type of work being performed.
- C. Unless specified otherwise, make medium riprap at least 18-inches thick, heavy riprap at least 24-inches thick, and extra-heavy riprap at least 30-inches thick.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Clearing, grubbing, and disposal.
 - 2. Stripping and stockpiling topsoil.
 - 3. Ash Tree Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Topsoil
 - 1. Topsoil is defined as the upper soil horizon consisting of mineral layers of maximum humus (organic) accumulation.

PART 3 – EXECUTION

3.1 CLEARING, GRUBBING, AND DISPOSAL

- A. General – Clear and grub the area of construction as identified on the drawings.
- B. Clearing – Cut all brush, shrubs, stumps and trees to within 4 inches of the existing ground surface.
- C. Grubbing:
 - 1. Remove all stumps, roots, logs and timber.
 - 2. Grubbing shall consist of the removal and disposal of roots and stumps.
- D. Disposal:
 - 1. Contractor is responsible for the following:
 - a. Disposal of all material removed under clearing and grubbing.
 - b. Furnishing of a disposal site.
- E. Clearing operations shall be completed in a manner so as to prevent obstruction of traffic and to protect all remaining trees, shrubs, and other vegetation from injury.
- F. Clearing and grubbing of oak trees shall be completed in accordance with the WisDOT Standard Specifications for Highway and Structure Construction.

3.2 STRIPPING AND STOCKPILING TOPSOIL

A. Stripping

1. Remove all topsoil beneath:
 - a. Structures.
 - b. Roadways.
 - c. All paved areas.
2. Remove topsoil in:
 - a. Areas disturbed by utility construction.
 - b. Areas requiring cuts of significant fills (significant fills are fills which cannot be obtained by addition of topsoil only).

B. Stockpiling

1. Contractor shall stockpile topsoil obtained in the stripping operation for replacement.
 - a. For areas where topsoil is to be replaced after underground utility construction.
 - b. For areas involving site grading where topsoil is to be replaced in order to sustain vegetative growth.
2. In areas where topsoil will not be required as specified above, Contractor shall remove and dispose of excess material as defined in other sections.

3.3 ASH TREE REQUIREMENTS

- A. Burning of stumps, roots, brush, waste logs and limbs, timber tops, and debris resulting from clearing and grubbing is not allowed.
- B. The emerald ash borer (EAB) has resulted in a quarantine in Brown County by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) and the Wisconsin Department of Natural Resources (DNR).
- C. Ash trees include the following species:
 1. Green ash (*F. pennsylvanica*) is found throughout the state, but is most common in southern Wisconsin.
 2. Black ash (*F. nigra*) is distributed over the entire state but is most frequently found in northern Wisconsin.
 3. Blue ash (*F. quadrangulata*) is a threatened species that is currently found only at a few sites in Waukesha County. The species is at the edge of its range in Wisconsin, but is common in states farther south. The species is not of commercial importance.
 4. White ash (*F. Americana*) is found throughout Wisconsin, but is most common in the southern third of the state.
 5. Mountain ash (*Sorbus Americana* and *S. decora*) is not a true ash and is not susceptible to EAB infestation.
- D. Follow and obey the following Wisconsin Department of Agriculture, Trade, and Consumer Protection order:
 1. ATCP 21.17 Emerald ash borer; import controls and quarantine.

IMPORTING OR MOVING REGULATED ITEMS FROM INFESTED AREAS;

PROHIBITION. Except as provided in sub.(3), no person may do any of the following:

- (a) Import a regulated item under sub.(2) into this state if that item originates from an emerald ash borer regulated area identified in 7CFR 301.53-3.
- (b) Move any regulated item under sub. (2) out of an emerald ash borer regulated area that is identified in 7CFR 301.53-3 and located in this state.

Note: the United States Department of Agriculture-Animal and Plant Health Inspection Service (USDA-APHIS) periodically updates the list of regulated areas in 7CFR 301.53-3. Subsection (1) applies to new regulated areas as those areas are identified in the CFR.

REGULATED ITEMS. The following are regulated items for purposes of sub. (1):

- 1. The emerald ash borer, *Agrilus planipennis* (Fairmaire) in any living stage.
 - 2. Ash trees.
 - 3. Ash limbs, branches, and roots.
 - 4. Ash logs, slabs or untreated lumber with bark attached.
 - 5. Cut firewood of all non-coniferous species.
 - 6. Ash chips and ash bark fragments (both composted and uncomposted) larger than one inch in diameter.
 - 7. Any other item or substance that may be designated as a regulated item if a DATCP pest control official determines that it presents a risk of spreading emerald ash borer and notifies the person in possession of the item or substance that it is subject to the restrictions of the regulations.
- E. The quarantine means that ash wood products may not be transported out of the quarantined area. If ash trees are identified within clearing and grubbing limits, the following measures are required for the disposal:
- 1. Chipped ash trees
 - a. May be left on site if used as landscape mulch within the project limits if approved by the Engineer.
 - b. May be buried on adjacent properties to projects within the quarantined zone with prior approval from the Engineer.
 - c. Chips must be disposed of immediately and may not be stockpiled.
 - d. Chipper equipment must be cleaned following post-chipping activities to insure no spread of wood chip debris into non-quarantined counties.
 - 2. Ash logs, branches, and roots
 - a. May be hauled to the City compost site for disposal if approved by the Engineer.
 - b. Ash logs, branches, and roots must be disposed of immediately and may not be stockpiled.

END OF SECTION

SECTION 31 13 10**TREE PRESERVATION OF PUBLIC TREES****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Protection of above ground branches and bark.
 - 2. Protection of below ground root system and surrounding soil.

1.2 REFERENCES

- A. City of De Pere Municipal Ordinance
 - 1. Chapter 30 Parks and Recreation

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. None

PART 3 – EXECUTION**3.1 ABOVE GROUND BRANCHES AND ROOTS**

- A. Tree trimming required is to be coordinated with the Engineer. The City reserves the right to trim all City trees.
- B. Hand trim damaged branches larger than two inch with handsaws, pruners, lopers, chainsaws or other specifically designed tree trimming equipment.
- C. Notify the Engineer of damage to bark. Damaged bark shall be repaired as directed by the Engineer

3.2 BELOW GROUND ROOT SYSTEM AND SURROUNDING SOIL

- A. Activities within the Protected Root Zone (PRZ)
 - 1. The root system shall be left undisturbed in the PRZ for each tree as follows:

Tree diameter at 4.5 feet (dbh)	Radius of PRZ (Measured from face of trunk)
0-3 inches	3 feet
3-8 inches	6 feet

8-14 inches	8 feet
14-19 inches	10 feet
19+ inches	15 feet

2. Minimize compaction.
 3. Do not store materials and equipment.
- B. Protection of the PRZ
1. Provide protection of the PRZ including but not limited to:
 - a. Fencing
 - b. Temporary raised bridges over the area for equipment.
 2. Auger/tunnel at a minimum depth of 36 inches for utility installations.
- C. Damaged Roots
1. Hand prune damaged and exposed roots larger than one inch with handsaws, pruners, loppers, chainsaws or other specifically designed root pruning equipment.
- D. Where trees are present near curb replacements, the root systems on the curb side shall be cut not more than four (4) inches beyond the edge of the new curb.
- E. For new sidewalk, limit soil disturbance to not more than four inches beyond the edge of the new sidewalk.
- F. The Engineer may route sidewalk around existing trees to minimize damage.

END OF SECTION

SECTION 31 23 00**EXCAVATION AND FILL FOR ROADWAY****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Excavation.
 - 2. Test Rolling.
 - 3. Filling and compacting.
 - 4. Disposal of surplus materials.
 - 5. Finish grading.
 - 6. Material testing.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 2. D1140 Test for Amount of Material in Soils Finer than the No. 200 Sieve
 - 3. D1556 Test for Density of Soil in Place by the Sand-Cone Method
 - 4. D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb. (4.54 kg) Rammer and 18-inch (457mm) Drop
 - 5. D2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
 - 6. D938-07 Standard Test Methods for In-Place Density and water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 SUBMITTALS

- A. Submit copies of the results of quality control testing (include location where test was done) for aggregate to be supplied, including a sieve analysis.

1.4 DENSITY TESTING

- A. The Engineer will provide an independent testing laboratory to provide testing services.

PART 2 – PRODUCTS**2.1 SOIL MATERIALS**

- A. Soil used for borrow, fill, and backfilling shall meet the requirements of soil class as stated in the drawings or in the Specifications.
- B. As a minimum, all soil shall meet the requirements of Soil Class G-1.
- C. Soil classes shall be as per Section "Soils and Aggregates".

PART 3 – EXECUTION

3.1 EXCAVATION

- A. Excavation to subgrade elevation per the drawings.
- B. Excavate soil material determined to be unsuitable when directed by the Engineer.
- C. Vegetation of a height greater than one foot shall be cut and disposed of before ground is broken for excavation.
- D. Heavy sod and other perishable material underlying proposed roadway and sidewalk embankments shall be removed.
- E. Excavation Below Subgrade
 - 1. Remove deposits of frost-heave material, unstable silty soils, wet and unstable soil, material salvaged from old road cores in marshes, topsoil containing considerable amounts of humus or vegetable matter, rocks, or other undesirable foundation material to the depth below finished grade as the plans show or the engineer directs. If possible, slope and drain the excavation bottoms to prevent water accumulation.
 - 2. Use selected materials from roadway and drainage excavation having suitable engineering properties. Borrow, or granular backfill, as the plans or special provisions show or as the engineer directs, to backfill excavated areas.

3.2 SUBGRADE COMPACTION IN CUTS

- A. Compact subgrade to 95 percent standard proctor density to a minimum depth of 6 inches.

3.3 SUBGRADE COMPACTION IN FILLS

- A. Compact fill in layers not exceeding 8 inches in thickness.
- B. Compact to 95 percent standard proctor density.

3.4 MOISTURE REQUIREMENTS

- A. Proper soil moisture contents for compaction shall be maintained in all soils.

1. Optimum moisture content as determined by Standard Proctor shall be used to determine acceptance moisture contents for soil compaction.
2. Use the guidelines to determine moisture content range for compaction of various soils:

Moisture Requirements for Compaction of Various Soils

Material Description	Soil Class	Tolerable Range of Moisture Content About Optimum (%)
Coarse grained, cohesionless soils with less than 4% P200 or with less than 8% uniform gradation (i.e., clean sand or gravel).	"A" and "B"	Highest practical moisture content (saturation may be required)
Sandy clays, silty clay silts, and clays	"E" and "G"	-2 to +4
All other soil types	All other soil classes	-1 to +3

Note: The above requirements are general guidelines for soil moisture content which may or may not apply to a specific soil material. In some circumstances, the required density may be attained at moisture contents outside the ranges indicated above.

3.5 TEST ROLLING

- A. Test roll finished cut or fill subgrades by rolling with a pneumatic-tire roller or a loaded dump truck with at least ten (10) cubic yards of materials.
 1. Method and equipment used shall be suitable for intended use.
 2. Take necessary precautions to protect existing structures from damage during test rolling.
 3. Test roll an area equal to the area of the proposed construction plus a minimum of three (3) feet on each side.
- B. Treat areas showing yielding or rutting under test rolling as follows:
 1. Replace and/or recompact as necessary to stabilize the area.
 2. Retest soil areas replaced or recompact.
 3. Remove poor soils and replace with aggregate and/or fabric as directed by the Engineer.

3.6 DISPOSAL OF SURPLUS MATERIALS

- A. Haul and dispose of all surplus materials.
- B. Provide disposal area for surplus materials.

3.7 FINISH GRADING

- A. Grade, trim, and shape subgrade to required grade and section.
 1. Adjust slopes by grading so that transition is smooth and gradual.
 2. The crests of cut banks shall be rounded and shaped.

3. Refill, Regrade and compact washouts ruts.
4. Remove all stones 3 inches or larger from grading limits.

B. Vertical Grading Tolerances

1. Rough grading tolerance.
 - a. Areas to be topsoiled – rough grade to within 0.2 foot of finish grades.
2. Areas having paved surfaces (i.e., concrete, asphalt, etc.).
 - a. Maximum allowable variation from correct profile and section shall not be more than $\frac{1}{4}$ inch in 10 feet.

END OF SECTION

SECTION 31 23 23.33**FLOWABLE FILL****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Flowable fill material for backfill and abandonment.

1.2 REFERENCES**A. American Society of Testing and Materials (ASTM)**

1. D4832-10 Standard Test Method for Preparation & Testing of Controlled Low Strength Material (CLSM) Test Cylinders
2. C618-12 Standard Specifications for Coal Fly Ash & Raw or Calcined Natural Pozzolan for use in Concrete. (Use Fly Ash conforming to the chemical and physical requirements for mineral admixture, Class F listed, including Table 2 (except for Footnote A). Waive the loss on ignition requirement
3. C403/C403M-08 Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
4. C150/C150M-11 Standard Specification for Portland Cement.
5. C33/C33M-11a Standard Specification for Concrete Aggregates.
6. C94/C94M-12 Standard Specification for Ready-Mixed Concrete.
7. C494/C494M-11 Standard Specification for Chemical Admixtures for Concrete
8. C685/C685M-11 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
9. C940-10a Standard Specification for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced – Aggregate Concrete in the Laboratory
10. D5971 Sampling Freshly Mixed Controlled Low Strength Material
11. D6103 Flow Consistency of Controlled Low Strength Material
12. D6023 Unit Weight, Yield, Cement Content and Air Content (Gravimetric) of Controlled Low Strength Material

B. American Concrete Institute (ACI)

1. SP-150-94 Controlled Low-Strength Materials

1.3 SUBMITTALS

- A. Provide flowable fill mix design containing cement and water.

- B. Provide documentation that the admixture supplier has experience of at least one year, with the products being provided and any equipment required to obtain desired performance of the product.

1.4 QUALITY ASSURANCE

- A. Flowable fill shall be manufactured by a ready-mix concrete producer with a minimum of 1 year experience in the production of similar products.
- B. For each type of material required for the work of this Section, provide primary materials that are the products of one manufacturer. If not otherwise specified here, materials shall comply with recommendations of ACI 229, "Controlled Low Strength Materials."
- C. Flowable fill shall be sampled and testing in the field in conformance with either ASTM C 94 or C 685. Samples for tests shall be taken for every 115 cubic meters (150 cubic yards) of material, or fraction thereof, for each day's placement. Tests shall include temperature reading and four compressive strength cylinders. Compressive strength sampling and testing shall conform to ASTM D 4832 with one specimen tested at 7 days, two at 28 days, and one held for each batch of four specimens. Sampling and testing shall be performed by a qualified, independent commercial testing laboratory. Test results should be submitted within 48 hours of completion of testing.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Provide flowable fill containing, at a minimum, cementitious materials and water. Cementitious materials shall be portland cement, pozzolanic materials, or other self-cementing materials, or combinations thereof, at the contractor's option, and following approval by the Resident Engineer. The flowable fill mix design may also contain, fine aggregate or filler, and/or chemical admixtures in any proportions such that the final product meets the strength, flow consistency and shrinkage requirements included in this specification, as approved by the Resident Engineer.
- B. Portland Cement: ASTM C150, Type 1 or Type 2 conforming to the State of Wisconsin Standard Specifications for Highway and Structure Construction. Alternative chemical grouts may be used based on field conditions if accepted by the Engineer.
- C. Water used for mixing the grouts shall be clean and potable and provided by the Contractor.
- D. Air Entraining Admixture: ASTM C260.
- E. Chemical Admixtures: ASTM C494.
- F. Aggregate: ASTM C33.

2.2 MIXTURE

- A. Mix design shall produce a consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.
- B. Flowable fill shall have a minimum strength of 100 psi and a maximum strength of 150 psi according to ASTM C39 at 28 days after placement.
- C. Flowable fill shall have minimal subsidence and bleed water shrinkage. Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per foot) of flowable fill depth (for mixes containing high fly ash content). Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C 940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory.
- D. Provide equipment as recommended by the Manufacturer and comply with manufacturer's recommendations for the addition of additives, whether at the production plant or prior to placement at the site.

PART 3 – INSTALLATION**3.1 GENERAL**

- A. Flowable fill refers to a cementitious slurry consisting of a mixture of fine aggregate or filler, water, and cementitious material(s), which is used as a fill or backfill in lieu of compacted earth.
- B. Mixture is capable of filling all voids in irregular excavations and hard to reach places (such as under undercuts of existing slabs), is self-leveling, and hardens in a matter of a few hours without the need for compaction in layers.

3.2 EXAMINATION

- A. Examine conditions of substrates and other conditions under which work is to be performed and notify Engineer, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.3 APPLICATION OF FLOWABLE FILL

- A. Secure tanks, pipes and other members to be encased in flowable fill.
- B. Insure that there are no exposed metallic pipes, conduits, or other items that will be in contact with the flowable fill after placement. If so, replace with non-metallic materials or apply manufacturers recommended coating to protect metallic objects before placing the flowable fill.
- C. Replacement or protection of metallic objects is subject to the approval of the Resident Engineer.

- D. Abandon pipe per the section on Selective Site Demolition and Abandonment.
- E. Alternatives for flowable fill for pipe abandonment may be required due to site conditions and means and methods by the Contractor. Changes in the flowable fill shall be approved by the Engineer.

3.4 PROTECTION AND CURING

- A. Protect exposed surfaces of flowable fill from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature.
- B. Curing method shall be subject to approval by Engineer.

END OF SECTION

SECTION 31 23 33**TRENCHING, BACKFILLING AND COMPACTING****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Obstruction removal.
 - 2. Dewatering.
 - 3. Sheet piling and bracing.
 - 4. Supporting of existing structures.
 - 5. Disposal of surplus materials.
 - 6. Trenching, backfilling and compacting.
 - 7. Restoration.
- B. This section applies to below ground pressure and gravity pipe lines.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb. (4.54 kg) Rammer and 18-inch (457mm) Drop
 - 2. D6938-07 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3 SUBMITTALS

- A. Submit copies of the results of quality control testing (include location where test was done).
 - 1. Materials source testing.

1.4 QUALITY ASSURANCE

- A. The Engineer will obtain an independent testing laboratory to provide quality control testing.
- B. Acceptable test results do not relieve the Contractor from making corrections to the tested work during the warranty period.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Conform to Section “Soils and Aggregates”.

B. Native Backfill Material

1. Backfill material shall be free of:
 - a. Vegetable or other organic material.
 - b. Concrete or concrete fragments.
 - c. Stones larger than 3 inches.
 - d. Frozen material.
 - e. Blasted rock.
 - f. All types of refuse.

C. Granular Backfill Material

1. Soil Class C-1, C-3, or C-5 in accordance with Section "Soils and Aggregates".

D. Clay Dam Backfill Material

1. Soil Class E-1 clay soil in accordance with Section "Soils and Aggregates".
2. Use where stated on the Drawings or where stated elsewhere.

2.2 SOURCE QUALITY CONTROL

- A. Provide test soil and aggregate material in accordance with Section "Soils and Aggregates".

PART 3 – EXECUTION

3.1 OBSTRUCTION REMOVAL

- A. Remove obstructions from within the construction limits as required; such as:

1. Mounds of dirt, stone or debris.
2. Street signs, culverts and end walls, advertising signs and guard posts (shall be replaced to original condition).

- B. Unless otherwise specified, the construction limits are:

1. Street right-of-way.
2. Easement boundaries.
3. Project site property lines.
4. As shown on the Plans.

- C. Strip and stockpile topsoil in accordance with section: "Site Clearing".

- D. Remove pavement, curb and gutter, sidewalk, and driveway and other surfaces within the maximum trench width for restoration payment purposes at the ground surface or as shown on the drawings whichever is greater.

1. Sawcut vertically pavement, curb and gutter, sidewalk, driveway and other surfaces to full depth prior to removal.
2. Remove concrete surfaces to the nearest joint.

3.2 DEWATERING

- A. Determine groundwater conditions.
- B. Provide and maintain necessary means and methods to dewater excavations as required.
- C. Dispose of water.
- D. Prevent runoff and dewatering system discharge for entering excavation.
- E. Secure permits from regulatory and governmental agencies governing dewatering.
- F. Provide well, water, pumping equipment, generating equipment and/or power.
- G. Maintain a water supply to private and public wells affected by the dewatering operation.
- H. Correct damage caused to private wells due to dewatering.
- I. Dewater to a minimum depth of 12 inches below excavations.
- J. Maintain dewatering operation until backfill and compaction procedures are completed.
- K. Groundwater Disposal
 - 1. Convey groundwater to a point of discharge through pipelines.
 - a. Open ditches and trenches are not permitted.
 - b. Use of Owner's utilities is not permitted without written consent.
 - 2. Maximum Sediment Content: 10 milligrams per liter.

3.3 TRENCH EXCAVATION

- A. Excavate trench to sufficient width and depth to permit proper utility construction at line and grade shown on the drawings.
- B. The bottom of the excavation shall conform to the pipe embedment details with a minimum width of the pipe outside diameter plus 12 inches.
- C. Do not open more than 200 feet of trench at any one time.
- D. Place excavated material in a location that will minimize inconvenience to public travel, adjacent property owners and other contractors.
- E. Disposal of Surplus Excavated Material
 - 1. Remove surplus excavated material from the site as soon it is determined it will not be used for backfill material.
 - 2. Dispose of pavement separately from soils material.
 - 3. Dispose of surplus material which includes:

- a. Loading and hauling.
- b. Dumping and leveling.
- c. Provide a dump site (when not specified by Owner)
 - 1) Conform with governing authorities.
 - 2) No limit on haul distance.
4. Do not dispose of excavated surplus material in state waters, floodplain, or wetlands without written approval of the appropriate regulatory agency.

F. Sheeting and Bracing

1. Sheet and brace trenches and excavations as required by applicable federal and state codes, by the Contract Documents, and as necessary to protect life and property.
 - a. When close sheeting is required, prevent soil from entering the trench either below or through such sheeting.
2. Removal of Sheeting and Bracing
 - a. Remove sheeting and bracing as the excavation is backfilled in such manner to avoid disturbance of adjacent structures and to insure adequate protection of the completed pipe section.
 - b. If the sheeting and bracing cannot be removed without damage to the pipe or adjacent areas, leave in place.

G. Portable Trench Shoe Shield (Shoe)

1. A shield may be used with the following restrictions.
 - a. Construct as required by State or Federal authority.
 - b. Do not exceed trench limits.
 - c. Do not disturb or alter pipe and bedding.

H. Rock Removal

1. Remove and dispose of rock in accordance to Section "Rock Removal".

3.4 TRENCH BACKFILLING AND COMPACTION

- A. Provide pipe foundation material below the bedding as directed by the Engineer.
- B. Notify Engineer of poor soils below the foundation and/or the pipe bedding.
- C. Provide pipe embedment as required for the type of pipe installed per the appropriate Section.
- D. Granular backfill shall be installed as follows unless specified otherwise on the Plans:
 1. One foot beyond the limits of existing or proposed pavements, driveways, and sidewalks.
 2. Ten feet beyond the limits of the railroad tracks.
 3. The vertical limits shall be to the existing or proposed subgrade.
- E. Native backfill may be used at locations not identified in D.
- F. Backfill Compaction

1. Compact trenches using mechanical compaction methods.
2. Compact backfill in layers not exceeding 18 inches to the following densities:

Material Type	Density Requirement
Native Material	Equal to adjacent undisturbed material
Granular Backfill	Minimum of 95% of the Modified Proctor Density

- G. Provide select backfill material as directed by the Engineer or as specified elsewhere.
- H. Backfill trench to last pipe joint (not to exceed 10 feet) at the end of each work day.
1. Backfill during nights, weekends and when no work is in progress.
 2. Take measures to protect work site.

3.5 SURFACE RESTORATION

- A. Remove surplus material (earth, rubbish, construction material, etc.) and restore areas affected by construction activities.
- B. Restore roads, streets, and highways meeting the following provision:
1. Shape subgrade and grade for installation of required base course and pavement.
 2. Install base course to final pavement grade, compacted to 95% Modified Proctor density and fine graded.
 3. Maintain base course surface grade and control dust until paving is completed.
 4. If paving is by others, provide maintenance of the base course for the period of 6 months from the date of Substantial Completion.
- C. Restore the following surfaces to the thickness stated on the drawings or, if not stated on the drawings, then restored to the thickness of the existing surface or to the minimum thickness stated as follows, whichever is better.
1. Portland Cement Concrete Pavement: 8 inch thickness
 2. Asphaltic Concrete Pavement: 4 inch thickness
 3. Base Course:
 - a. For a concrete street: 8 inch thickness
 - b. For an asphaltic concrete street: 15 inch thickness
 4. Unpaved Roads: 15-inch thickness
 5. Curb and Gutter:
 - a. Curb and gutter to match existing style and size
 - b. Minimum 6 inch aggregate base
 6. Sidewalk:
 - a. Minimum Sidewalk Thickness: 4 inches
 - b. Minimum alley thickness: 8 inches
 - c. Minimum 4 inch aggregate base
 7. Driveways and Parking Lots:
 - a. Concrete: thickness – 6 inches
 - b. Asphaltic Concrete: Minimum Thickness – 3 inches
 - c. Minimum 6 inch aggregate base

- 8. Landscaping:
 - a. Perform as defined in section "Turf and Grasses".
- D. Make restitution to the Owner of trees and shrubs damaged during construction.

END OF SECTION

SECTION 31 25 00**EROSION AND SEDIMENT CONTROL****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Erosion Bales and Bags
 - 2. Inlet Protection
 - 3. Silt Fence
 - 4. Erosion Mats
 - 5. Ditch Checks
 - 6. Stone Tracking Pad
 - 7. Temporary Ditch Check – Sediment Logs

1.2 REFERENCES

- A. Wisconsin DOT, Erosion Control, Product Acceptability lists for Multi-Modal Application (PAL), latest edition.
- B. American Society for Testing and Materials (ASTM)
 - 1. D1388 Test Method for Stiffness of Fabrics
 - 2. D2487 Test Method for Classification of Soils for Engineering Purposes
 - 3. D3776 Test Method for Mass Per Unit Area (Weight) of Woven Fabric
 - 4. D4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc type Apparatus)
 - 5. D4491 Test Method for Water Permeability of Geotextiles by Permittivity
 - 6. D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
 - 7. D4751 Test Method for Determining Apparent Opening Size of a Geotextile
 - 8. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
 - 9. D5035 Test Method for Breaking Strength and Elongation of Textile Fabric (Strip Method)
 - 10. D5338 Test Method for Determining Aerobic Biodegradation of Plastic Materials Under Controlled Composting Conditions

- C. Wisconsin Department of Natural Resources Stormwater Technical Standards,
<https://dnr.wisconsin.gov/topic/Stormwater/standards>

1.3 SYSTEM DESCRIPTION

- A. Provide additional erosion and sediment control to prevent erosion which may be caused due to selected construction methods.

1.4 SUBMITTALS

- A. Manufacturer's certification for manmade products
- B. A list of ditch checks materials
- C. Gradations for aggregate used in erosion control practices

PART 2 – PRODUCTS

2.1 EROSION BALES AND BAGS

- A. Sand Bags
1. Minimum unfilled size of 16 by 26 inches.
 2. Completely filled with a granular soil (P200<50%).
- B. Rock Filled Filter Bags
1. Minimum unfilled size of 18 by 30 inches.
 2. Construct bag of high density polyethylene as manufactured by Erotex.
 3. Seal bag with a high density polyethylene draw string knitted directly into the bag opening in a rolled seam using minimum of 480 denier polyester sewing yarn.
 4. Fill bag with well graded coarse aggregate conforming to the following AASHTO M43 Size No. 76:

Sieve Size	% Passing by Weight
2 inch	---
1 ½ inch	---
1 inch	100
¾ inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

- C. Erosion Bales
1. Tightly compacted bales of grain straw or hay.
 2. Use straw, if required to function for more than 15 days.

D. Support Post

1. Wood or steel construction, minimum length 4 feet.
2. Wood Posts: 2" x 2" or equivalent steel posts.

2.2 INLET PROTECTION

- A. Inlet protection shall with the Wisconsin Department of Natural Resources Conservation Practice Standard #1060 "Storm Drain Inlet Protection for Construction Sites".

2.3 SILT FENCE

A. Geotextile Fabric

1. Fabric shall be either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride.
2. Fabric shall have the minimum strength values in the weakest principal direction.
3. Non-woven fabric may be needle punched, heat bonded, resin bonded or combination thereof.
4. Fabric shall meet the following requirements:
 - a. If silty soils on-site then the following can be used:

1) Grab Tensile Strength	ASTM D4632	101 lbs (450 N)
2) Apparent Opening Size	ASTM D4751	0.6 mm (No 30)
3) UV Resistance Strength Retained at 500 Hours (%)	ASTM D4355	70
4) Permittivity (per second)	ASTM D4491	0.14
 - b. If sandy soils on-site then the following can be used:

1) Grab Tensile Strength	ASTM D4632	101 lbs (450 N)
2) Apparent Opening Size	ASTM D4751	0.3 mm to 0.8 mm
3) UV Resistance Strength Retained at 500 Hours (%)	ASTM D4355	70
4) Permittivity (per second)	ASTM D4491	0.14

B. Support Posts

1. Wood or steel construction minimum length 48 inches.
2. Wood posts – 1 1/8" x 1 1/8" of hickory or oak, or equivalent steel posts.

- C. Silt fence shall with the Wisconsin Department of Natural Resources Conservation Practice Standard #1056 "Silt Fence".

2.4 EROSION MATS

A. General

1. Erosion mat shall conform to the Wisconsin Department of Natural Resources Conservation Practice Standard.

2. Only mats conforming to the Class and Type listed in the Wisconsin Department of Transportation Erosion Control Product Acceptability List will be allowed.

B. Types

1. Non-Channel erosion mat shall conform to the Wisconsin Department of Natural Resources Conservation Practice Standard #1052 "Non-Channel Erosion Mat".
 - a. Utilize Class I, Urban.
2. Channel erosion mat shall conform to the Wisconsin Department of Natural Resources Conservation Practice Standard #1053 "Channel Erosion Mat".

C. Anchoring Devices/Stakes

1. Anchoring and components for temporary erosion mats shall be completely biodegradable as determined by ASTM D5338.
2. Materials shall be environmentally safe for soil and groundwater.
3. Do not use petroleum based plastics or composites.
4. Do not use materials which may present a hazard from splintering or spearing.
5. Design anchors to hold a minimum of two months and be substantially degraded within four months during the summer (warm soil conditions).

2.5 DITCH CHECKS

- A. Ditch checks shall with the Wisconsin Department of Natural Resources Conservation Practice Standard #1062 "Ditch Check (Channel)".
- B. Submit a list of ditch checks materials to the Engineer for review.

2.6 STONE TRACKING PAD

- A. The Stone Tracking Pad materials shall conform with the Wisconsin Department of Natural Resources Conservation Practice Standard #1057 "Stone Tracking Pad and Tire Washing".
- B. Approval is required for materials used to construct the tracking pad.
- C. Utilize 2-inch to 3-inch aggregate in areas where access is required to adjacent properties.

2.7 TEMPORARY DITCH CHECKS (TDC) – SEDIMENT LOGS

- A. TDC materials shall be one of the following approved products.

Product	Manufacturer
Curlex 12-inch Sediment Log	American Excelsior
AEC Premier 12-inch Wattle	American Excelsior
Stenlog 12	Erosion Control Blanket.com
Triangular Silt Dike	Triangular Silt Dike
Aspen Xcel Log	Western Excelsior
Ditch Chexx	Filtress
Bio-D Silt Check	Ro Lanka

PART 3 – EXECUTION**3.1 GENERAL**

- A. Keep disturbed areas to a minimum.
- B. Stabilize and protect disturbed areas with temporary seed and mulch within 14 days of active disturbance of the soil surface.
- C. Place excavated trench material on the high side of the trench where appropriate.
- D. Discharge trench water to filter barrier prior to release into a drainage way.
- E. Install gravel mats at site vehicle entrance and site exit locations to prevent tracking of soil.
- F. Collect tracked soil and clean from paved roads near the construction site the same day it occurs.
- G. Sediment control measures shall be in place at the end of each working day.
- H. Locate soil stockpiles no closer than 25 feet of a roadway, wetland, or drainage control channel and control by covering the pile with tarpaulins, temporary seed and mulch or other suitable means, if the pile is exposed for 14 days or more.
- I. Protect storm inlets including inlets in paved roadways with erosion bales, geotextile fence or other suitable approved barriers.
- J. When it is necessary to cross waterways, provide crossing structures for machinery.
- K. Repair, replace, and maintain erosion and sedimentation structures until vegetation is re-established or permanent structures are installed.
- L. Remove temporary erosion control structures and accumulated sediment and/or debris when vegetation is established.
- M. Erosion control practices shall be as shown on the plans or directed by the Engineer. Additional erosion control practices installed due to the Contractors means and methods will be incidental to the Work.

3.2 EROSION AND SEDIMENT CONTROL DEVICES

- A. Installation of erosion bales shall be done in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1055 "Sediment Bale Barrier (Non-Channel)".
- B. Erosion Bags

1. Place type (sand or rock filled) where shown on the Drawings at a minimum.
2. Place bags end to end across surface water flow path.
3. Place bags at right angles to the direction of water flow.
4. Excavate shallow sump on the upstream side of bags.
5. Entrench bags at least 4 inches into the ground.
6. Place bags prior to disturbing upslope areas.
7. Drive support posts a minimum of 12 inches into the subgrade and extend to the top of the bags.
8. Remove from the site after final stabilization.

C. Inlet Protection

1. Installation of inlet protection shall be done in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1060 "Storm Drain Inlet Protection for Construction Sites".

D. Silt Fences

1. Installation of silt fence shall be done in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1056 "Silt Fence".

E. Erosion Mats

1. Installation:
 - a. See plan details for anchor trench (at ends, checks and edges) installation procedures.
 - 1) Anchor trenches shall be 12" deep.
 - 2) Compact anchor trench backfill.
 - 3) Place staples in end and check trenches spaced at 12 inches.
 - b. Follow manufacturer's specifications and instructions for placement unless project documents are more stringent.
 - c. Roll width overlaps shall be 12" at edges. Pin or staple every 3 feet along overlap length.
 - d. Roll end overlaps may be spliced by overlapping (in the direction of water flow) two feet with the upstream portion of the mat on top of the downstream portion.
This overlap shall receive at least three pins or staples with a maximum spacing of 12".
 - e. Pins or stakes shall be biodegradable with the length based on manufacturer's recommendation
 - f. Pins or stakes shall be driven flush with the mat.
 - g. Place mat flat conforming to contours in soil surface. Do not stretch mat.
 - h. Place mat from toe of slope toward top of slope.
 - i. Mat can be placed from downstream toward upstream or from upstream toward downstream.
2. Site Preparation:
 - a. Place seed and fertilizer prior to placing permanent erosion geomat.
 - b. Seed and fertilizer may be placed after permanent erosion mat installation with Engineer's approval.
 - c. Ground surface shall be smooth and compact.
 - d. Remove all rocks, dirt clods, stumps, roots, grass clumps, trash and other obstructions from lying in direct contact with the soil surface and the erosion mat.

3. Erosion Control Revegetative Mats (ECRM):
 - a. ECRM are placed on top of the soil.
4. Turf Reinforcement Mats (TRM):
 - a. TRM are buried below the surface.
5. Wisconsin Department of Natural Resources:
 - a. Non-Channel erosion mat shall be installed on accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1052 "Non-Channel Erosion Mat".
 - b. Channel erosion mat shall be installed in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1053 "Channel Erosion Mat".

F. Ditch Checks

1. Ditch check work shall be performed in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1062 "Ditch Check (Channel)".

G. Stone Tracking Pad

1. Stone tracking pad work shall be performed in accordance with the Wisconsin Department of Natural Resources Conservation Practice Standard #1057 "Stone Tracking Pad and Tire Washing".

H. Temporary Ditch Checks (TDC) – Sediment Logs

1. TDC shall be capable of maintaining location and form during and after rainfall events.
2. TDC shall be placed at locations shown on the Drawings.
3. Place TDC generally perpendicular to the flow line of the ditch and extend far enough so the ground level on the ends of the TDC are a minimum 18-inches higher than the flow line.
4. Place TDC immediately after road ditch has been backfilled and shaped TDC shall be removed and replaced during subsequent trenching operations in the road ditch area.

3.4 MAINTENANCE

- A. Inspect silt fences and filter barriers immediately after each rainfall and at least daily during prolonged rainfall.
1. Make any required repairs immediately.
 2. Maintain temporary erosion and sedimentation control structures until permanent soil erosion controls are completed and/or vegetation is established.
 - a. Repair damaged structures.
 - b. Replace lost structures.
 - c. Remove sediment from deposition areas adjacent to erosion control structures without damaging structures on a regular basis.
 - d. Refill eroded areas as required for grade stabilization.
- B. If the fabric on silt fence or filter barrier decomposes or becomes ineffective prior to the end of the expected usable life and the barrier still be necessary, replace the fabric promptly.

- C. Remove sediment deposits after each major storm event and when deposits reach approximately one-half the height of the barrier.
- D. Remove any sediment deposits remaining in place after the silt fence or filter barrier is no longer required and dress to conform to the existing grade, prepared and seeded.
- E. Repair/restore any washed out areas.
- F. Maintenance period to be entire project period including the one year warranty.
- G. Owner may direct Contractor to remove the temporary erosion control measures any time during the one year correction period.
- H. Construct permanent erosion control measures immediately after earthwork is completed.

END OF SECTION

SECTION 31 34 19**GEOTEXTILE FABRICS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Geotextile fabric under riprap.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. D4355 Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
 - 2. D4533 Test Method for Trapezoid Tearing Strength of Geotextiles
 - 3. D4491 Test Method for Water Permeability of Geotextiles by Permittivity
 - 4. D4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
 - 5. D4751 Test Method for Determining Apparent Opening Size of a Geotextile
 - 6. D4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

1.3 SUBMITTALS

- A. Provide, at the time of delivery of the geotextile fabric, a manufacturer's Certificate of Compliance that the geotextile fabric meets the requirements of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver geotextile fabric in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion due to shipping and hauling.
- B. Store geotextile fabric in a dry location until installed.

PART 2 – PRODUCTS**2.1 GENERAL**

- A. Provide geotextile fabric consisting of either woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride. All fabric shall have a minimum strength values in the weakest principle direction. Non-woven fabric may be needle punched, heat bonded, resin bonded or combinations thereof.
- B. The geotextile fabric shall be insect, rodent, mildew and rot resistant.

- C. Clearly mark the geotextile fabric rolls showing the type of fabric.
- D. If sewn seams are used, provide a field sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project, prior to incorporation into the work.

2.2 MATERIALS

A. Non-Woven Geotextile Fabric, Type HR

- 1. Type HR non-woven geotextile fabric shall be used beneath heavy riprap, Soil Class A-1 and medium riprap, Soil Class A-2, and light riprap, Soil Class A-3.
- 2. The fabric shall comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength (lbs.)	ASTM D4632	300 min.
Puncture Strength (lbs.)	ASTM D4833	100 min.
Apparent Breaking Elongation (%)	ASTM D4632	15 min.
Apparent Opening Size (U.S. Standard Sieve)	ASTM D4751	30-140
Permittivity, sec. ⁻¹	ASTM D4491	.30 min.

¹ All numerical values represent minimum/maximum average roll values (i.e., the average of minimum test results on any roll in a lot should meet or exceed the minimum specified values).

- 3. The following fabrics are approved for Type HR:
 - a. Amoco (Nilex) -4512
 - b. Cartage – FX-160HS
 - c. Contech – C120NW
 - d. Mirafi – 1120N

PART 3 – EXECUTION

3.1 SEWING

- A. Sew factory and field seams with a thread having the same or greater durability as the material in the fabric.
- B. Use a 401 stitch conforming to Federal Standard No.751 a.
- C. Seams shall develop a tensile strength equal to or greater than 80 percent of the specified grab tensile strength of the fabric, unless otherwise specified.

3.2 NON-WOVEN GEOTEXTILE FABRIC, TYPE HR

- A. Grade the smooth and remove all stones, roots, sticks or other foreign material which would interfere with the fabric being completely in contact with the soil.
- B. Place the fabric loosely and parallel to the direction of water movement.

1. Provide pinning or stapling to hold the geotextile in place.
 2. Join separate pieces of fabric by overlapping or sewing.
 3. Place the fabric in the overlapped joints with minimum overlap of 24 inches in the direction of flow.
- C. After placement, do expose the fabric longer than 48 hours prior to covering.
- D. Cover damaged areas with a patch of fabric using a three-foot overlap in all directions.
- E. Place riprap from the base of the slope upward.
- F. Do not allow free fall of riprap greater than 6 inches or less if required to prevent damage to the fabric.

END OF SECTION

SECTION 32 01 17

CRACK AND JOINT SEALING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Base Preparation – Asphalt and Concrete Pavements
 - 2. Placing and Finishing
 - 3. Traffic Control
 - 4. Clean-up

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

1.3 SUBMITTALS

- A. Submit manufacturer's certification that materials delivered comply with the requirements of this section and the referenced standard.
- B. Submit daily copy of the amount of material of joint sealant delivered and placed.
- C. Submit material manufacturer's recommended melting procedures.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. The material shall be hot pour elastic type. This material shall conform to the requirements of the Specification of Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements, ASTM D6690.
- B. The material shall be as a manufactured by HI-SPEC, CRAFCO, or equal.
- C. Material shall be packaged and shipped in a suitable commercial container clearly marked with:
 - 1. Name of material.
 - 2. The name of the manufacturer.
 - 3. The brand name.
 - 4. Weight.
 - 5. Batch number.

6. Pouring temperature recommended by the manufacturer.

PART 3 – EXECUTION

3.1 BASE PREPARATION – EXISTING ASPHALT AND CONCRETE PAVEMENTS

A. Asphalt Crack Preparation

1. All random or reflective cracks less than ½ inch wide shall be routed out to provide a sealant reservoir ½ inch (12.7mm) wide with a minimum depth ½ inch (12.7mm). This provides for a 1:1 width to depth ratio. Backer rod may be installed in the joint opening to control depth and sealant usage. Routing shall be accomplished by mechanical means and shall be extended 1 inch beyond each end of the crack. All joints and cracks shall be blown clean by compressed air (minimum air pressure, 80 pounds per square inch) with heat lancing and then crackfilled.

B. Asphalt Crackfilling Longitudinal Curb Joints

1. Routing shall be accomplished by mechanical means and shall be extended 1 inch beyond each end of the crack. All joints and cracks shall be blown clean by compressed air (minimum air pressure, 80 pounds per square inch) with heat lancing and then crackfilled.

C. Concrete Crack Preparation

1. All joints and cracks, including curb and gutter, shall be blown clean with compressed air (minimum air pressure, 80 pounds per square inch) with heat lancing and then crackfilled.

3.2 BASE PREPARATION – NEW CONCRETE PAVEMENTS

- A. All contraction and expansion joints in concrete pavement shall be sealed with a hot poured sealer. All sawed longitudinal joints shall be sealed with hot-poured sealer.
- B. The operation of sealing shall be performed as soon as practicable upon elapse of the curing period and in any event prior to the time traffic of any kind uses the pavement.
- C. Joints shall not be sealed until they have been inspected and approved by the engineer.
- D. Application of the joint sealer shall be made when the joint surfaces are clean and dry.
- E. Immediately before sealing the joint thoroughly clean the joints of all laitance, curing compound and other foreign material. Exposed joint faces shall be cleaned by sandblasting, or by water blasting with sufficient pressure to thoroughly and completely clean the joint. A multiple-pass technique shall be used until the surfaces are free of material that might prevent bonding. For final cleaning immediately prior to installation of the sealer, the joints shall be blown clean with oil-free compressed air. The joint faces must be surface dry when sealant is applied.

3.3 PLACING AND FINISHING

- A. The sealant must be melted in a double boiler, oil jacketed melter-applicator equipped with a mechanical agitator pump, gas pressure gauges, separate temperature thermometers for the oil bath, and melted material with accessible control valves and gauges. Follow the melting procedures recommended by the material supplier. Air temperatures are to be at or above 40 degrees F. Prior to the application of sealants, all prepared cracks shall be completely dry. If any moisture is evident on the street surface or vertical walls, the prepared crack application procedure shall be terminated.
- B. Joints shall not be sealed until they have been inspected and approved by the engineer.
- C. The sealing compound shall not be heated above the maximum safe heating temperature. The maximum safe heating temperature shall be determined from tests made on samples from each lot or shipment of the material delivered to the project. When so approved by the Engineer, the manufacturer's recommended maximum safe heating temperature may be used in lieu of test determinations when relatively small quantities of sealer are used. Any material heated above the maximum safe heating temperature shall be discarded.
- D. During periods of rain or inclement weather, crackfilling material shall not be placed without the approval of the Engineer. After the period of rain or inclement weather, all cracks and joints shall be blown clean and dry with compressed air. All joints, cracks and surface defects must be free of any moisture prior to placement of the crackfilling material.
- E. It may be required by the Engineer that Contractors use a backer tape or another acceptable method of sealing the bottom of the reservoir if the joint sealant seeps down into the bottom of the crack, causing a void or low spot in the finished joint.
- F. All completed cracks shall be completely cured prior to allowing traffic to come in contact with sealant. If, with the Engineer's approval, it is necessary to open traffic to partially cured material, an adequate coating of mason sand or household toilet paper would be sufficient.
- G. On concrete streets the joints and cracks shall be pressure filled flush with the surface of the street and the material shall be applied immediately into the prepared crack or joint. On asphalt streets the joints and cracks shall be pressure filled with a wand or bander and squeegeed to a width three (3) times the width of the crack or joint and the material shall be applied immediately following heat lancing of the joints and cracks.
- H. In the event satisfactory sealing of a joint is not accomplished in a single pouring, the sealing compound shall be placed in two pourings. At least one-half of the required amount shall be placed in the first pouring, and the second pouring shall follow the first as soon as practicable after the first pouring has attained maximum shrinkage but not later than one hour after the first pouring. If the additional application is not poured within one hour, the joint/crack shall be re-cleaned at a lower pressure such that the first pour is not removed.

3.4 TRAFFIC CONTROL

- A. The Contractor shall maintain two lanes of traffic at all times on all streets unless approved by the Engineer. Barricades, warning signs and flagmen shall be provided in accordance with the State of Wisconsin Department of Transportation Manual of Traffic Control Devices, latest edition.

3.5 CLEAN UP

- A. All debris shall be kept within the barricaded construction area and shall not be allowed to fall within open traffic lanes. All debris shall be cleaned up prior to the end of the day and prior to the opening of traffic lanes. The Contractor shall properly dispose of such material.

END OF SECTION

SECTION 32 01 20

MUD-JACKING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Mud-Jacking Concrete
 - 2. Mud-Jacking Hole Restoration
 - 3. Clean-up

1.2 REFERENCES (Not Used)

1.3 SUBMITTALS

- A. Grout mix design.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Certified grout mix shall contain a minimum of 7 percent Portland Cement.

PART 3 – EXECUTION

3.1 MUDJACKING CONCRETE

- A. Holes for injecting the grout mix will be spaced not less than 12 inches nor more than 18 inches from a traverse joint or crack and spaced not more than six (6) inches from center of the hole to center of hole.
- B. The grout mix will have a consistency stiff enough to raise the concrete without blowing or leaking, and yet fluid enough to prevent pyramiding.
- C. The hole size for slab raising operations shall be a minimum of one inch (1") up to a maximum of two inches (2") in diameter.
- D. The holes shall be spaced as necessary to uniformly assure complete communication of slurry between holes.
- E. Slabs shall be raised to the required elevation and pitched at one-quarter (1/4) inch per twelve (12) inches of lineal run, or as directed by the Engineer.

3.2 MUD-JACK HOLE RESTORATION

- A. All jacking operation holes will be cleared of the grout mix and filled with a stiff 1:3 cement mix, which will be consolidated and finished smooth.
- B. Holes shall be cleaned the full depth of the slab by removing excess slurry and wire brushing exposed sidewalls.
- C. Prior to placement of the Portland Cement, the surface around the holes shall be damp.

3.3 CLEAN-UP

- A. Slabs raised shall be thoroughly scraped and swept after completion, but prior to patching.
- B. Surrounding grass areas adjacent to slab raising shall be left in a clean, non-debrised condition.

END OF SECTION

SECTION 32 11 23**CRUSHED AGGREGATE BASE COURSE****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Material testing.
 - 2. Foundation preparation.
 - 3. Crushed aggregate base course for roads, shoulders, and parking areas.
 - 4. Preparation of crushed aggregate base course for paving.
 - 5. Adjustment of utility accesses.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. T2 Sampling Stone, Slag, Gravel, Sand, and Stone Block for Use as Highway Materials
 - 2. T27 Sieve Analysis of Fine and Coarse Aggregates
 - 3. T37 Sieve Analysis of Mineral Filler
 - 4. T89 Determining the Liquid Limit of Soil
 - 5. T90 Determining the Plastic Limit and Plasticity Index of Soils
 - 6. T104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- B. American Society for Testing and Materials (ASTM):
 - 1. D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54 kg) Rammer and 18-In. (457 mm) Drop.
 - 2. D6938-07 ASTM D6938-07 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Submit copies of the results of quality control testing (include location where test was done):
 - 1. Materials testing by Contractor:
 - a. Provide source testing report and approval letter from Owner the material was supplied.
- B. Submit daily one copy of weight tickets showing the net weight for each truckload of crushed aggregate base material delivered and placed.

1.4 QUALITY ASSURANCE

- A. The Engineer will obtain an independent testing laboratory to provide quality control testing.

1.5 DELIVERY, STORAGE AND HANDLING**A. Stockpiling of Aggregates**

1. Store aggregates to prevent contamination by foreign matter or by aggregates of different sizes.

B. Delivery of Aggregates

1. Vehicles used to transport aggregates shall be of a type to minimize loss of materials and excessive segregation of particles.

PART 2 – PRODUCTS**2.1 MATERIALS****A. Aggregates**

1. Aggregates shall consist of hard, durable particles of crushed stone or crushed gravel and a filler of natural sand, stone sand or other finely divided mineral matter.
 - a. Remove oversize material by screening or by crushing to required sizes.
 - b. Composite material shall be free from organic matter, shale, and lumps or balls of clay and shall conform to the gradation requirements below.
2. Liquid Limit and Plasticity Index:
 - a. Aggregate including any blended filler shall have a liquid limit of not more than 25 and a plasticity index of not more than 6.
3. Fracture Count:
 - a. At least 58 percent of particles retained on the No. 4 sieve shall have at least one fractured face.
4. Soundness:
 - a. When the fraction of aggregate retained on the No. 4 sieve is subjected to five cycles of the sodium sulfate soundness test, weighted loss shall not exceed 18 percent by weight.
5. Filler for Blending:
 - a. Additional mineral filler required to meet gradation requirements or for satisfactory binding of material shall be uniformly blended with base course material at the screening plant.
 - b. Mineral fillers shall be free from agglomerations or lumps and shall contain not more than 15 percent of material retained on a No. 4 sieve.
6. Moisture Content: Shall not exceed 7 percent.

B. Aggregate base course material produced from crushed concrete conforming to section 31 05 10 and this section shall be permitted if the material is from the project site or if allowed in the project manual.**C. Aggregate Gradation Requirements**

1. Gradation No. 2 (1½ inch material):

Sieve Size	% By Weight Passing	
	Crushed Gravel	Crushed Stone or Concrete
1 ¼ inch	95-100	95-100
¾ inch	70-93	70-93
3/8 inch	45-80	45-80
No. 4	30-63	30-63
No. 10	20-48	20-48
No. 40	8-28	8-28
No. 200	4-10(1)	2-12(1)

(1) Limited to 8.0 percent for base placed between new and old pavement.

2. Gradation No. 3 (¾ inch material):

Sieve Size	% By Weight Passing	
	Crushed Gravel	Crushed Stone or Concrete
1 inch	100	100
¾ inch	95-100	95-100
3/8 inch	50-90	50-90
No. 4	35-70	35-70
No. 10	15-55	15-55
No. 40	10-35	10-35
No. 200	8-15	5-15

2.2 SOURCE QUALITY CONTROL

A. Test aggregate material per the following requirements:

1. Sampling: AASHTO T2.
2. Sieve Analysis:
 - a. AASHTO T27 for aggregates including fracture count.
 - b. AASHTO T37 for mineral fillers.
3. Liquid Test: AASHTO T89.
4. Plasticity Index: AASHTO T90.
5. Soundness: AASHTO T104 using sodium sulfate.

PART 3 – EXECUTION

3.1 PREPARATION OF FOUNDATION

- A. Preparation of foundation for crushed aggregate base course shall be in accordance with requirements of Section "Excavation and Fill".
- B. Do not place the base course on a foundation that is soft or spongy or one that is covered by ice or snow.
- C. Do not place base material on a dry or dusty foundation when existing condition would cause rapid dissipation of moisture from base material and hinder or preclude its proper compaction.

1. Apply water to such dry foundations and rework or recompact as necessary.

3.2 CRUSHED AGGREGATE BASE COURSE INSTALLATION

A. Use gradations as follows:

1. Base course: Gradation No. 2
2. Top 3 inch layer of shoulders and aggregate driveways: Gradation No. 3

B. Construct crushed aggregate base course to the width, thickness, section and location shown on the drawings.

1. Maximum compacted thickness of any one layer shall not exceed 6 inches for 1¼ or ¾ inch material; 9 inches for 3 inch material.
 - a. When multiple courses are required, they shall be composed of approximately equal thicknesses.

C. Spreading Base Material

1. Proceed with the work such that the hauling equipment will travel over the previously placed material.
2. Route hauling equipment as uniformly as possible over all portions of the previously constructed layers of the base course.
3. Deposit the material on the foundation or previously placed layer in such a manner as to minimize segregation and to facilitate spreading to a uniform layer of the required dimensions.

D. Compaction

1. After a layer of aggregate has been placed and spread to the required thickness, width, and section, it shall be compacted.
2. If the material is deficient in moisture content, to attain the required density, add necessary moisture during compaction operations by means which provides a uniform application.
3. Each layer or course placed shall be compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D1557).
4. Areas where proper compaction is not obtainable due to segregation of materials, excess fines or other deficiencies shall be reworked or removed and replaced with material that will yield the desired results.
5. Prior to and during compaction operations, shape and maintain the material to the proper dimensions.

E. Maintenance

1. Provide maintenance of the base course until surface paving is complete or until the base is otherwise accepted.

F. Dust Abatement

1. Minimize the dispersion of dust from the base course by the application of water or other approved dust control materials.

G. Preparation of Base for Paving

1. The preparation of crushed aggregate base courses for paving shall include all necessary scarifying, shaping, and compacting to provide the required cross-sectional contour, a profile free from abrupt changes in elevation, and a surface free from pits, holes, depressions, or projections above the normal surface.
2. Remove any standing or ponded water, and ice or snow from the base before paving begins.

3.3 ADJUSTING UTILITY ACCESSES

- A. Adjust existing sanitary and storm manholes to proposed finished street grade.
- B. Adjust existing water valve boxes to proposed finished street grade.

END OF SECTION

SECTION 32 11 26.16

PULVERIZED ASPHALT AND AGGREGATE BASE COURSE

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Material testing.
 - 2. Foundation preparation.
 - 3. Pulverize asphalt and aggregate base course installation.

1.2 REFERENCES

- A. Wisconsin Department of Transportation Section 325

1.3 QUALITY ASSURANCE

- A. The Engineer will obtain an independent testing laboratory to provide quality control testing.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Stockpiling of Aggregates
 - 1. Store aggregates to prevent contamination by foreign matter or by aggregates of different sizes.
- B. Delivery of Aggregates
 - 1. Vehicles used to transport aggregates shall be of a type to minimize loss of materials and excessive segregation of particles.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. The maximum allowable recycled asphalt pavement (RAP) content in the salvaged material is 50%. This will be based on pulverizing depths. If RAP is above 50%, blending with virgin aggregate material will be required.
- B. 97% or more of RAP will pass a 2-inch sieve.

PART 3 – EXECUTION

3.1 PREPARATION OF FOUNDATION

- A. Pulverize the full depth (shown on plans or elsewhere) of the existing asphaltic pavement and aggregate until 97 percent or more will pass the 2-inch sieve. Windrow material as construction operations dictate.
- B. Preparation of foundation for pulverized asphalt and aggregate base course shall be in accordance with requirements of Section "Excavation and Fill".
- C. Do not place the base course on a foundation that is soft or spongy or one that is covered by ice or snow.
- D. Do not place base material on a dry or dusty foundation when existing condition would cause rapid dissipation of moisture from base material and hinder or preclude its proper compaction.
 - 1. Apply water to such dry foundations and rework or re-compact as necessary.

3.2 PULVERIZE ASPHALT AND AGGREGATE BASE COURSE INSTALLATION

- A. Construct surface base course to the width, thickness, section, and location shown on the drawings.
 - 1. Maximum compacted thickness of any one layer shall not exceed 8 inches.
- B. Spreading Base Material
 - 1. Proceed with the work such that the hauling equipment will travel over previously placed material.
 - 2. Route hauling equipment as uniformly as possible over all portions of the previously constructed layers of the base course.
 - 3. Deposit the material on the foundation or previously placed layer in such a manner as to minimize segregation and to facilitate spreading to a uniform layer of the required dimensions.
- C. Compaction
 - 1. After a layer of aggregate has been placed and spread to the required thickness, width, and section, it shall be compacted.
 - 2. Compact the re-laid material first with either a rubber tired roller or 12.5-ton or heavier vibratory padfoot roller and second with an 8-ton or heavier vibratory steel roller. Add water, as required, both before and during compaction.
 - 3. Each layer or course placed shall be compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTMD1557).
 - 4. Areas where proper compaction is not obtainable due to segregation of materials, excess fines or other deficiencies shall be reworked or removed and replaced with material that will yield the desired results.
 - 5. Prior to and during compaction operations, shape and maintain the material to the proper dimensions.

D. Maintenance

1. Provide maintenance of the base course until surface paving is complete or until the base is otherwise accepted.

E. Dust Abatement

1. Minimize the dispersion of dust from the base course by the application of water or other approved dust control materials.

END OF SECTION

SECTION 32 12 16

ASPHALTIC CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Sampling and Testing Requirements
 - 2. Surface Preparation
 - 3. Asphaltic Concrete Paving

1.2 REFERENCES

- A. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, and all supplemental and interim supplemental specifications, as they may pertain, except the items: method of measurement and basis of payment shall not apply.

1.3 SUBMITTALS

- A. Submit copies of each asphaltic concrete mix design proposed for the project.
- B. Submit daily one (1) copy of weight tickets showing the net weight for each truckload of asphaltic concrete delivered and placed.

1.4 QUALITY ASSURANCE

- A. The City will perform density testing.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store asphalt cement in tanks free of foreign substances and caked asphalt.
- B. Stockpile aggregate to prevent excessive segregation.
- C. Storage period for hot mix shall not exceed 2 hours.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Conform to WisDOT Standard Specifications for Highway and Structures Construction Sections 450, 455, and 460.

2.2 EQUIPMENT

- A. All equipment shall conform to WisDOT Standard Specifications for Highway and Structure Construction Section 450.

2.3 SOURCE QUALITY CONTROL TESTING

- A. Materials to be tested:
 - 1. Aggregate.
 - 2. Asphaltic concrete mix design confirmation.
- B. Tests for source quality control testing shall be in accordance with WisDOT Standard Specifications for Highway and Structures Construction Sections 450, 455 and 460.

PART 3 – EXECUTION**3.1 SURFACE PREPARATION**

- A. Prepare a compacted foundation in accordance with Section "Crushed Aggregate Base Course".
- B. For existing pavement remove the following asphalt:
 - 1. Localized areas which tend to ravel, shove, or bleed.
 - 2. Areas unsuitable as a base.
 - 3. Unstable patching.
- C. Remove loose concrete and protruding joint material.
- D. Clean surface and joints of foreign material, e.g. dust, dirt, water, vegetation, etc.
- E. Control weeds with herbicide conforming to governing state or local authority, rules and regulations.
- F. Apply tack coat on existing surfaces and between layers at minimum rate of 0.05 to 0.07 gallon per square yard after dilution.
- G. Fill potholes and depressions with a leveling course of asphaltic concrete mix compacted to required density of surface course.
- H. Adjust and reset the casting after placing the binder course and prior to placing the surface course.

3.2 MIX PREPARATION

- A. Aggregates
 - 1. Separate into three sizes as defined under mix uniformity.

2. Store in separate bins until proportioned into mix.
3. When fillers are required, add through separate bin and feed.
4. Dry and heat aggregate.
5. Feed aggregate into mixer within 15°F plus or minus of required discharge temperature.

B. Asphalt Cement

1. Feed asphalt cement into mixer within 25°F plus or minus of required discharge temperature.

C. Mix Uniformity

1. Design mix tolerance (plus or minus):
 - a. Aggregates passing No. 4 and larger sieves: 6 percent.
 - b. Aggregates passing No. 4 and No. 100 sieves (inclusive): 4 percent.
 - c. Aggregates passing No. 200 sieves: 2 percent.
 - d. Bituminous Material: 0.4 percent.
2. Irrespective of tolerances, gradations shall be within the master range defined under aggregate gradation of this section.

3.3 ASPHALTIC CONCRETE INSTALLATION

A. Do not place asphaltic concrete pavement when following conditions exist:

1. Unstable or frozen base.
2. During rain or snow.
3. When air temperature is less than 35°F (1.5°C).

B. Place to thickness, grade, section and location shown on the Drawings.

1. When thickness of the lifts is not shown, thickness shall be 2 inches compacted.
2. Finished surface shall be a true plane of 1/8 inch in 10 feet.

C. Establish course thickness by placing in layers in accordance with WisDOT Standard Specifications Section 460.

D. Hand Spreading

1. Permitted only in areas inaccessible to finishing machines.
2. Place by means of a shovel and shape with rake or lute.
3. Do not rake over machine spread surfaces.

E. Compaction

1. Roll as soon as mixture will support roller without displacing or hair line cracking:
 - a. Initial pass shall be with drive roller toward paver.
 - b. Start at center and continue toward either edge.
 - c. Overlap successive trips.
2. Subsequent strips laid shall start adjacent to previous laid strip and continue to opposite edge.
3. Roll until:

- a. Roller marks are eliminated.
- b. Surface is of uniform density.
- c. Required density is obtained.

F. Bonding Joints

- 1. Clean all joints.
- 2. When joining new asphaltic concrete pavement to existing asphaltic concrete pavement, saw cut joints and tack coat.
- 3. When joining new asphaltic concrete pavement to new asphaltic concrete pavement, saw cut end joints and tack coat cold joints.
- 4. Milled joints may be acceptable if approved by the Engineer.

G. Replace pavement full lane width with all joints saw cut and tacked when:

- 1. Minimum density is not met.
- 2. Minimum asphalt content is not met.
- 3. There is significant segregation, raveling, rutting, or deformation.

3.4 FIELD QUALITY CONTROL

A. Density Testing

- 1. Perform by nuclear method in accordance with ASTM D2950.
- 2. Fifteen per production day or fifteen per 4,500 square yards placed, whichever number is greater.
- 3. Minimum density required shall be in accordance with WisDOT Standard Specifications Section 460.

END OF SECTION

SECTION 32 13 13**PORTLAND CEMENT CONCRETE PAVEMENT****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Sampling and testing requirements.
2. Surface preparation.
3. Portland cement concrete paving.

1.2 REFERENCES**A. American Association of State Highway and Transportation Officials (AASHTO):**

1. M148 Liquid Membrane-Forming Compounds for Curing Concrete
2. M153 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
3. M171 Sheet Materials for Curing Concrete
4. M182 Burlap Cloth Made from Jute or Kenaf
5. M213 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
6. M254 Corrosion Resistant Dowel Bars

B. American Society for Testing and Materials (ASTM):

1. A184 Spec. for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
2. A185 Spec. for Welded Steel Wire Fabric for Concrete Reinforcement
3. A615 Spec. for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. A617 Spec. for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
5. C31 Making and Curing Concrete Test Specimens in the Field
6. C33 Standard Specification for Concrete Aggregates
7. C39 Test for Compressive Strength of Cylindrical Concrete Specimens
8. C94 Spec. for Ready-Mixed Concrete
9. C143 Test for Slump of Portland Cement Concrete
10. C172 Sampling Fresh Concrete
11. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
12. C309 Standard Specifications for Liquid Membrane – Forming Compounds for Curing Concrete
13. C1315 Spec. for Liquid Membrane-Forming Compounds Having Special properties for Curing and Sealing Concrete
14. C920 Spec. for Elastomeric Joint Sealants
15. D1751 Spec. for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

16. D1752 Spec. for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
 17. D3405 Spec. for Joint Sealants, Hot-Poured for Concrete and Asphalt Pavements
 18. E329 Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
- C. American Association of State and Highway Transportation Officials
1. T96 Standard Method of Test for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine
 2. T013 Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
 3. T104 Standard Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- D. Wisconsin Department of Transportation (WisDOT), State of Wisconsin Standard Specifications for Highway Construction, Latest Edition (State Specifications)

1.3 SUBMITTALS

- A. Design Mixes
1. Submit copies of the composition and strength testing results for design mix for each type of concrete.
 2. Manufacturer's certification of the curing compound.
- B. Certificates
1. Provide producer's certification that the supplied materials meet the applicable specification requirements.
 2. Provide the material content per cubic yard for each class of concrete furnished.
 - a. Dry weight of concrete.
 - b. Saturated surface-dried weights of fine and coarse aggregates.
 - c. Quantity, type, and name of any admixtures used.
 - d. Weight of water.
 3. Provide delivery tickets for each truck at the time of pour.
 - a. Delivery tickets are not required for job-mixed concrete.
- C. Samples
1. Provide all material samples needed for the required testing.
 2. The Engineer will create and test concrete cylinders.

1.4 QUALITY ASSURANCE/QUALITY MANAGEMENT PLAN

- A. General Requirements
1. Provide a Quality Management Plan (QMP) conforming to the WisDOT State Specifications based on the size of the project.
 2. Small Quantity projects for class I is defined as follows:

- a. Less than 150 cubic yards of structure concrete placed under a single bid item.
 - b. Less than 2500 cubic yards of slip-formed pavement placed using a single mix design.
 - c. Less than 1000 cubic yards of non-slipped formed pavement placed using a single mix design.
- B. Small Quantity Project Requirements
1. Installation testing to be completed by the Owner includes the following:
 - a. Slump
 - b. Air-entrainment
 - c. Compressive strength test
 2. Other testing per the WisDOT State Specification Sections 415 is to be completed by the Contractor including:
 - a. Probing method for depth on slipped form pavement per Section 415.3.16.4.2.
 - b. Surface Testing and Correction per 415.3.10.
 3. Submit an abbreviated QMP per the WisDOT State Specification Sections 710.2.2 (2) and (3) and 710.2.
 - a. Eliminate sections regarding measurement and payment and incentive and disincentive based on the results.
 4. Additional tests may be conducted by the Contractor for those conducted by the Owner.
- C. Large Quantity Projects
1. Installation testing to be completed by the Owner includes the following:
 - a. Slump
 - b. Air-entrainment
 - c. Compressive strength test
 2. Other testing per the WisDOT State Specification Sections 415 is to be completed by the Contractor including:
 - a. Probing method for depth on slipped form pavement per Section 415.3.16.4.2.
 - b. Surface Testing and Correction per 415.3.10.
 3. Modify the WisDOT QMP for concrete pavement based on the following:
 - a. Arrange one pre-pour meeting to discuss concrete placement.
 - b. Number of compressive strength tests to be as noted below.
 - c. Eliminate sections regarding measurement and payment and incentive and disincentive based on the results.
- D. Compressive Strength Testing
1. Small Quantity Projects
 - a. Tests to be taken for each 200 cubic yards of concrete placed or at least once each day for each design mix.
 - b. Test one cylinder at 7 days.
 - c. Test two cylinders at 28 days.
 - d. Remaining cylinder will be tested in the event a prior test fails.
 2. Large Quantity Projects
 - a. Tests to be taken for each 500 cubic yards of concrete placed or at least once for each ½ day for each mix.

3. 28 Day Test Requirements
 - a. Compressive strength is 4,000 psi.
 - b. No individual test falls more than 500 psi below specified compressive strength.
 - c. If differential strengths of the two specimens is 350 psi or greater, the low strength specimen shall be discarded and the strength of the remaining cylinder shall then be the test result. If the test is below 3500 psi, the test is considered a failure. Also, if either of the two 28 day specimens falls below 3000 psi, the test result is considered a failure.
4. Failure of compressive strength tests shall result in the following additional testing:
 - a. Provide two core samples of each portion of work affected and perform compressive strength tests.
 - b. Replace work if core samples do not equal or exceed specified compressive strength
 - c. Additional testing shall be completed at the Contractor's expense, including traffic control to perform and replace nonconforming work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Concrete

1. Conform to the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition.
 - a. Class I concrete
 - b. Twenty-eight day compressive strength: 4,000 psi
 - c. Air entrainment:
 - 1) Slip-formed concrete – 7.0 percent, +/- 1.5 percent
 - 2) Other concrete – 6.0 percent, +/- 1.5 percent
 - d. Slump:
 - 1) 2.5 inch or less – Slip-formed
 - 2) 4.0 inch or less – Non Slip-formed

B. Aggregates

1. Conform to WisDOT State Specifications
 - a. Slip formed concrete aggregate shall conform to Soil Class A-6 (1 1/2-Inch Crushed Rock) (WisDOT Size No. 2 Aggregate per 501.2.5.4.5)
 - b. Hand formed concrete aggregate shall conform to either:
 - 1) Soil Class A-7 (3/4-Inch Crushed Rock) (WisDOT Size No. 1 Aggregate per 501.2.5.4.5)
 - 2) Soil Class A-6 (1 1/2-Inch Crushed Rock) (WisDOT Size No. 2 Aggregate per 501.2.5.4.5)
2. Conform to ASTM C33.
3. Aggregate Wear: Loss of abrasion and impact shall not exceed 50 percent by mass (AASHTO T96)
4. Aggregate Soundness: The weighted average sodium sulfate loss shall not exceed 12 percent by mass (AASHTO T104)
5. Freeze-Thaw: The weighted average loss shall not exceed 18 percent by mass (AASHTO T103)

C. Reinforcement

1. Conform to the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition.

D. Joint Sealing

1. Concrete pavement joint material shall conform to Section 32 01 17, Crack and Joint Sealing.

E. Curing Material

1. Furnish linseed oil based curing compound conforming to ASTM C309.
 - a. Linseed oil emulsion shall consist of, by volume exclusive of the pigment, 50 +/- 4 percent linseed oil and 50 +/- 4 percent water. Ensure that the oil phase is, by weight, 80 percent boiled linseed oil and 20 percent viscosity (Z-8) linseed oil.
 - b. ASTM C309 shall be modified to waive the drying time.

2.2 EQUIPMENT

A. Concrete Spreader

1. Shall be capable of striking off the surface of the concrete in a longitudinal direction of the slab at any required elevation.

B. Slip-Form Paver

1. Shall be designed to consolidate, screed, and float-finish freshly placed concrete in one complete pass.
2. Shall be equipped to vibrate the concrete for the full width and depth of course.
3. Machine design shall prevent the spreading or slumping of the concrete.

C. Finishing Machine (for Formed Pavement)

1. Shall be of the screeding and troweling type, equipped with at least two oscillating transverse screeds, adjustable tilt, and crown.
2. Machine shall be capable of striking off and consolidating concrete.

D. Vibrators

1. May be pan type or the internal type with immersed tube or multiple spuds.
2. Frequency Requirements:
 - a. Pan Type: 4,000 impulses per minute minimum.
 - b. Internal Type:
 - 1) Tube Vibrators: 5,000 impulses per minute minimum.
 - 2) Spud Vibrators: 7,000 impulses per minute minimum.

2.3 SOURCE QUALITY CONTROL

A. Material Acceptance Testing

1. Design mix.

- B. Perform additional testing under the following circumstances:
 - 1. Material failure.
 - 2. Change in ready-mix source.
 - 3. Design mix changes requested by Contractor.

PART 3 – EXECUTION

3.1 PRE-POUR MEETING

- A. Attend a pre-pour meeting prior to construction with a slip form paver for each paving event, as determined by the Engineer.

3.2 BASE PREPARATION

- A. Prepare in accordance with the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition.
- B. Before placing concrete:
 - 1. Remove loose material from compacted base.
 - 2. Proof-roll prepared base surface to check for unstable areas and the need for additional compaction.
 - 3. Correct any deficiencies prior to paving.
 - 4. Adjust all fixtures (i.e., castings, frames, inlets, and valve boxes) per City standards
 - 5. Moisten the compacted base as required to prevent the base from removing water from the placed concrete.

3.3 PLACING AND FINISHING CONCRETE

- A. Place and finish in accordance with the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition.
- B. Provide a concrete stamp per the detail.
- C. All concrete joints shall be sealed.

3.4 CONCRETE CORES

- A. Concrete cores completed by the Contractor shall be repaired with like material as approved by the Engineer.

3.5 CONCRETE WORK WARRANTY

- A. Work shall be warrantied for a period of one year after substantial completion covering;
 - 1. Transverse cracking.
 - 2. Spalling.

3. Popouts.
4. Other detrimental impacts related to workmanship.

B. Cost for repairs and traffic control shall be the responsibility of the Contractor.

3.6 OPENING ROADWAY TO TRAFFIC

- A. If additional strength tests are required to open the roadway to traffic prior to the 7-day break, the contractor shall cast cylinders to verify compressive strengths of 3000 pounds per square inch. Submit the compressive strength test results to the Engineer for verification. Compute the opening strength as the average of compressive strength test results for 2 cylinders. If the strength of a cylinder is less than 90 percent of the required strength, the Engineer will reject the resulting average.
- B. For concrete patches completed with high early strength concrete, the Engineer will complete a 3-day cylinder break to check strength prior to opening the roadway to traffic.

END OF SECTION

SECTION 32 16 13**CONCRETE CURB AND GUTTER****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Fine grading and compaction of subgrade.
2. Curb and gutter construction.
3. Backfilling and finish grading.
4. Landscaping.

1.2 REFERENCES**A. American Concrete Institute (ACI)**

1. ACI 305 Recommended Practice for Hot Weather Concreting
2. ACI 306 Recommended Practice for Cold Weather Concreting

B. American Society for Testing and Materials (ASTM):

1. A615 Spec. for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
2. C31 Making and Curing Concrete Test Specimens in the Field
3. C33 Spec. for Concrete Aggregate
4. C39 Test for Compressive Strength of Cylindrical Concrete Specimens
5. C94 Spec. for Ready-Mixed Concrete
6. C143 Test for Slump of Portland Cement Concrete
7. C150 Spec. for Portland Cement
8. C172 Sampling Fresh Concrete
9. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method
10. C309 Standard Specifications for Liquid Membrane – Forming Compounds for Curing Concrete
11. C1315 Spec. for Liquid Membrane-Forming Compounds Having Special properties for Curing and Sealing Concrete
12. D1557 Test Methods for Moisture-Density Relations of Soils and Soils-Aggregate Mixtures Using 10-Lb. (4.54 Kg) Rammer and 18-In. (457 mm) Drop
13. D1751 Spec. for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
14. E329 Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction

- C. American Association of State and Highway Transportation Officials
 - 1. T96 Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 2. T013 Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
 - 3. T104 Standard Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- D. Wisconsin Department of Transportation (WisDOT), State of Wisconsin Standard Specifications for Highway Structure Construction, Latest Edition (State Specification)

1.3 SUBMITTALS

- A. Concrete design mix of composition and strength testing results for design mix for each type of concrete.
- B. Producer's certification that the supplied materials meet the applicable specification requirements.
- C. Manufacturer's certification of the curing compound.

1.4 QUALITY ASSURANCE/QUALITY MANAGEMENT PLAN

- A. General Requirements
 - 1. Provide a Quality Management Plan (QMP) conforming to the WisDOT State Specifications for Class II concrete
- B. Testing to be completed as follows:
 - 1. Installation Testing by Owner:
 - a. Slump.
 - b. Air-entrainment.
 - c. Compressive strength test.
 - 2. Other testing per the WisDOT State Specification is to be completed by the Contractor.
 - 3. Additional tests may be conducted by the Contractor for those conducted by the Owner.
- C. The following shall be in accordance with the stated State Specifications and references:
 - 1. Inspection and Testing: ASTM E329.
 - 2. Sampling: ASTM C172.
 - 3. Slump: ASTM C143.
 - 4. Air-Entrainment: ASTM C231.
 - 5. Compressive Strength Test: ASTM C31 and C39.
- D. Compressive strength test shall consist of four standard test cylinders made from a single batch of concrete:
 - 1. Tests to be taken for each 200 cubic yards of concrete placed or at least once each day.

2. Test one cylinder at 7 days.
3. Test two cylinders at 28 days.
4. Remaining cylinder shall be tested in the event prior tests fail.
5. 28 Day Test Requirements:
 - a. Compressive strength is 4,000 psi.
 - b. No individual test falls more than 500 psi below specified compressive strength.
 - c. If differential strengths of the two specimens is 350 psi or greater, the low strength specimen shall be discarded and the strength of the remaining cylinder shall then be the test result.
 - d. If the test result is below 3500 psi, the test is considered a failure. Also, if either of the two 28 day specimens falls below 3000 psi, the test result is considered a failure.
6. Failure of compressive strength tests shall result in following additional testing:
 - a. Provide two core samples of each portion of work affected and perform compressive strength tests.
 - b. Replace work if core samples do not equal or exceed specified compressive strength.
 - c. Additional testing shall be completed at the Contractor's expense.

PART 2 – PRODUCTS

2.1 CONCRETE

- A. Conform to ASTM C94, WisDOT State Specifications, and the following:
 1. Class II concrete
 2. Twenty-eight Day Compression Strength: 4000 psi.
 3. Aggregate shall conform to either of the following:
 - a. Soil Class A-7 (3/4-Inch Crushed Rock) (WisDOT Size No. 1 Aggregate per 501.2.5.4.5)
 - b. Soil Class A-6 (1 1/2-Inch Crushed Rock) (WisDOT Size No. 2 Aggregate per 501.2.5.4.5)
 4. Minimum Cement Content: 6 bags/c.y.
 5. Air entrainment:
 - a. Slip-formed concrete – 7.0 percent, +/- 1.5 percent
 - b. Other concrete – 6.0 percent, +/- 1.5 percent
 6. Maximum Water-Cement Ratio: .44
 7. Slump:
 - a. 2.5 inch or less – Slip-formed
 - b. 4.0 inch or less – Non slip-formed
- B. Admixtures to lower freezing point of concrete are not permitted.

2.2 CEMENT

- A. Conform to ASTM C150, Type 1.

2.3 AGGREGATES

- A. Conform to WisDOT State Specifications

- B. Conform to ASTM C33.
- C. Aggregate Wear: Loss of abrasion and impact shall not exceed 50 percent by mass (AASHTO T96)
- D. Aggregate Soundness: The weighted average sodium sulfate loss shall not exceed 12 percent by mass (AASHTO T104)
- E. Freeze-Thaw: The weighted average loss shall not exceed 18 percent by mass (AASHTO T103)

2.4 EXPANSION JOINT

- A. Conform with ASTM D1751.
- B. Thickness: $\frac{3}{4}$ inch

2.5 REINFORCEMENT BAR

- A. Conform with WisDOT Standard Specifications for Highway Construction, Latest Edition, Section 505.
- B. Grade 60.
- C. Minimum Bar Size: #4, Epoxy Coated

2.6 CURING MATERIALS

- A. Furnish linseed oil based curing compound conforming to ASTM C309.
 - 1. Linseed oil emulsion shall consist of, by volume exclusive of the pigment, 50 +/- 4 percent linseed oil and 50 +/- 4 percent water. Ensure that the oil phase is, by weight, 80 percent boiled linseed oil and 20 percent viscosity (Z-8) linseed oil.
 - 2. ASTM C309 shall be modified to waive the drying time.

2.7 CRUSHED AGGREGATE BASE MATERIAL

- A. Aggregates shall consist of hard, durable particles of crushed stone or crushed gravel and a filler of natural sand, stone sand or other finely divided mineral matter.
 - 1. Remove oversize material by screening or by crushing to required sizes.
 - 2. Composite material shall be free from organic matter, shale, and lumps or balls of clay and shall conform to the gradation requirements below.
- B. Liquid Limit and Plasticity Index
 - 1. Aggregate, including any blended filler, shall have a liquid limit of not more than 25 and a plasticity index of not more than 6.

- C. Fracture Count
 - 1. At least 45 percent of particles retained on the No. 4 sieve shall have at least one fractured face.
- D. Soundness
 - 1. When the fraction of aggregate retained on the No. 4 sieve is subjected to five cycles of the sodium sulfate soundness test, weighted loss shall not exceed 18 percent by weight.
- E. Filler for Blending
 - 1. Additional mineral filler required to meet gradation requirements or for satisfactory binding of material shall be uniformly blended with base course material at the screening plant.
- F. Moisture content shall not exceed 7 percent.
 - 1. Additional mineral filler required to meet gradation requirements or for satisfactory binding of material shall be uniformly blended with base course material at the screening plant.
 - 2. Mineral fillers shall be free from agglomerations or lumps and shall contain not more than 15 percent of material retained on a No. 4 sieve.
- G. Aggregate Gradation Requirements shall conform to C-2 or C-4 from Soils and Aggregate.

PART 3 – EXECUTION

3.1 PREPARATION OF SUBGRADE

- A. Prepare the subgrade by excavating to the lines, grades, and cross-sections shown on the drawings as required for placing curb and gutter.
- B. If subgrade excavation in cut is required, stockpile the surplus material for use in fill areas behind the curb and gutter, or dispose of at a site provided by the Contractor.
- C. If subgrade excavation in fill is required, then furnish, install, and compact granular sub-base material.
 - 1. Sub-base material shall be Soil Class C-2 or C-4 or suitable material from cut areas.
- D. Compact to minimum 95 percent modified proctor density (ASTM D1557).

3.2 PLACING AND GRADING BASE COURSE

- A. Provide a minimum of 6 inches of base material.
- B. The subgrade shall be prepared by fine grading to the lines, grades, and cross-sections shown on the drawings as required for placing the curb and gutter.
- C. Compact to minimum 95 percent modified proctor density (ASTM D1557).

3.3 CATCH BASINS/INLETS

- A. Adjust catch basins/inlets to curb and gutter elevation per City standards.

3.4 FORMS

- A. Conform to ACI 347.
- B. Provide forms of the size and type of material required to properly construct the curb and gutter as required.
- C. Properly brace or tie together forms to maintain position and shape.
- D. Clean and coat forms with clear, non-staining mineral or paraffin base form oil prior to placement of the concrete against the forms.
- E. Removal of Forms
 - 1. The forms may be removed provided the concrete obtains sufficient strength so as not to be damaged and will retain its shape.
 - 2. Protect the curb and gutter until the concrete has attained design strength.

3.5 SLIPFORM CONSTRUCTION

- A. The use of slipform equipment will be acceptable.
- B. Coordinate the operations of mixing, delivering, and placing of the concrete to provide uniform progress with minimum stopping and starting of the curb machine.
- C. The curb machine shall be capable of placing the specified curb and gutter section with an adequate amount of vibration to preclude the possibility of honeycomb formation.

3.6 ENVIRONMENTAL CONSTRUCTION

- A. Hot Weather Concreting
 - 1. Follow ACI 305 whenever mean surrounding air temperature equals or exceeds 80°F (27°C).
 - 2. Do not place concrete whenever air temperature equals or exceeds 90°F (32°C).
- B. Cold Weather Concreting
 - 1. Follow ACI 306 whenever mean surrounding air temperature is below 40°F (4.5°C).
- C. Do not place concrete during rain, sleet, or snow unless protection is provided.

3.7 PLACING CONCRETE

- A. Construct curb and gutter to match the dimensions shown in the details.

- B. Construct curb and gutter on the prepared and moistened foundation in one course.
- C. Construct curb and gutter to the required lines and grades as shown on the drawings.
- D. Place concrete by using the slipform or fixed form method.
- E. Use mechanical vibration for concrete with slump less than or equal to two (2) inches. After consolidation strike off, and finish to the required section.
- F. Contraction Joints
 1. Provide joints at 10-foot intervals.
 2. Create contraction joints by sawing or forming an induced plane of weakness at least two (2) inches deep.
 3. If sawing, perform as soon as practicable after concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracks occur.
- G. Place expansion joints as follows:
 1. 300 feet maximum spacing on tangent sections.
 2. Where radial curb and gutter meet tangent sections.
 3. Adjacent to existing expansion joints in abutting concrete paving.
 4. Three (3) feet from inlets.
 5. Place at right angles to the flow line and surface of the gutters.
- H. Place depressions for handicapped ramps and driveways as required and shown on the drawings.
- I. Place a concrete stamp per the detail.

3.8 REINFORCEMENT

- A. Install two (2) - twenty (20) foot long number four (4) deformed reinforcement bars over all trenches that fall under any portion of the Concrete Curb & Gutter being constructed. The Engineer will determine the location of all deformed reinforcement bars.
- B. Install two (2) number four (4) epoxy coated deformed reinforcement bars, 12 inches long between new and existing slabs. The bars shall be drilled six inches into the existing concrete slab.

3.9 FINISHING

- A. Finish in accordance with the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition
- B. Thoroughly trowel and brush or lightly broom the face surfaces of the curb and gutter prior to concrete set.

- C. Round exposed edges of the curb and gutter to $\frac{1}{4}$ inch radius, both front and back, and edges adjacent to expansion joints.
- D. Pointed with mortar composed of three parts sand and one part Portland cement honeycombed areas as soon as possible after the curb and gutter has been placed.

3.10 CURB RAMPING

- A. Provide depressed and sloped curb at curb ramping locations and driveways shown on the Drawings or as directed by the Engineer.
- B. Provide appropriate longitudinal slope on curb as shown on the Drawings for curb ramps and for driveways or as directed by the Engineer.

3.11 CURING

- A. Start curing activities as soon as free water has disappeared from the surface of concrete after placing and finishing.
- B. Apply curing compound to all exposed surfaces by spraying a uniform coating in such a manner as to provide a continuous water impermeable surface. Apply in accordance with manufacturer's recommendations to limit loss of water to not more than 0.40 kg/m² in 72 hours.
- C. Under hot weather conditions, conform to ACI 305.
- D. Under cold weather conditions, conform to ACI 306.
- E. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

3.12 RESTORATION

- A. Backfilling
 - 1. Backfill low areas with Soils Class G-1 as defined in Section "Soils and Aggregates".
 - a. Between curb and property line.
 - b. In boulevard areas.
 - c. Shape to line and grade to permit landscaping.
 - d. Compact to 85 percent Modified Proctor density (ASTM D1557) and test roll.
- B. Landscaping
 - 1. Perform as defined in Section "Turf and Grasses".

3.13 CONCRETE WORK WARRANTY

- A. Work shall be warrantied for a period of one year after substantial completion covering;
 - 1. Transverse cracking.
 - 2. Spalling.
 - 3. Popouts.
 - 4. Other detrimental impacts related to workmanship.
- B. Cost for repairs and traffic control shall be the responsibility of the Contractor.

END OF SECTION

SECTION 32 16 20**CONCRETE SIDEWALKS AND DRIVEWAYS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Excavation.
 - 2. Compaction aggregate base.
 - 3. Sidewalk and driveway construction.

1.2 REFERENCES STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. A185 Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
 - 2. C31 Making and Curing Concrete Test Specimens in the Field.
 - 3. C33 Specification for Concrete Aggregates.
 - 4. C39 Test for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. C94 Specification for Ready-Mixed Concrete.
 - 6. C143 Test for Slump of Portland Cement Concrete.
 - 7. C150 Specification for Portland Cement.
 - 8. C172 Sampling Fresh Concrete.
 - 9. C231 Test for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 10. C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 11. C1315 Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - 12. D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Lb (4.54 kg) Rammer and 18-in. (457 mm) Drop.
 - 13. D1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Type).
 - 14. E329 Standard Recommended Practice for Inspection Testing Agencies for Concrete, Steel and Bituminous Materials Used in Construction.
- B. American Concrete Institute (ACI)
 - 1. ACI 304 Measuring, Mixing, Transporting, and Placing Concrete.
 - 2. ACI 305 Recommended Practice for Hot Weather Concreting.
 - 3. ACI 306 Recommended Practice for Cold Weather Concreting.
 - 4. ACI 347 Recommended Practice for Concrete Formwork.

- C. American Association of State and Highway Transportation Officials
 - 1. T96 Standard Method of Test for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and impact in the Los Angeles Machine
 - 2. T013 Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
 - 3. T104 Standard Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- D. Wisconsin Department of Transportation (WisDOT), State of Wisconsin Standards Specifications for Highway Construction, Latest Edition (State Specifications)

1.3 SUBMITTALS

- A. Concrete design mix of composition and strength testing results for design mix for each type of concrete.
- B. Producer's certification that the supplied materials meet the applicable specification requirements.
- C. Manufacturer's certification for curing compound.

1.4 QUALITY ASSURANCE/QUALITY MANAGEMENT PLAN

- A. General Requirements
 - 1. Provide a Quality Management Plan (QMP) conforming to the WisDOT State Specifications for Class II concrete.
- B. Testing to be completed as follows:
 - 1. Installation Testing by Owner:
 - a. Slump.
 - b. Air-entrainment.
 - c. Compressive strength test.
 - 2. Other testing per the WisDOT State Specification is to be completed by the Contractor.
 - 3. Additional tests may be conducted by the Contractor for those conducted by the Owner.
- C. The following shall be in accordance with the State Specifications and stated references:
 - 1. Inspection and Testing: ASTM E329.
 - 2. Sampling: ASTM C172.
 - 3. Slump: ASTM C143.
 - 4. Air-Entrainment: ASTM C231.
 - 5. Compressive Strength Test: ASTM C31 and C39.
- D. Compressive strength test shall consist of four standard test cylinders made from a single batch of concrete:
 - 1. Tests to be taken for each 200 cubic yards of concrete placed or at least once each day.

2. Test one cylinder at 7 days.
3. Test two cylinders at 28 days.
4. Remaining cylinder shall be tested in the event prior tests fail.
5. 28 Day Test Requirements:
 - a. Compressive strength is 4,000 psi.
 - b. No individual test falls more than 500 psi below specified compressive strength.
 - c. If differential strengths of the two specimens is 350 psi or greater, the low strength specimen shall be discarded and the strength of the remaining cylinder shall then be the test result.
 - d. If the test result is below 3500 psi, the test is considered a failure. Also, if either of the two 28 day specimens falls below 3000 psi, the test result is considered a failure.
6. Failure of compressive strength tests shall result in following additional testing:
 - a. Provide two core samples of each portion of work affected and perform compressive strength tests.
 - b. Replace work if core samples do not equal or exceed specified compressive strength.
 - c. Additional testing shall be completed at the Contractor's expense.

PART 2 – PRODUCTS

2.1 CONCRETE

- A. Concrete shall conform to ASTM C94, the WisDOT State Specification, and the following:
 1. Class II concrete
 2. Twenty-eight Day Compressive Strength: 4,000 psi.
 3. Aggregate shall conform to either of the following:
 - a. Soil Class A-7 (3/4-Inch Crushed Rock) (WisDOT Size No. 1 Aggregate per 501.2.5.4.5)
 - b. Soil Class A-6 (1 1/2-Inch Crushed Rock) (WisDOT Size No. 2 Aggregate per 501.2.5.4.5)
 4. Minimum Cement Content: 6 bags/c.y.
 5. Air entrainment:
 - a. Slip-formed concrete – 7.0 percent, +/- 1.5 percent
 - b. Other concrete – 6.0 percent, +/- 1.5 percent
 6. Maximum Water-Cement Ratio: .44
 7. Slump:
 - a. 2.5 inch or less – Slipformed
 - b. 4.0 inch or less – Non-Slipformed

2.2 CEMENT

- A. Conform to ASTM C150, Type 1.

2.3 AGGREGATES

- A. Conform to WisDOT State Specifications
- B. Conform to ASTM C33.

- C. Aggregate Wear: Loss of abrasion and impact shall not exceed 50 percent by mass (AASHTO T96)
- D. Aggregate Soundness: The weighted average sodium sulfate loss shall not exceed 12 percent by mass (AASHTO T104)
- E. Freeze-Thaw: The weighted average loss shall not exceed 18 percent by mass (AASHTO T103)

2.4 CURING MATERIALS

- A. Use linseed oil based material conforming to the WisDOT Standard Specifications for Highway and Structure Construction, Latest Edition. Furnish linseed oil based curing compound conforming to ASTM C309.
 - 1. Linseed oil emulsion shall consist of, by volume exclusive of the pigment, 50 +/- 4 percent linseed oil and 50 +/- 4 percent water. Ensure that the oil phase is, by weight, 80 percent boiled linseed oil and 20 percent viscosity (Z-8) linseed oil.
 - 2. ASTM C309 shall be modified to waive the drying time.

2.5 EXPANSION JOINT

- A. Conform to ASTM D1751.
- B. Thickness: ½ inch.

2.6 REINFORCEMENT BAR

- A. Conform with WisDOT Standard Specifications for Highway Construction, Latest Edition, Section 505.
- B. Grade 60.
- C. Minimum Bar Size: #4., Epoxy Coated

2.7 CURB RAMP DETECTABLE WARNING FIELD

- A. Provide detectable warning fields in curb ramps in accordance with the requirements of the current edition of the Standard Specification for the State Department of Transportation.
- B. Fields to be unpainted cast iron.
- C. Acceptable products are:
 - 1. Neenah Foundry
 - 2. Cast DWD by Pioneer Detectable LLC
 - 3. Other Engineer approved equal cast iron plate.

PART 3 – EXECUTION**3.1 PREPARATION OF THE SUBGRADE**

- A. Excavate subgrade to line and grade shown on plans and details.
- B. Provide a minimum of 4 inches of base.
 - 1. Soil Class C-2 or C-4 as defined in Section "Soils and Aggregates".
- C. Compact to minimum 95 percent modified proctor density, ASTM D1557.
- D. Surplus material may be used in fill areas.
- E. Excess material shall be disposed at a site provided by Contractor.
- F. The foundation shall be six (6) inches wider than the sidewalk.

3.2 FORMS

- A. Conform to ACI 347.
- B. Forms shall be of the size, shape and type of material required to construct the sidewalk and driveway as required.
- C. Brace and tie together forms to maintain position and shape.
- D. Clean and coat forms with clear, non-staining mineral or paraffin base form oil prior to placement of concrete against forms.
- E. Surfaces in contact with concrete shall be free from frost, debris, and other deleterious material.
- F. Moisten the base prior to placement of concrete.
- G. Remove laitance and other unsound material before freshly placed concrete is placed against previously placed concrete.
- H. Have materials available to protect concrete from damage until it has hardened sufficiently to resist damage.
- I. Unless noted otherwise, furnish the following minimum thicknesses:
 - 1. Sidewalks: 4"
 - 2. Curb Ramps: 6" unless directed otherwise by the Engineer.
 - 3. Driveways: Residential: 6"
 - 4. Driveways: Industrial, Business, Commercial: 8"
 - 5. Alleys: 8"

- J. Sidewalk shall be 5 feet in width for new construction. Match width of existing sidewalk for reconstruction unless directed otherwise by the Engineer.
- K. The sidewalk shall slope a maximum of $\frac{1}{4}$ inch per foot towards the street or as shown on the Plan or as directed by the Engineer.
- L. Edges of sidewalks and edges adjacent to expansion joints or construction joints shall be finished with an edging tool having a radius of $\frac{1}{4}$ inch.

3.3 EXPANSION JOINTS

- A. Location and geometry of expansion joints shall be as shown on the Drawings or according to the following criteria:
 - 1. At right angle or tee intersections.
 - 2. At sidewalk and stoop intersections.
 - 3. Where sidewalk and driveway adjoin vertical surfaces.
 - 4. Where sidewalk and driveway adjoin existing concrete street pavements.
 - 5. Where sidewalk and driveway adjoin existing concrete driveways.
 - 6. Where driveway and sidewalk adjoin curb and gutter.
 - 7. Where 4" thick sidewalk meets 6" thick sidewalk at curb ramps.
 - 8. Maximum spacing 300 feet.
- B. Extend filler full width and depth of concrete, with top slightly below finished surface of concrete.

3.4 CONTRACTION JOINTS

- A. Locate in accordance with details and following criteria:
 - 1. Transverse joints in the sidewalk shall be spaced at an average spacing of 5 foot intervals.
 - 2. When matching existing concrete sidewalk results in a variable joint spacing, transverse joint spacing in the new sidewalk shall be modified to a minimum spacing of 4 feet and a maximum spacing of 6 feet, unless additional variation is approved by the Engineer.
 - 3. Transverse joints shall be placed down the center of the approach portion of the driveway.
 - 4. Joints shall not deviate more than five degrees from a right angle measured at intersecting joints or flatwork edge, and more than $\frac{1}{2}$ inch from a straight line.
- B. Joint Dimensions
 - 1. Depth:
 - a. Minimum 1 inch or one-fifth of slab depth whichever is greater.
 - 2. Width:
 - a. Minimum $\frac{1}{8}$ inch for sawed joints, $\frac{1}{4}$ inch for other types.
 - b. Maximum $\frac{1}{4}$ inch for sawed joints, $\frac{3}{8}$ inch for other types.

3.5 ENVIRONMENTAL REQUIREMENTS

A. Hot Weather Concreting

1. Follow ACI 305 whenever mean surrounding air temperature equals or exceeds 80°F (27°C).
2. Do not place concrete whenever air temperature equals or exceeds 90°F (32°C).

B. Cold Weather Concreting

1. Follow ACI 306 whenever mean surrounding air temperature is below 40°F (4.5°C).

C. Do not place concrete during rain, sleet, or snow unless protection is provided.

3.6 PLACING CONCRETE

A. Conveying Concrete

1. Convey concrete from mixer to place of final deposit by methods that will prevent separation or loss of materials.
2. Equipment for chuting, pumping, or pneumatically conveying concrete shall be capable of providing a supply of concrete at site of work without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive placements.
3. Unless otherwise approved, conform to ACI 304.

B. Depositing Concrete

1. Place concrete on prepared and moistened foundation in a single lift.
2. Deposit concrete as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.
3. Carry on concreting at such a rate that concrete is at all times plastic, and flows readily into spaces between reinforcing.
4. Do not deposit concrete that has partially hardened or that has been contaminated by foreign materials.
5. Do not use rettempered or remixed concrete.
6. After concreting is started, it shall be carried on as a continuous operation until placing a section is completed.
7. Thoroughly consolidate concrete by suitable means during placement, and thoroughly work concrete around reinforcement and embedded fixtures, and into corners of forms.
 - a. Provide mechanical vibration for concrete eight (8) inches thick and greater.

C. Provide a concrete stamp per the detail.

3.7 REINFORCEMENT

- #### A. Install two (2) number four (4) epoxy coated deformed reinforcement bars over all trenches that fall under any portion of the concrete sidewalk or driveway being constructed. The Engineer will determine the final location of all deformed reinforcement bars. In general, reinforcement bars shall be extended into the adjacent concrete slab that is outside of the trench as follows:
1. When the adjacent concrete slab is existing, drill 6" into the concrete.

2. When the adjacent concrete slab is new, overlap the reinforcement bar at least 12 inches into the adjacent concrete slab.

- B. Install two (2) number four (4) epoxy coated deformed reinforcement bars, 12 inches long between new and existing slabs. The bars shall be drilled six inches into the existing concrete slab.

3.8 FINISHING

- A. Strike off concrete to a true and even surface.
- B. Finish float and trowel surface smooth.
- C. Brush or lightly broom surface at right angles to traffic.

3.9 CURING

- A. Start curing activities as soon as free water has disappeared from surface of concrete after placing and finishing.
- B. Apply curing compound to exposed surfaces by spraying a uniform coating to provide a continuous water impermeable surface. Apply in accordance with manufacturer's recommendations to limit loss of water to not more than 0.40 kg/m² in 72 hours.
- C. Maintain all exposed concrete surfaces moist for the first 7 days after placement.
- D. Under hot weather conditions conform to ACI 305.
- E. Under cold weather conditions conform to ACI 306.
- F. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

3.10 EXISTING CONCRETE FLATWORK

- A. When abutting to existing flatwork, provide the following:
 1. Saw cut existing concrete at construction limits.
 2. Install expansion joints between existing and new construction.

3.11 CURB RAMPS

- A. Install curb ramps where shown on Drawings or as directed by the Engineer.
- B. Provide detectable warning field run parallel to the direction of travel of the ramp to allow wheel chairs unimpeded access to the road or sidewalk.

- C. Elevation of the warning field is to be equal to the elevation of the curb cut to allow drainage.
 - 1. Equal elevations of the warning field, curb ramp and curb at the curb interface are also required so there is no tripping hazard or impediment to wheel chairs or walkers.
 - 2. Do not recess the warning field.
- D. Install warning fields 0 to 2 inch from back of curb.
 - 1. For installations on a radius, the leading edge of the detectable warning field is to remain within the 0 to 2 inch offset from back of curb.
 - 2. The opposite corner adjacent to the curb will be a varying distance in order to keep the warning fields parallel to the direction of travel.
- E. Slope longitudinal sidewalk to meet the curb ramp with a slope 12 horizontal to 1 vertical or flatter.
- F. Install warning fields per standard detail 8D5, A through E, from the Wisconsin Department of Transportation Facility Development Manual.

3.12 CONCRETE WORK WARRANTY

- A. Work shall be warrantied for a period of one year after substantial completion covering;
 - 1. Transverse cracking.
 - 2. Spalling.
 - 3. Popouts.
 - 4. Other detrimental impacts related to workmanship.
- B. Cost for repairs and traffic control shall be the responsibility of the Contractor.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Furnishing and applying pavement line markings.

1.2 REFERENCES

- A. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, and all supplemental and interim supplemental specifications, as they may pertain, except the items: method of measurement and basis of payment shall not apply.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. M247 Standard Specification for Glass Beads Used in Pavement Markings

1.3 SUBMITTALS

- A. Submit a certificate of compliance certifying that the epoxy and/or paint supplied under the contract conforms to these specifications.
- B. Submit a certificate of compliance certifying that the beads supplied under the contract conform to these specifications.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver paint and epoxy materials to the job site unopened, in manufacture's containers legibly marked with the contents, color, batch number, date manufactured, and manufacture's name and address. Do not use material more than one year old.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Conform to WisDOT Standard Specifications for Highway and Structures Construction Sections 646.
- B. Glass Beads
 - 1. Furnish glass beads conforming to AASHTO M247, except for gradation conform to the following:

Sieve Size	(%) Percent Passing by Weight	
	For Epoxy	For Paint
No. 20	100	95-100
No. 30	75-95	70-90
No. 40	---	60-80
No. 50	15-35	10-30
No. 80	---	0-3
No. 100	0-5	0-1

2.2 EQUIPMENT

- A. All equipment shall conform to WisDOT Standard Specifications for Highway and Structure Construction Section 646.3.2.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. All surface preparation shall conform to WisDOT Standard Specifications for Highway and Structure Construction Section 646.3.1.

3.2 LINE MARKING

- A. All line marking shall conform to WisDOT Standard Specifications for Highway and Structure Construction Section 646.3.3.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Topsoil
 - 2. Salvaged Topsoil
 - 3. Fertilizer
 - 4. Seeding
 - 5. Mulch

1.2 REFERENCES

- A. Association of Official Seed Analysis (AOSA)
 - 1. Rules for testing seed.

1.3 SUBMITTALS

- A. Topsoil
 - 1. Provide topsoil analysis performed in accordance with ASTM D5268 and demonstrating the topsoil meets Natural Resource Conservation Service (NRCS) specified soil types.
 - 2. Submit results of tests for nutrient levels and provide recommendations for fertilizer type and application.
- B. Fertilizer
 - 1. Furnish certification from supplier attesting to:
 - a. Brand name, chemical analysis, and guarantee of analysis.
- C. Seed
 - 1. Furnish certification of conformance with AOSA "Rules for Testing Seed" and attest to:
 - a. Mix, age, weed content, purity, and germination.
- D. Mulch Material
 - 1. Furnish sample of mulch material when requested by the Engineer.
- E. Erosion Mat
 - 1. Furnish sample of erosion mat material along with a certification of its physical properties.

PART 2 – PRODUCTS

2.1 TOPSOIL

- A. Consists of adequate mineral content to support the growth of the intended vegetation, consists of Soils Class F-1 or F-2 (Soils and Aggregates) as required and shall meet the definition and specification stated in ASTM D5268, and meets one of the following NRCS soil textures:
 - 1. Loam.
 - 2. Sandy Loam.
 - 3. Silt Loam.
 - 4. Silty Clay Loam.
 - 5. Clay Loam.
- B. The topsoil shall consist of adequate mineral content to support the growth of the intended vegetation and shall not contain herbicides which would be detrimental for the intended use.
- C. The topsoil shall have adequate fertility for quick establishment of vegetation.
- D. The pH of the topsoil shall be between 6.0 and 7.0.
- E. Topsoil shall be free from deleterious substances.
- F. Topsoil shall be free from roots, sticks, weeds, brush, stones or other litter and waste products.
- G. Pulverize and screen the topsoil such that 100 percent passes the 1-inch (25 mm) sieve and at least 90 percent passes the No. 10 (2.00 mm).

2.2 SALVAGED TOPSOIL

- A. Consists of the natural loam, sandy loam, silt loam, silty clay loam or clay loam humus-bearing soils available from the overlying portions of the areas contemplated by the plans.
- B. Salvaged topsoil shall be free from deleterious substances, roots, sticks, weeds, brush, stones or other litter and waste products.
- C. Pulverize and screen the salvaged topsoil such that 100 percent passes the 1-inch (25 mm) sieve and at least 90 percent passes the No. 10 (2.00 mm).

2.3 FERTILIZER

- A. Fertilizer shall meet the recommendations of the supplier.

2.4 SEED

- A. Conform with the requirements of the governing authority for seeding and for restrictions on noxious weed seed.
- B. Seed mixture shall be composed of seeds of the purity, germination, and proportion by weight as follows:

Seed Mix #10 – Heavy Soil

Percent	Variety	Min. % Purity	Min. % Germination
40	Kentucky Bluegrass	98	85
25	Red Fescue	97	85
20	Perennial Ryegrass	97	90
10	White Clover	95	90
5	Redtop	92	85
100% Total			

Seed Mix #20

Percent	Variety	Min. % Purity	Min. % Germination
6	Kentucky Bluegrass	98	85
24	Hard Fescue (varieties below)	97	85
40	Turf Type Tall Fescue (varieties below)	98	85
30	Perennial Ryegrass	97	90
100% Total			

Hard Fescue Varieties: Choose one or both:

- Scaldis Hard Fescue
- SR3100 Hard Fescue

Turf type tall fescue varieties: Choose two of the five:

- Tulsa turf type tall fescue
- Regiment turf type tall fescue
- Crossfire turf type tall fescue
- Shortstop turf type tall fescue
- SR8200 turf type tall fescue

Seed Mix #30

Percent	Variety	Min. % Purity	Min. % Germination
10	Kentucky Bluegrass	98	85
30	Red Fescue	97	85
15	Improved Fine Perennial Ryegrass	97	90
25	Hard Fescue (varieties below)	97	90
10	Salt Grass	98	85
10	Birdsfoot Trefoil	95	80
100% Total			

Seed Mix #40

Percent	Variety	Min. % Purity	Min. % Germination
35	Kentucky Bluegrass	98	85
20	Hard Fescue	97	85

20	Red Fescue	97	85
25	Improved Fine Perennial Ryegrass	96	85
<hr/> 100% Total <hr/>			

C. Temporary Nurse Crop

- When required the Contractor shall furnish one of the following seed mixtures:

Species	Min. % Purity	Min. % Germination	Lbs. per Acre
Oats	98	90	80
Rye	98	85	100

2.5 MULCH

- Mulch shall consist of straw, hay, marsh hay, or wood chips which are free of noxious weeds and other objectionable foreign matter.
 - If wood chips are used, the mulch area shall be treated with one (1) pound of available nitrogen per 1,000 square feet.
- Mulch binder shall conform to one of the following:
 - Emulsified asphalt shall meet the requirements for Type SS-1 AASHTO M140.
 - Terra Tack I, or equal.

PART 3 – EXECUTION

3.1 TOPSOILING (TOPSOIL OR SALVAGED TOPSOIL)

- Topsoil all areas which are required to be seeded. Place topsoil to the following depth of 4 inches when settled.
- Topsoil placement for seeding lawns:
 - Mechanically level subgrade to allow uniform placement of topsoil.
 - Remove rocks, roots, clods, and other foreign material.
 - Place topsoil to required depth.
 - Mechanically level topsoil.
 - Rake topsoil smooth and remove all lumps.
 - Seed as required.

3.2 SALVAGED TOPSOIL STRIPPING

- Remove available topsoil from the site of work in such amounts and to such depths as available or required and the transporting and stockpiling of such topsoil in accordance with the plans, required in the contract or directed by the Engineer.

- B. All areas from which topsoil is procured shall be cleared, if necessary, by means of mowing weeds or other vegetation to a height of approximately six inches and freed from any litter such as brush, rock or foreign material of objectionable size or quantity.
- C. The humus-bearing soil shall then be stripped off to such depth as available, or as necessary to produce sufficient volumes required by the contract, taking all practicable care to avoid incorporation of any of the underlying sterile soil therewith.
- D. The topsoil thus stripped from these areas will be stockpiled and leveled as directed so that it can be reclaimed.
- E. Any appreciable volumes excavated in excess of the amounts required to accomplish these requirements shall be disposed of by the Contractor at the Contractor's cost and expense.

3.3 SEEDING

- A. Selection of seed mixtures, rate of seeding and intended use of the mixtures shall be as follows:

Seed Mixture	Rate of Seeding (lbs. per 1,000 sq. ft.)	Intended Use
No. 10	3-4	Average loam or heavy clay soils
No. 20	5-6	Light, sandy or gravelly soils. All ditches, inslopes.
No. 30	5-6	For medians and on slopes generally within 15 feet of the shoulder where a salt tolerant turf is preferred.
Seed No. 40	Rate of Seeding 3-4	In urban area or other areas where a lawn type turf is desired.

- B. Seeding period shall be as recommended by the seed supplier.
- C. Seeding
 - 1. Utilize a machine or combination of machinery which will produce the following:
 - a. Apply seed uniformly at the rate specified.
 - b. Cover seed with approximately ¼ inch of topsoil.
 - c. Roll lightly.
 - d. Apply seed at right angles to surface drainage.

3.4 MULCHING

- A. Complete mulching as follows:
 - 1. Within 48 hours after seeding has been completed.
 - 2. Place all mulch uniformly to a loose depth of 1 to 1½ inches (2 to 3 tons per acre).
 - 3. Mulching operation shall begin at the top of slopes and proceed downward.
 - 4. Do not mulch under high winds.

B. Mulching shall be secured using one of the following methods:

1. Method "A":

a. Secure mulch with heavy twine or netting.

1) Twine to be fastened with pegs or staples to form a grid of 6- to 10-foot spacing.

2. Method "B":

a. Anchor mulch in soil by means of a mulch tiller.

b. Mulch shall be impressed in the topsoil to a depth of 1½ to 2½ inches in one pass of the tiller.

3.5 SEQUENCE

A. Topsoil, seed, and mulch restoration shall be completed prior to final asphaltic concrete pavement placement.

3.6 MAINTENANCE

A. Maintain all seeded areas until all the following conditions are met.

1. Seeding: Establish a good stand of grass (uniform in density and color) satisfactory to Owner.

2. Capable of resisting erosion.

B. Watering of turf shall be included in maintenance.

END OF SECTION

SECTION 33 00 01**CONCRETE PIPE - REINFORCED****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Circular storm sewer.
2. Elliptical storm sewer pipe.

1.2 REFERENCES**A. American Association of State Highway and Transportation Officials (AASHTO):**

1. M198 Joints of Circular Concrete Sewer
2. M273 Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers with less than 2 ft. of Cover Subjected to Highway Loadings

B. American Society for Testing and Materials (ASTM):

1. C76 Standard Specification for Reinforce Concrete Culvert, Storm Drain, and Sewer Pipe.
2. C443 Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
3. C444 Standard Specification for Perforated Concrete Pipe
4. C497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
5. C506 Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
6. C507 Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, Sewer Pipe
7. C877 Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
8. C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
9. C1433 Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers

1.3 SUBMITTALS

- A. Manufacturer's certification that the material delivered has been satisfactorily tested in accordance with ASTM C497.
- B. Provide a detail design of the pipe joints and gasket.

- C. Manufacturer's certification that culvert box sections and culvert box endwalls conform with ASTM 1433.
- D. Provide manufacturer's certification that the material for sealing bands conforms with ASTM C-877.

1.4 QUALITY ASSURANCE

- A. Pipe shall be available to Owner's Representative for inspection.
- B. Material brands and/or pipe shall not be mixed.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Upon delivery insure that the pipe is clearly marked with the following information:
 - 1. Specification designation.
 - 2. Pipe class or strength designation.
 - 3. Date of manufacture.
 - 4. Name or trademark of manufacturer.
 - 5. Plant identification.
 - 6. Letters E or Q indicating elliptical or quadrant reinforcement.
- B. Store material to protect from damage and do not stack in layers.

PART 2 – PRODUCTS

2.1 CIRCULAR PIPE

- A. Conform to ASTM C76 of the classification stated in the drawings.
- B. Provide bell and spigot joints conforming to ASTM C443 with flat rubber gaskets meeting standard gasket requirements.

2.2 ELLIPTICAL PIPE

- A. Conform to ASTM C507 of the classification stated on the drawings.
- B. Provide tongue and groove joints with flexible plastic Type B gaskets conforming to AASHTO M198 and joint sealants conforming to ASTM C990.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Storm Sewer

1. Use circular pipe ASTM C76 "B" or "C" wall unless stated otherwise on drawings.
2. Use elliptical pipe, arch pipe and box sections only where shown on drawings.
3. Use perforated pipe only where shown on drawings.

3.2 FIELD QUALITY CONTROL

A. Inspect and reject pipe for the following defects:

1. Improper marking.
2. Fractures or cracks passing through wall, except for a single end crack that does not exceed depth of joint.
3. Defects indicating non-compliance with proportioning, mixing and molding of the concrete.
4. Surface defects indicating honeycombed or open texture.
5. Ends are not normal to the wall and center line of the pipe.
6. Damaged or cracked ends.
7. Any continuous crack having a width of 0.01 inch or more and extending for a length of 12 inches or more.

END OF SECTION

SECTION 33 00 02**POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes:**

1. PVC pipe for mainline gravity sewer.
2. PVC pipe for sewer services.
3. PVC pipe for water main
4. PVC pipe for pressure sewer (force main)

B. The products described are not installed under this Section.**1.2 REFERENCES****A. American Society for Testing and Materials (ASTM):**

1. A307-00 Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile Strength
2. D1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride)(CPVC) Compounds
3. D1785 Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, and 120
4. D2241 Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
5. D2466 Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
6. D2467 Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
7. D2564 Standard Specifications for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe Systems
8. D2672 Standard Specifications for Joints for IPS PVC Pipe Using Solvent Cement
9. D2855 Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
10. D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
11. D3139 Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
12. D3212 Specifications for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
13. F477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
14. F679 Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe Fittings

B. American Water Works Association (AWWA)

1. C104 Cement Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water
2. C110 Gray Iron and Ductile Iron Fittings, 3-inch through 48-inch for Water and Other Liquids
3. C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Rittings
4. C153 Ductile-Iron Compact Fittings, 3-inch through 16-inch, for Water and Other Liquids
5. C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for water
6. C905 Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch

1.3 SUBMITTALS

A. Submit the following:

1. Certification of productions date of all materials.
2. Manufacturer's certification that the materials delivered were manufactured, sampled, tested, and inspected in accordance with this specifications and appropriate referenced standards.
3. Product data sheet.
4. Manufacturer's recommendations for assembly.

1.4 QUALITY ASSURANCE

A. Make pipe available to the Engineer's Representative for inspection.

B. Pipe shall be considered defective and will be rejected when:

1. Pitted or cratered.
2. Flaking.
3. Straightness varies more than ½ inch in 10 feet.
4. Any defect which prevents assembly according to manufacturer's recommendations.
5. Not utilized within six months of date of production. The Engineer may extend this date to twelve (12) months if property stored.
6. Pipe is not properly marked.

C. Material brands and/or pipe classes shall not be mixed.

D. Pipe Marking – pipe and fittings shall be marked as follows:

1. Manufacturer's name, trademark or logo.
2. Nominal size.
3. PVC cell classification.
4. Pipe stiffness designation, dimension ration, or schedule size and pressure class.
5. ASTM or AWWA specification designation.
6. National Sanitation Foundation approval (pipe for potable water).

7. Production date.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect the pipe shipment to identify shifted loads, broken packaging or rough treatment, which could be an indication of damage.
- B. Unload the pipe in a manner which will not put stress on the pipe or strike anything causing damage.
- C. Place and store the pipe package units on level ground stacked no more than 8 feet high. Do not store close to heat sources.
- D. Store gaskets away from excessive exposure to heat, direct sunlight, ozone, oil or grease.
- E. Store Solvent cement in tightly sealed containers away from excessive heat.
- F. Handle pipe in a manner to prevent impact blows, abrasion damage, gouging or cutting.
- G. When handling pipe in cold weather, provide additional care to prevent damage due to impact. Impact strength is reduced in cold weather.

PART 2 – PRODUCTS

2.1 NON-PRESSURE RATED PIPE

- A. Mainline Gravity Sewer and Sewer Services
 1. Pipe fittings and repair couplings shall be manufactured and tested in accordance with the following standards:
 - a. Sizes 8 inch through 15 inch and depths up to 30 feet: ASTM D3034, PSM SDR-35 PVC
 - b. Sizes 18 inch through 48 inch and depths up to 30 feet: ASTM F679, PS46 PVC, T-1 minimum cell classification
 2. Elastomeric Gaskets: Conform with ASTM F477
 3. Elastomeric Joints: Conform with ASTM D3212
 4. Solvent Weld Joints: Not permitted.
 5. Repair couplings for transition between ABS composite pipe and PVC shall be Fernco eccentric couplings with stainless steel shear rings, bands, nuts, and housings.
- B. Sewer Services
 1. Pipe shall be manufactured and tested in accordance with ASTM D2665.
 2. Fittings to conform with ASTM F1866.
 3. Pipe for sizes 4-inch and 6-inch: Schedule 40.
 4. Solvent Weld Joints: ASTM D2672.
 - a. Solvent Cements: ASTM D2564
 - b. Joints shall be made in accordance with ASTM D2855.

2.2 PRESSURE RATED PIPE

A. Water Main

1. Manufacture and test the pipe and joints in accordance with the following standards:
 - a. Pipe sizes 4-inch through 12-inch: AWWA C900 pressure Class 235, thickness Class DR 18.
 - b. Pipe sizes 14-inch through 36-inch: AWWA C905, pressure Class 235, thickness Class DR 18.
2. Elastomeric gaskets shall be manufactured as defined in ASTM F477.
3. Joints shall conform to ASTM D3139.
4. Fittings:
 - a. Standard ductile iron mechanical or push-on joint conforming to AWWA C110 or compact ductile iron mechanical or push-on joint conforming to AWWA C153.
 - b. Cement mortar lined conforming to AWWA C104.
 - c. Rubber gasket joints conforming to AWWA C111.
 - d. Tee-head bolts and hexagonal nuts shall be 304 stainless steel with anti-seize mechanism.

B. Thrust Restrained Joint PVC pipe for Trenchless Construction of Water Main

1. Manufacture and test the pipe and joints in accordance with the following standards:
 - a. Pipe sizes 4-inch through 12-inch: AWWA C900, pressure Class 150, thickness Class DR 18.
 - b. Pipe sizes 14-inch through 36-inch: AWWA C905, pressure Class 150, thickness Class DR 18.
2. Provide twin elastomeric gaskets manufactured in accordance with ASTM F477.
3. Design joint so be used with non-metallic couplings with high-strength flexible thermoplastic splines inserted into mating precision-machined grooves in the pipe and coupling to provide full 360 degree restraint.
4. Fittings:
 - a. Standard ductile iron mechanical or push-on joint conforming to AWWA C110 or compact ductile iron mechanical or push-on joint conforming to AWWA C153.
 - b. Cement mortar lined conforming to AWWA C104.
 - c. Rubber gasket joints conforming to AWWA C111.
 - d. Bolts and nuts shall be 304 stainless steel with anti-seize mechanism.

END OF SECTION

SECTION 33 00 03**HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Pressure pipe and fittings for water distribution.

1.2 REFERENCES**A. American Water Works Association (AWWA)**

1. C901 Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½ in.(13 mm) Through 3 in. (76 mm) for Water Service
2. C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100 mm) Through 63 in. (1,575 mm), for Water Distribution and Transmission

B. American Society for Testing and Materials (ASTM):

1. A307-00 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
2. D638 Standard Test Method for Tensile Properties of Plastics
3. D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
4. D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
5. D1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
6. D1599 Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
7. D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
8. D2290 Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method
9. D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
10. D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Pipe and Tubing
11. D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

C. National Sanitation Foundation

1. NSF No. 14 Plastics Piping Components and Related Materials

1.3 SUBMITTALS**A. Product Data**

1. Provide product data on pipe and fittings including dimensions.

B. Quality Assurance/Control Submittals

1. Certification that the tests required by this specification section were performed and meet the stated minimum requirements.
2. Evidence from the pipe manufacturer that the personnel completing joints is qualified to perform the thermal butt fusion.
3. Manufacturer's instructions and procedures for joining the pipe and pipe fittings.

1.4 QUALITY ASSURANCE**A. Pipe shall be available to Owner's Representative for inspection.****B. Pipe shall be considered defective and will be rejected when:**

1. Any defect which prevents assembly according to manufacturer's recommendations.
2. Not utilized within six months of date of production. The Engineer may extend this date to twelve (12) months if property stored.
3. Pipe is not properly marked.

C. Material manufacturer, pipe diameters and pressure classes shall not be mixed.**D. Personnel completing the joints shall be certified by the pipe manufacturer as being qualified to perform the thermal butt fusion.****1.5 DELIVERY, STORAGE AND HANDLING****A. Upon delivery inspect pipe and fittings for damage, cracks, holes, or foreign inclusions.****B. Store pipe and accessories on flat level ground with no rocks or other objects under the pipe.****PART 2 – PRODUCTS****2.1 MATERIALS****A. Pipe Sizes 4-inch and Larger**

1. Pipe and fittings shall be high density polyethylene (HDPE) meeting AWWA C906 standards.
2. Materials used for the manufacture of the HDPE pipe and fittings shall be made from a PE 3608 resin compound meeting the minimum cell classification of PE 345434C in accordance

with ASTM D3350 and the hydrostatic design basis of 1,600 psi determined in accordance with ASTM D2837.

3. Provide ductile iron outside diameter of nominal size shown on the Drawings or stated in the Bid Schedule.
 4. Provide pipe with a dimension ratio (DR) of 9, pressure class 200.
 5. Pipe shall be installed within 6 months of the production date.
- B. Pipe sizes up to 2 inches:
1. Polyethylene (PE) tubing shall conform to the requirements of AWWA C901, PE 3608, DR 9.
- C. Pipe sizes greater than 2 inches up to 3 inches:
1. Polyethylene (PE) pipe shall conform to the requirements of AWWA C901, PE 3608, DR 9.
- D. Fittings
1. Fittings shall meet the requirements of AWWA C901 or AWWA C906 whichever applies.
 2. Fittings for pipe greater than 3 inches diameter shall be HDPE molded fittings and HDPE fabricated fittings of the same pressure rating and outside diameter as the connecting pipe.
 - a. The pipe manufacturer shall mold or fabricate and supply all HDPE molded fittings, fabricated fittings, accessories and adapters required to perform the Work. No Contractor fabricated fittings shall be used.
 - b. Molded fittings shall be manufactured with thermal butt-fused joints meeting the requirements of ASTM D3261.
 - c. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings.
 3. Fittings for pipe 3 inches diameter or less shall be capable of restraining PE pipe from pullout with the same pressure class as the connecting pipe.
 - a. Provide metal compression connections with ferrule and compression nut.
 - b. Provide a stainless steel insert stiffener to insert inside the tube.
 - c. Insert fittings shall not be used.

2.2 PIPE IDENTIFICATION

- A. Mark the pipe and fittings with the appropriate standard AWWA C901 or AWWA C906 whichever is applicable to affirm the product was manufactured, inspected, sampled, and tested in accordance with the standard.
- B. Pipe and fittings shall be marked with the following at intervals between markings of no greater than 5 feet:
1. Nominal size and OD based on ductile iron OD sizing.
 2. Standard material code designation of PE 3408 or PE 3608 (as applicable).
 3. Dimension ratio.
 4. Pressure class 200
 5. AWWA C901 or AWWA C906, whichever is applicable.
 6. Manufacturer's production code to include day, month, year produced.

2.3 JOINTS

- A. HDPE Pipe and Pipe Fittings Greater than 3 inches Diameter
 - 1. Pipe and pipe fittings shall be designed for joining by thermal butt fusion.
 - 2. Joining method shall be capable of conveying water at the pressure designated by the pressure class.
 - 3. Joints shall be pipe end to pipe end and pipe end to fitting.
- B. Transition from HDPE to Ductile Iron Pipe or PVC Pipe
 - 1. Provide a molded flange connector adaptor with a ductile iron back-up flange for making a flange to flange connection. If the connecting pipe is plain end then use an EBAA Iron Inc. Megaflange 2100 Restrained Flange Adaptor on the connecting pipe.
 - 2. For buried connections use a mechanical joint connection adaptor with a mechanical joint flange backup connecting to a mechanical joint pipe ductile iron pipe and when connecting to a plain end PVC pipe provide an EBAA Iron Inc. use the series 15PF00 for Restraint for C900 PVC Pipe.
 - a. Provide extended T-bolts for the connection.
 - b. Provide stainless steel stiffener inserted in the pipe.
 - 3. From the transition joint pipe restrains shall be provided at all joints within the following distances of the transition joint:
 - a. 6" diameter pipe - 15 linear feet.
 - b. 8" diameter pipe - 19 linear feet.
 - c. 10" diameter pipe - 24 linear feet.
 - d. 12" diameter pipe - 28 linear feet.
 - e. 14" diameter pipe - 33 linear feet.
 - f. 16" diameter pipe - 36 linear feet.
- C. Transition from HDPE to stainless steel.
 - 1. Provide a molded flange connector adaptor with a stainless steel backup flange for making a flange to flange connection.
 - 2. Bolts and nuts shall be 304 stainless steel with anti-seize mechanism.

2.4 SOURCE QUALITY CONTROL

- A. The following tests shall be performed on the production pipe:
 - 1. Measurement of pipe dimensions in accordance with ASTM D2122
 - a. Pipe dimensions shall be within the tolerances stated in AWWA C906 or AWWA C901 whichever is applicable.
 - b. Wall thickness variability in any diametrical cross section of the pipe shall not exceed 12%.
 - c. The outside diameter measured at the cut-end of the pipe length shall not be more than 1.5% smaller than the average outside diameter specified in AWWA C906 or AWWA C901, whichever is applicable, when measured at any point not closer than 12 inches to the squarely cut-end of the pipe length.

2. Thermal stability of a pipe specimen from mid-wall area in accordance with the method described in ASTM D3350. The minimum induction temperature shall be 220°C.
 3. Ring-tensile strength test of pipe specimens tested in accordance with ASTM D2290. Tensile strength shall be not less than 2,900 psi.
 4. Quick burst test of pipe specimens in accordance with ASTM D1599. The test pressure at failure shall not be less than that which results from the minimum hoop stress value of 2,900 psi.
 5. Elongation at break test of five pipe specimens cut equally spaced around the circumference of the pipe in the longitudinal direction tested in accordance with ASTM D638 using a cross-head separation of 2 inches per minute. The elongation at break for each test specimen shall not exceed 400%.
 6. Five-second pressure test of a section of pipe tested in accordance with ASTM D1598. The pipe shall not burst, crack, spit, or otherwise fail a test pressure four times the pipe pressure class applied for five seconds. This test is also required for fittings.
 7. Melt index of pipe specimens tested in accordance with ASTM D1238. The resultant index shall be less than 0.15.
 8. Density of pipe specimens tested in accordance with ASTM D2839. The result shall be minimum 0.955 grams per cubic centimeter.
 9. Bend-back test in accordance with AWWA C901 or AWWA C906 whichever is applicable. Any indication of cracking or crazing shall reject the pipe.
- B. Test the PE compounds by an accredited testing agency in accordance with the applicable requirements of NSF No. 14 to demonstrate the materials are suitable for use with potable water.

PART 3 – EXECUTION

3.1 POLYETHYLENE PIPE INSTALLATION

- A. In addition to the applicable sections for installing piping, conform to the following:
1. Thermal butt fuse all joints as per ASTM D2657.
 2. Utilize certified personnel for jointing operation.

END OF SECTION

SECTION 33 00 04**CORRUGATED METAL CULVERT PIPE (CMCP) AND FITTINGS****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
 - 1. Circular corrugated steel pipe.
 - 2. Flared end sections.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. M36 Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
 - 2. M190 Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
- B. American Society for Testing and Materials (ASTM):
 - 1. A760 Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

1.3 SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop drawings for sectional plate pipe, sectional plate arches, or sectional plate pipe arches.
 - 2. Include shop detail, erection, and other drawings showing dimensions, sizes of material, details, and other information necessary for the complete fabrication and erection of the metal work
- B. Quality Assurance/Control Submittals
 - 1. Provide manufacturer's certification.

1.4 QUALITY ASSURANCE

- A. Mark each piece of pipe as follows:
 - 1. Manufacturer's name or trademark.
 - 2. Date of manufacture.
 - 3. Pipe size.
- B. Provide manufacturer's certification that samples representing each lot have been tested and inspected in accordance with ASTM A760/AASHTO M36 have been found to meet the requirements for material required per this Specification Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Shipping, Handling and Unloading

1. Package pipe and fittings to prevent damage during shipping.
2. Fittings shall be on a pallet.
3. Use lifts for loading or unloading to avoid shock.
4. Do not drop materials.
5. Do not drag pipe or strike with hard objects which could scratch coatings.

B. Acceptance at the Site.

1. Inspect pipe and pipe fittings when delivered to the site and prior to installation.
2. Reject pipe for any of the following:
 - a. Uneven laps.
 - b. Variation from a straight centerline of more than ½ inch.
 - c. Ragged or diagonal sheared edges.
 - d. Loose bolts or rivets.
 - e. Fasteners which are unevenly lined.
 - f. Poorly formed seams.
 - g. Illegible brand marking.
 - h. Poorly formed seams.
 - i. Dents or bends in the metal.
 - j. Elliptical shape on round pipe.
 - 1) The average inside diameter of the pipe shall not vary more than ½ inch or 1 percent, whichever is greater.
 - 2) Measure on the inside crest of the corrugations.
 - 3) Clearly mark rejected pipe as “Rejected” with OSHA yellow paint.

C. Storage and Protection

1. Provide safe storage for material.
2. Store materials to keep free from dirt and foreign matter.
3. Store fittings in a manner that will allow them to drain and protect them from freezing.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Pipe Material

1. Corrugated steel pipe material, manufactured and fabricated in accordance with ASTM A760/AASHTO M36.
2. Metallic Coating – Zinc (galvanized).
3. Circular pipe shall be Type I.
4. Corrugation size 2 2/3" x ½" for pipe sizes 12" diameter through 84" diameter.
5. Material sheet thickness:
 - a. 6" diameter - 0.052 inches
 - b. 8" diameter to 21" diameter – 0.064 inches

- c. 24" diameter to 30" diameter – 0.079 inches
 - d. 36" diameter to 54" diameter – 0.109 inches
 - e. 60" diameter to 72" diameter – 0.138 inches
 - f. 78" diameter to 96" diameter – 0.168 inches
6. Flared end sections shall meet the same requirements as the connecting pipe.

B. Gaskets

- 1. Band of expanded rubber in accordance with ASTM A760/AASHTO M36.

C. Band Connectors

- 1. Corrugations to match the pipe sections in accordance with ASTM A760/AASHTO M36.

D. Coating

- 1. Provide Type A, fully bituminous-coated pipe in accordance with AASHTO Standard M190.

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 33 00 05**DOUBLE AND TRIPLE WALLED POLYPROPYLENE PIPE****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Double walled polypropylene pipe for mainline gravity storm sewer.
2. Triple walled polypropylene pipe for mainline gravity storm sewer.

B. The products described are not installed under this Section.**1.2 REFERENCES****A. American Society for Testing and Materials (ASTM):**

1. D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
2. F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
3. F2736 Standard Specification for 6 to 27 in. (152 To 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
4. 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

1.3 SUBMITTALS**A. Submit the following:**

1. Certification of production date of all materials.
2. Manufacturer's certification that the materials delivered were manufactured, sampled, tested, and inspected in accordance with this specifications and appropriate referenced standards.
3. Product data sheet.
4. Manufacturer's recommendations for assembly.

1.4 QUALITY ASSURANCE**A. Make pipe available to the Engineer's Representative for inspection.****B. Pipe shall be considered defective and will be rejected when:**

1. Pitted or cratered.
2. Flaking.
3. Straightness varies more than ½ inch in 10 feet.

4. Any defect which prevents assembly according to manufacturer's recommendations.
5. Not utilized within six months of date of production. The Engineer may extend this date to twelve (12) months if property stored.
6. Pipe is not properly marked.

C. Material brands and/or pipe classes shall not be mixed.

D. Pipe Marking – pipe and fittings shall be marked as follows:

1. Manufacturer's name, trademark or logo.
2. Nominal size.
3. Pipe stiffness designation, dimension ration, or schedule size and pressure class.
4. ASTM specification designation.
5. Production date.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inspect the pipe shipment to identify shifted loads, broken packaging or rough treatment, which could be an indication of damage.
- B. Unload the pipe in a manner which will not put stress on the pipe or strike anything causing damage.
- C. Place and store the pipe package units on level ground stacked no more than 8 feet high. Do not store close to heat sources.
- D. For onsite gasket installation on pipe, store gaskets away from excessive exposure to heat, direct sunlight, ozone, oil or grease.
- E. For gaskets installed on the pipe offsite, keep the protective wrap on gaskets until installation.
- F. Handle pipe in a manner to prevent impact blows, abrasion damage, gouging or cutting.
- G. When handling pipe in cold weather, provide additional care to prevent damage due to impact.

PART 2 – PRODUCTS

2.1 NON-PRESSURE RATED PIPE

A. Mainline Gravity Sewer and Sewer Services

1. Pipe fittings and repair couplings shall be manufactured and tested in accordance with the following standards:
 - a. Sizes 8 inch through 27 inch and depths up to 20 feet: ASTM F2736, PSM SDR-35 PVC
 - b. Sizes 30 inch through 60 inch and depths up to 20 feet: ASTM F2764, PS46 PVC, T-1 minimum cell classification
2. Pipe shall have a minimum pipe stiffness of 46 PSI.

3. Minimum height of cover to the top of pipe to the existing elevation or proposed finished elevation (whichever is less) shall be two feet.
4. Elastomeric Gaskets: Conform with ASTM F477
5. Elastomeric Joints: Conform with ASTM D3212
6. Solvent Weld Joints: Not permitted.

B. Sewer Services

1. 4" and 6" pipe shall be Schedule 40 PVC and conform to section 33 00 02, Polyvinyl Chloride (PVC) Pipe and Fittings.
2. Branch laterals shall be designed to accept SDR 35.

END OF SECTION

SECTION 33 05 05

UTILITY PIPING – GENERAL PROVISIONS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Safety and related matters.
 - 2. Interference with the work of others
 - 3. Existing utilities and structures.
 - 4. Conflict with utilities.
 - 5. Work on streets, highways, railroad right-of-way, and work in waterways and wetlands.
 - 6. Easements.
 - 7. Protection of property markers.
 - 8. Cold weather.
 - 9. Cleaning of the work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SAFETY AND RELATED MATTERS

- A. Comply with all federal, state, and local rules and regulations concerning:
 - 1. Construction safety including confined entry.
 - 2. Noise control.
 - 3. Dust and smoke control.
 - 4. Stormwater.
- B. Access to Services
 - 1. Insure free access to all fire hydrants, valve boxes, manholes, curb stops, fire alarms, police call boxes, etc.
- C. Protection of Work, Public, and Property
 - 1. Provide safe passage for local vehicular and pedestrian traffic.
 - 2. Provide vehicular and pedestrian access to properties abutting street where utilities are being constructed.
 - 3. Provide all necessary barricades, warning lights, and signs, signals, flagmen, etc. in accordance with federal, state, and local regulations.
- D. Organize and perform construction activities to minimize the creation of airborne dust and the tracking of mud and dirt into public streets.
 - 1. If dust is generated, implement control measures such as:

- a. Street sweeping and cleaning.
- b. Water sprinkling or application of chemical dust suppressant.
- c. Cover dusty materials in piles or in transit.
- d. Protect buildings that may be adversely affected.
- e. Protect new and existing machinery, motors, instrument panels or similar equipment with suitable dust screens.
 - 1) Provide proper ventilation with dust screens.

3.2 INTERFERENCE WITH THE WORK OF OTHERS

- A. Arrange work in a manner as to not interfere with any other work.
 1. Coordinate work with other contracts through Owner's Representative.

3.3 EXISTING UTILITIES AND STRUCTURES

- A. The existing utilities and structures as shown on the drawings may not be all inclusive.
- B. The locations of existing utilities and structures are shown on the drawings for information to the Contractor, but should not be construed as a representative of the exact location.
- C. Maintain or provide:
 1. Service of water, sewers, gas, culverts, drains, electricity, or other utilities encountered.
 2. Temporary connections and outlets for all private and public utilities that are interrupting construction.
 3. Disposal for all drainage and sewage resulting from relocations and/or interruptions in accordance with regulations and permits of the controlling governmental agency(s).
- D. Correct any damage to below or above ground utilities and structures encountered during construction.

3.4 CONFLICT OF UTILITIES

- A. Separation of Water Mains and Sewers
 1. The following separations shall be minimum:
 - a. Parallel.
 - 1) 8 feet, measured center to center.
 - b. Vertical (when pipelines cross or when horizontal clearance is impossible).
 - 1) Water Main Below a Sewer: 18 inches clear. (Both pipes must be constructed of water main quality pipe and joints for ten feet either side of the crossing).
 - 2) Water Main Above a Sewer: 6 inches clear.
 2. When crossing a sewer, center a full length of water main or sewer to position joints as far as possible from sewer.
- B. Utility Location
 1. Coordinate relocation of any utilities with the work schedule.

C. Crossing Existing Water Services

1. If water services are crossed during utility construction, and located above the utility, the Engineer may direct the contractor to insulate the water service.
2. If the depth of cover over the water service is less than six feet, insulate as required by the Engineer.

3.5 WORK ON STREET, HIGHWAY, RAILROAD RIGHT-OF-WAY AND WORK IN WATERWAYS AND WETLANDS

- A. Work on street, highway, railroad right-of-ways, or in waterways and wetlands are subject to provisions of special permits required and issued by governmental agencies having jurisdiction in addition to requirements of specifications for this work.
- B. Do not commence Work prior to receiving required permits.
- C. Provide special bonds when required by permit.
- D. Notify controlling authority prior to beginning and after completing any construction in right-of-ways or streams.
- E. Bear all expenses related to permit compliance.

3.6 EASEMENTS

- A. Owner will provide all easements.
- B. Work on the easements shall be in strict compliance with the terms of the easements agreements.
- C. Owner, easement grantee, and Contractor shall be in full agreement on the method of execution prior to beginning work.
 1. Only structures, trees, shrubs, and other obstructions are to be removed as mutually agreed.
 2. Restoration shall be equal to original condition or the conditions of the agreement.

3.7 PROTECTION OF ESTABLISHED PROPERTY MARKERS

- A. Protect all property markers (iron pipe, concrete, or wood posts, etc.) from movement from original position.
- B. Pay costs of replacement of property markers moved during construction.
- C. Re-establishment of removed property lot pins will be done by a Registered Land Surveyor in accordance with pertinent sections of the State of Wisconsin Statutes. The City of De Pere will have the right of approval of the Registered Land Surveyor. Certification of proper re-establishment of lot pins will be provided by the Contractor.

3.8 COLD WEATHER

- A. The Engineer reserves the right to order pipe laying discontinued whenever, in the Engineer's opinion, there is a danger of the quality of work being impaired because of cold weather.
- B. The Contractor shall be responsible for heating the pipe and jointing materials so as to prevent freezing of joints.
- C. No pipe shall be laid on frozen ground.
- D. When pipes are to be laid with rubber gaskets in cold weather, the gasket material shall be sufficiently warmed so as to facilitate making a proper joint.
- E. When pipes are to be laid with a solvent cemented joint in cold weather, care shall be taken to ensure the removal of all ice and snow from the jointed area prior to the application of the solvent cement.

3.9 CLEANING OF WORK

- A. Pipelines
 - 1. Interiors of utility pipelines (including existing) affected by construction procedures shall be free of all extraneous materials.
 - 2. Pipelines shall be left clean at the completion of work.
- B. Final Cleanup and Inspection
 - 1. Remove the following:
 - a. Temporary offices and storage structures.
 - b. Temporary fencing and roads.
 - c. Surplus material and rubbish.
 - d. Material (liquid or solid) resulting from cleaning operations.
 - 2. The Engineer and Owner may make a final inspection of the work during the progress of the final cleaning and repairing. Any portion of the work accepted by the Owner shall be kept clean by the Contractor until final acceptance of the entire project.
 - 3. When the Contractor has completed the final cleaning operation, he shall notify the Engineer in writing that he is ready for final inspection.
 - 4. After written notification to the Contractor, the Owner may elect to remove from the work site and/or adjacent properties, all rubbish, surplus or waste materials which the Contractor has neglected or refused to remove, and deduct the costs of removal from any monies due the Contractor.
 - 5. During construction, the Contractor shall clean up as the Work proceeds. The premises shall be kept free of accumulations of waste materials and earth, rubbish and other debris resulting from the work. If in the judgment of the Engineer, the Contractor fails to keep the sites clean as described herein above, the Engineer will recommend to the Owner withholding all progress payments until the sites have been cleaned up to the Engineer's satisfaction.

6. All debris and waste materials and salvaged materials, unless required by the Specifications to be reused or delivered to the Owner, shall become the property of the Contractor and shall be removed by the Contractor from the construction sites.
7. Where truck crossings occur over sidewalks, they shall be kept free from all spilled earth and grading materials and shall at all times be maintained in a passable condition for foot traffic.
8. Generally, the transportation of materials to and from the sites shall be over regular streets. When the Contractor's operations or that of its shippers, haulers, or subcontractors are such that dirt, mud, or debris is spilled or otherwise deposited on streets, driveways, sidewalks, or other thoroughfares, the Contractor shall clean up the large chunks before the close of every day's operations or before it is broken up or becomes impacted on the surface. In case of dispute or Contractor's failure to perform this cleanup work, the Owner may clean the streets and walks, remove the rubbish, etc., and will charge the cost to the Contractor, by withholding monies due to cover all charged work.
9. After completion of work in any of the site work areas, the Contractor will remove all waste materials, rubbish and debris from and about the premises as well as all tools and surplus materials, and will leave the sites clean and ready for occupancy by the Owner. The Contractor will restore to their original condition any roads, utilities, walks, buildings, etc. disturbed or damaged by the Contractor's operations.
10. Open burning of debris will not be permitted unless specifically authorized in writing by the Owner, and then only following state, municipal or other local codes, ordinances, rules or regulations.
11. Payment for cleaning up and complying with all items in this Section shall be made incidental to construction.

END OF SECTION

SECTION 33 05 23**TRENCHLESS EXCAVATION CONSTRUCTION****PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes
1. Auger horizontal earth boring (boring and jacking).
 2. Horizontal directional drilling.
 3. Compaction methods.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. A139 Standard Specification for Electric-Fusion (Arc) – Welded Steel Pipe (NPS 4 and over)

1.3 SUBMITTALS

- A. Certificate of compliance for the steel casing pipe.
- B. Horizontal and vertical location of the installed pipe during horizontal directional drilling.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Steel Casing Pipe
1. Meets the requirements of ASTM A139, Grade B.
 2. No protective coating.
 3. No hydrostatic test required.
 4. Pipe shall be new and unused.
 5. Pipe shall be straight and round.
 6. Beveled ends for butt welding.
 7. Straight seam or seamless pipe.
 8. Minimum yield strength of 35,000 psi.
 9. Pipe wall thickness to be determined by the Contractor designed for loads due to jacking and E80 loadings with the following minimums:

Nominal Pipe Diameter (inches)	Nominal Wall Thickness (inches)
Under 14	0.250
14 and 16	0.281
18	0.312

20	0.344
24	0.406
26	0.438
30	0.469
32	0.500
36	0.532
42	0.563

PART 3 – EXECUTION

3.1 INSTALLATION

A. Auger Horizontal Earth Boring (Boring and Jacking)

1. This method is to be used for the installation of a steel casing pipe under roads, railroads, streams and other obstacles as shown on the drawings.
2. Provide boring and receiving pits meeting the requirements of section "Trenching, Backfilling and Compacting."
3. The grades and slopes of the casing shall conform to the drawings.
 - a. Use a grade control head where grade is critical for sanitary and storm sewer.
 - b. Provide a water level or other device to measure the grade of the pipe casing while it is being installed.
 - c. Determine the grade of each end of the installed casing prior to removal of equipment.
4. Take care to ensure that developed thrust pressures do not disturb existing utilities in or around the bore pit area.
5. In soft unstable soil use an auger of slightly smaller diameter than the inside diameter of the casing so as not to create a void between the casing and the soil.
6. Pressure grout the void between the casing and the bore hole, if the outside diameter of the casing is over-excavated.
7. The casing pipe diameter shall be a minimum of 6" larger than the bell diameter of the carrier pipe.
8. Install casing horizontally and vertically to an accuracy of +0.5% of the length of the casing. Use an oversized casing where line and grade of the carrier pipe cannot be provided within this accuracy.
9. Provide continuous circumferential butt welds for a watertight straight and true casing pipe.
10. Support and brace the carrier pipe to prevent shifting.
11. Provide flowable fill between casing and carrier pipe conforming to the requirements for pipe abandonment under Section 31 05 10.

B. Horizontal Directional Drilling

1. This method is to be used for installation of the carrier pipe under roads, railroads, streams and other obstacles as shown on the drawings.
2. The drilling process shall be by mechanical cutting using a drill bit (cutting head) capable of drilling in rock.
3. A bentonite slurry shall be used to transport drill cuttings to the surface, stabilize the hole against collapse, lubricate and cool the cutting head.

4. The cutting head shall provide directional steering and monitoring of the actual position for a pipeline that is not straight.
5. During drilling of the pilot hole, continuously monitor the location of the cutting head and record locations at a maximum of 20 foot intervals to be used for as-built information.
6. The pilot hole exit shall provide an accuracy of 5 feet left or right, 1 foot up or down, and -5 feet to +15 feet in length from that shown on the drawings.
7. Provide tracer wire on carrier pipe.
8. Fill the annular space between the borehole and the carrier pipe with bentonite slurry.
9. Bentonite Slurry and Cuttings:
 - a. Collect slurry and cuttings by a mobile spoils recovery equipment and removed from the site.
 - b. Dispose of spoils at an acceptable site.
 - c. Do not dispose of drill cuttings (spoils) into sanitary, storm or other public drainage system.
 - d. Do not permit spoils to flow over land and contain all materials.
 - e. Upon completion of the boring and pipe installation, remove all spoils from the starting and termination pits. Restore pits to their original condition.
 - f. Cover stockpiled material when not being used to prevent runoff.
 - g. The pilot hole, preream, and pullback operations shall be in one continuous operation.

C. Compaction Methods

1. Restricted to use for lines smaller than 4" diameter in compressible soil conditions and less than 50 feet in length.
2. Do not use the backhoe bucket to push the tool or pipe.
3. Push rod, rotary or percussion methods are acceptable when the grade and slope is not critical.
4. Install the pipe horizontally and vertically to an accuracy of +1% of the length of the boring.
5. Provide boring and receiving pits meeting the requirements of section "Trenching, Backfilling and Compacting."
6. Where appropriate soil conditions permit use of compaction methods for installation of sewer laterals (4" and 6") to required grades, the following applies:
 - a. May use rotary method with track-type boring unit utilizing a rigid solid drill stem.
 - b. May use percussion method utilizing a launching platform and sighting device to obtain proper alignment.
 - c. Grade shall be maintained between 1.04% and 2.08%.
 - d. If grades cannot be maintained using these methods, then install using horizontal directional drilling.

END OF SECTION

SECTION 33 11 00**WATER DISTRIBUTION SYSTEMS****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Underground installation of pressure pipe, fittings and appurtenances.
2. Fire Hydrants
3. Valves
4. Polyethylene encasement for ductile iron pipe and fittings
5. Tracer wire
6. Insulation for pipe frost shield
7. Disinfection of water mains.

1.2 REFERENCES**A. American Water Works Association (AWWA):**

1. C105 Polyethylene Encasement of Ductile-Iron Pipe Systems
2. C219 Bolted, Sleeve-Type Couplings for Plain-End Pipe
3. C502 Dry-Barrel Fire Hydrants
4. C504 Rubber-Seated Butterfly Valves
5. C512 Air-Release, Air/Vacuum and Combination Air Valves for Waterworks Service
6. C515 Reduced Wall, Resilient Seated Gate Valves for Water Supply Services
7. C550 Protective Epoxy Interior Coatings for Valves and Hydrants
8. C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
9. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
10. C651 Disinfecting Water Mains
11. C800 Underground Service Line Valves and Fittings
12. C901 Polyethylene (PE) Pressure Pipe and Tubing, ½ Inch through 3 Inch for Water Service
13. C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 in. through 63 in. for Distribution and Transmission

B. American Society for Testing and Materials (ASTM):

1. A48 Standard Specification for Grey Iron Castings
2. A307-00 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
3. A575 Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
4. B62 Standard Specification for Composition Bronze or Ounce Metal Castings
5. B88 Standard Specification for Seamless Copper Water Tube
6. B584 Standard Specification for Copper Alloy Sand Castings for General Applications
7. C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
8. C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
9. C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
10. C990 Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
11. D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping
12. F1668 Standard Guide for Construction Procedures for Buried Plastic Pipe

C. American Association of State Highway and Transportation Officials (AASHTO) :

1. H-20 Standard Specification for Highway Bridges

D. Federal Specifications (FS):

1. SS-C-153C Cement, Bituminous, Plastic

E. National Fire Protection Association

1. NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants

1.3 SUBMITTALS

- A. A manufacturer's certification that the products were manufactured in accordance with the designated reference standards with these specifications and including test results and date of tests.
- B. Manufacturer's calculations and recommendations for joint restraint.
- C. Pipe location records.

PART 2 - PRODUCT**2.1 NO LEAD BRASS FITTINGS AND VALVES – GENERAL**

- A. All fittings and valves shall be manufactured in accordance with AWWA Standard C-800, latest revision, and as further specified in these technical specifications.
 - 1. Exception: Any brass part of the fitting or valve in contact with potable water shall be made of a “No-Lead Brass”, defined for this specification as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C-800. This “No-Lead Brass” alloy shall not contain more than nine one hundredths of one percent (0.09% or less) total lead content by weight.
 - 2. Any brass part of the fitting or valve not in contact with potable water shall be made of 85-5-5 brass as defined for this specification as UNS Copper Alloy C83600 per ASTM B62, ASTM B584 and AWWA C-800.
- B. All brass fittings and valves shall be certified by an ANSI accredited test lab per NSF/ANSI standard 61, Drinking Water Components – Health Effects, Section 8 or NSF/ANSI Standards 372, Drinking Water System Components – Lead Content. Proof of certification is required.
- C. Brass fittings and valves shall comply with the United States of America Safe Drinking Water Act, and the U.S. Environmental Protection Agency.
- D. All brass fittings and valves shall have the manufacturer’s name or trademark permanently stamped or cast on it. Another marking identifying the “no lead” brass alloy, e.g., ‘NL’, shall be cast or permanently stamped on the fitting or valve.

2.2 FIRE HYDRANTS

- A. Conform to requirements of AWWA C502.
- B. Manufactured within one year of installation.
- C. Compression type shutoff with bronze by bronze seating design opening against the pressure and closing with the pressure.
- D. Main Valve Opening: 5 ¼”
- E. Minimum Barrel Diameter: 7”
- F. Provide traffic model with upper and lower barrels joined at the ground line by a separate and breakable and replaceable flange joint and providing 360 degrees rotation of upper barrel.
- G. Hydrant shall be designed to accept barrel extensions.
- H. Hydrant bolts and nuts shall be 304 stainless steel with anti-seize mechanism.

- I. Nozzles
 - 1. Provide three-way design with one 4 ½" NST pumper nozzle and two 2 1/2" NST hose nozzles.
 - 2. Provide nozzle caps with nut the same size as the operating nut and chain.
- J. Bury depth shall be 6.5 feet measured to the nearest ½ foot from the bottom of the connecting pipe to the ground line of the hydrant.
- K. Inlet connection shall be 6 inch mechanical joint with 304 stainless steel bolts and nuts with anti-seize mechanism.
- L. The hydrant top section shall be painted the color yellow, excluding the caps.
- M. The caps on the hydrant shall be painted per NFPA Standard 291, based on available fire flows as determined by the Engineer and shown on the plans.
 - 1. Class AA –Blue Caps M4137 Hydrant National Blue – Rated capacity of 1500 gpm or greater
 - 2. Class A –Green – Rated capacity of 1000-1499 gpm
 - 3. Class B –Orange – Rated capacity of 500-999 gpm
 - 4. Class C –Red – Rated capacity of less than 500 gpm
- N. Hydrant to have a 16" break-off section.
- O. 1 ½" pentagon operating nut to open left.
- P. Hydrant markers shall consist of a five (5) foot long 3/8 inch diameter fiberglass shaft attached to a heavy duty MIL SPEC zinc plated carbon steel spring mount with a flat bracket. The shaft shall be completely wrapped with alternating six (6) inch wide reflective tape strips so that there will be no exposed fiberglass. The reflective tape color shall match the hydrant cap color. Complete assembly shall be corrosion and UV resistant. Flat mounting bracket shall fit onto the 5/8-inch hydrant bolt.
- Q. Hydrants shall be Waterous WB67250

2.3 VALVES

- A. General
 - 1. Valves shall be for buried service.
 - 2. Valve ends shall be mechanical joint for buried service.
 - 3. Operating stem shall turn counterclockwise to open.
 - 4. Shaft or stem shall be sealed using O-ring seals.
 - 5. Manufactured within one year of installation.
- B. Butterfly Valves
 - 1. Conform to requirements of AWWA C504 mechanical joint end valves, Class 150B
 - 2. Used where water main is larger than 12 inches diameter.

3. Equip with traveling nut or worm gear operators.
 4. Valve Body: Cast iron ASTM A126, Class B.
 5. Valve Shaft: Stainless steel 304.
 6. Valve Disc: Ductile iron ASTM A536 with 304 stainless steel disc edge.
 7. Shaft seals shall be the self-adjusting split-V type or standard O-ring seals.
 8. Operators:
 - a. The operator shall be furnished with a standard AWWA 2-inch square nut for manual wrench operation as specified in Section 19 of AWWA C-500 which shall be positively secured to the operator input shaft.
 - b. Valve to open counter clockwise.
 - c. A self-draining, self-aligning base 4-3/4 to 5 inch diameter concentric with the input shaft, shall be provided to accept a circular valve box base.
 - d. The valve shall seat closed at an angle of 90 degrees from full open.
 - e. The operator shall be self-locking, and the disc shall not creep or flutter under service conditions.
 - f. The operator shall be furnished with a permanent factory set stop at each of its travel.
 - g. Maximum input torque required to develop the rated output torque shall not exceed 150 foot-pounds for any size valve.
 - h. The operator shall be designed for the output torque shown in Table 1 of AWWA C504.
 - i. The operator case shall be completely watertight, sealed by means of approved gaskets, gasket compounds, O-rings or threaded plugs.
 - j. Operators shall be filled with suitable oil lubricant or thoroughly coated with an approved grease at the factory. If the operator lubricant is oil, suitable fill and drain plugs shall be provided.
 9. Bolts and nuts for end connections shall be 304 stainless steel with anti-seize mechanism.
 10. Acceptable Manufacturers: See special provisions.
- C. Resilient Wedge (Gate) Valves
1. Conform to requirement of AWWA C515 mechanical joint connectors with 304 stainless steel bolts with anti-seize mechanism or push-on connectors.
 2. Use where water main is 12 inches in diameter or smaller.
 3. Stem shall be non-rising.
 4. Bolts and nuts on the valve shall be 304 stainless steel.
 5. Bolts and nuts for end connections shall be 304 stainless steel bolts with anti-seize mechanism.
 6. Tapping valves shall have one end flanged with alignment lip to attach tapping sleeve, and the other end with a special flange to attach the drilling machine and adaptor.
 7. Test Plugs:
 - a. The valve bonnet shall be provided with a 1/2 or 3/8 inch diameter threaded, solid, malleable or cast iron test plug.
 8. Stem Seal:
 - a. The valve stem seal shall be O-rings. The compound shall be of Buna N or NBR rubber and have a durometer hardness of 70 +/- 5 when tested in accordance with ASTM Designation D-2240.

9. Operating Nut:
 - a. The valve shall be equipped with a standard 2 inch square operating nut with cast-on directional arrow.
 - b. Valve to open counter clockwise.
10. Valves will be fitted with a three (3) foot long extension stem with bottom bolts for tightening to the valve at 90 degrees to each other.
 - a. Extension stem manufacturer shall be Ess Brothers and Sons Inc. or approved equal.
11. Acceptable Manufacturers:
 - a. Mueller
 - b. Kennedy
 - c. American Flow Control/Waterous
 - d. Clow

D. Valve Boxes

1. Cast iron, three-piece screw type, 5 ¼ inch shaft, round or oval base sized for valve.
2. Threads shall be cast into top and bottom sections.
3. Cover shall be anti-rattle type mark with the word "water" on top.
4. Acceptable Manufacturers:
 - a. Tyler 6860DD
 - b. Bingham Taylor
 - c. Sigma

2.4 POLYETHYLENE ENCASUREMENT FOR DUCTILE IRON PIPE AND FITTINGS

A. Conform to requirements of AWWA C105.

B. Type: I

C. Class: "A" (natural color) or "C" (black).

D. Grade: "E-1"

E. Thickness: 8 mils

2.5 WATER MAIN

A. Pipe material and size shall be stated in the Proposal and shown in the Drawings.

B. If the material is not stated, water main is to be Polyvinyl Chloride Pipe (PVC).

2.6 WATER SERVICES

A. Pipe and Tubing

1. Pipe and/or tubing material and size shall be as stated in the proposal and shown on the drawings.

2. Copper tubing shall conform to the requirements of ASTM B88, Type K for sizes up to 2 inches diameter.
 3. Polyethylene (PE) tubing shall be blue and conform to the requirements of AWWA C901, PE 3608, DR 9 for sizes up to 2 inches.
 4. Polyethylene (PE) pipe shall be blue and conform to the requirements of AWWA C901, PE 3608, DR 11, for sizes greater than 2 inches up to 3 inches.
 5. Polyvinyl Chloride Pipe (PVC) shall conform to the requirements of AWWA C900 for sizes 4 inches or greater.
- B. Corporation Stops/Valves
1. Conform to the requirements of AWWA C800.
 2. Ball type valve with double O-ring seals.
 3. Outlet shall include a copper flare connection for copper tubing or compression connection with stiffeners for polyethylene tubing.
 4. The pipe stiffener length for polyethylene tubing shall match the length of the fitting at the location of the compression nut.
 5. Acceptable Manufacturers:
 - a. Ford F1000
 - b. McDonald
 - 1) 1" - 74701Q
 - 2) 1 ½" & 2" – 74701BQ
- C. Curb Stops/Valves
1. Conform to the requirements of AWWA C800.
 2. Ball type valve with double O-ring seals.
 3. Inlet and outlet shall include a copper flare connection for copper tubing or compression connection with stiffeners for polyethylene tubing.
 4. The pipe stiffener length for polyethylene tubing shall match the length of the fitting at the location of the compression nut.
 5. Curb Stop to Curb Box Rod Connection
 - a. Material: Stainless steel 304
 - b. Bolt Size: ¼ - 20 x 1 ¼
 - c. Nylon Stainless Steel Locker
 6. Acceptable Manufacturers:
 - a. Ford B44-444M
 - b. McDonald 6104Q
 - c. Mueller B25155
- D. Tapping or Service Saddles
1. Stainless steel double strap designed for ductile iron pipe.
 2. Full circumference wide band stainless steel double bolt designed for PVC pipe.
 3. Required for PVC service taps and taps over 1" in diameter for ductile iron pipe.
 4. All taps shall be made with a Rockwell 372, Romac, Smith Blair Model 372, or equal service saddle.

E. Curb Boxes

1. Minneapolis pattern.
2. Cast iron lid with a 1 ¼" threaded brass pentagon plug and the work "Water" on top in raised letters with nut for trace wire.
3. Upper section shall be a minimum 1 ¼" I.D. steel pipe.
4. Base section shall be a minimum 1 ¼" I.D. cast iron.
5. The casting shall be thoroughly coated with bituminous pitch varnish or pipe dip.
6. Provide a McDonald 5660SS 48 inch stationary Type 304 Stainless Steel curb box rod.
7. Length shall be 7 ½ foot bury with a 6 ½ to 7 ½ foot adjustment range.
8. Acceptable Manufacturers:
 - a. Mueller H-10300
 - b. Ford EM2-60-57
 - c. McDonald 5614

2.7 TRACER WIRE

A. Wire for Water Main Construction.

1. #10 AWG solid, 21% conductivity annealed copper-clad high carbon steel extra high strength wire.
2. 1150 lbs. average tensile break load.
3. 30 mil high molecular weight high density blue polyethylene jacket, 30 volt rating.

2.8 TRACER WIRE ACCESS BOX

A. Provide access box device in accordance with the following:

1. The covered access device (tracer wire access box) shall have:
 - a. Two pieces to allow for telescoping action adjustment and for frost control.
 - b. Top piece to extend below ground a minimum of 12 inches.
 - c. 2 ½ inch minimum diameter extension from the top piece of the access box to the top of the sewer pipe.
 - d. Lid to be heavy cast iron manufactured in accordance with ASTM A48 Class 25. The top of the lid to be permanently engraved with "WATER" by the manufacturer. The lid is to be furnished with a means of locking the lid such as a standard lockable pentagonal bolt head. Lid to be furnished with connection holes where the tracer wire is to be connected with stainless steel terminal bolts.
2. Acceptable access devices are:
 - a. The Valvco Water Tracer Wire Access Box manufactured by C. P. Test Services-Valvco, Inc, reference:
<http://www.fischer-harris.com/ValvcoTracerWireAccessBox.htm>
 - b. The Cathodic Test Box P200 series manufactured by Bingham & Taylor, reference:
<http://www.binghamandtaylor.com/cathodic.htm>
3. In lieu of the above access devices furnish materials required as shown on the drawing detail for Tracer Wire Access.
4. In lieu of the above devices, a modified water valve box, approved by the Engineer will be

considered, meeting the following requirements:

- a. Cast iron, two-piece screw type, 5 ¼ inch shaft, with extension to top of sewer pipe.
- b. Threads shall be cast into top section.
- c. Cover shall be anti-rattle type mark with the word "WATER" on top.

2.9 COUPLINGS AND ADAPTERS

A. Flanged Coupling Adapters

1. Used for connecting plain end pipe to flanged equipment and fittings.
2. Ductile iron body and follower completely epoxy coated.
3. Plain rubber gasket.
4. Provide with anchor studs.

B. Bolted Couplings

1. Used for connecting plain end pipe to plain end pipe.
2. Steel sleeve completely epoxy coated.
3. Ductile iron follower.
4. Plain rubber gaskets.
5. Meet the requirements of AWWA C-219.

C. Tapping Sleeves

1. Tapping sleeves shall be rated at 200 psi working pressure up to 12" diameter and 150 psi working pressure above 12" diameter.
2. Sleeve and outlet flange shall be 304 stainless steel.
3. Sleeve gasket shall be full length of the sleeve waffle style 360 degree around the pipe.
4. Provide full face gasket between the outlet flange and the valve flange.
5. Tapping sleeves shall be Mueller H-034, Smith Blair 665, Dresser Style 630, or Romac.

D. Couplings and adapters shall be Dresser, Smith-Blair, or Romac Industries.

2.10 INSULATION BOARD

A. Extruded polystyrene conforming to ASTM C578, Type IV.

B. Each board shall be 2 inches thick x 4 feet wide x 8 feet long.

2.11 PIPE EMBEDMENT MATERIAL

A. Soil Class A-7 - ¾" or A-8-3/8" crushed rock per section "Soils and Aggregates for Earthwork."

B. Soil Class G-2 - "Clean earth fill per section "Soils and Aggregates for Earthwork."

C. Sand or engineer approved material for steel casing void.

2.12 THRUST RESTRAINTS

A. Mechanical Restraints

1. Ductile Iron Pipe and Fittings:
 - a. Megalug Series 1100 follower gland or equal for mechanical joint restraints.
 - b. Clow "Super Lock," American "Lok-Ring" or U.S. Pipe "TR Flex" for push-on joint restraint.
2. Polyvinyl Chloride (PVC) Pipe:
 - a. Megalug Series 2000 PV restraint gland or equal for mechanical joint restraint.
 - b. EBAA Iron, Inc. Series 1600 for AWWA C-900 pipe push-on joint restraint and EBAA Iron, Inc. Series 2800 for AWWA C-905 pipe push-on joint restraint, or equal.
 - c. Sigma One-Lok
3. Alpha™ ends may be used in lieu of a mechanical restraint.
4. Polyvinyl Chloride (PVC) Pipe:
 - a. Megalug Series 2000 PV restraint gland or equal for mechanical joint restraint.
 - b. EBAA Iron, Inc. Series 1600 for AWWA C-900 pipe push-on joint restraint and EBAA Iron, Inc. Series 2800 for AWWA C-905 pipe push-on joint restraint, or equal.

B. Concrete Thrust Blocks

1. Ready-mixed concrete conforming to the following:

Class	28-day Compressive Strength (PSI)	Max. Size Coarse Aggregate	Min. Cement Content (Bags/CY)	Air Content (%)	Slump
B	3000	1 ½ Inch	4.75	6 +/-1	3 to 4 Inch

2. Job-mixed concrete is permitted for amounts one cubic yard or less and shall meet the same material and strength requirements as ready-mixed concrete.

PART 3 - EXECUTION

3.1 WATER MAIN PIPE INSTALLATION

A. General

1. Vertical and Horizontal Alignment:
 - a. Install pipe to maintain vertical and horizontal alignment as shown on the drawings.
 - b. Place pipe to required line and grade with a tolerance of plus or minus 0.1 feet.
 - c. Install pipe without unplanned high points in the line, and a minimum cover over the top of pipe of six (6) feet.
 - d. Provide fittings, valves and hydrants at the required locations with joints centered, spigots bottomed and valve and hydrant stems plumb.
2. Commence pipe installation only after the trench has been dewatered below the trench bottom and all necessary sheeting and bracing is in place.
3. Use full length pipe except where necessary at valves and fittings.
4. Cut pipe to provide a smooth end at a right angle to the longitudinal axis of the pipe.
5. Assemble pipe in accordance with the written recommendations of the manufacturer.

6. When the interruption or operation of an existing pressure pipeline system is necessary to complete construction, conform to the following:
 - a. Owner will operate system at Contractor's request.
 - b. Confine requests to Owner's normal working schedule.
 - c. Do not operate controls or appurtenances.
7. Excavate to existing water main. Adjust line and grade if necessary to avoid use of extra fittings.
8. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds two feet of rise per one hundred feet of trench, the bells shall face upgrade.
9. Permissible joint deflection shall conform to the following table:

Maximum Permissible Joint Deflection – Rubber Gasket Joint			
Pipe Size	Max. Def. Degrees	Max. Def. in. per 18 ft	Radius Of Curve - ft
6	5-00	19	205
8	5-00	19	205
10	5-00	19	205
12	5-00	19	205

10. Remove and salvage plugs, flush pipes and incidental sections of existing water main as requested by Engineer.
11. Maintain five (5) feet between fittings.
12. Do not insert pipe beyond the stop marks at joints.
13. Bolts are to be tightened with a torque wrench to the manufacturer's recommendations.

B. Open Cut Method

1. Pipe construction of any pipe material shall follow the recommended procedures of ASTM F1668.
2. Trench requirements shall conform to section "Trenching, Backfilling and Compacting".
3. Keep pipe clean during and after laying.
4. Do not roll, drop, or dump pipe appurtenances into the trench.
5. When laying operations are interrupted or terminated, temporarily seal pipe ends to prevent entry of water, debris, small animals, or other types of contamination. Prevent flotation of the sealed pipe.

C. Trenchless Excavation Method

1. Boring and Jacking:
 - a. Provide casing pipe bored and jacked in-place in accordance with section "Trenchless Excavation Construction," at line and grade to accommodate the carrier pipe.
 - b. Install carrier pipe at line and grade through casing pipe blocked to prevent contact with the casing pipe.
 - c. Fill the annular space between casing pipe and carrier pipe with sand or pea gravel.
2. Horizontal Directional Drilling:
 - a. Install pipe directly by horizontal directional drilling in accordance with section

"Trenchless Excavation Construction" at the line and grade shown on the drawings.

- b. Design pipe as required above that specified to accommodate tensile stress during the installation process.

D. Ductile Iron Pipe Installation

1. Install pipe and appurtenances in accordance with AWWA C600.
2. Install pipe and fittings with polyethylene encasement in accordance with AWWA C105.
3. Pipe shall be cut at right angles to the centerline of the pipe. Cutting shall be done in a neat workmanlike manner without damage to the pipe so as to leave a smooth end. All pipes shall be cut with an approved mechanical cutter. The cut end of a pipe to be used with a rubber gasket joint shall be tapered by grinding or filing about 1/8 inch back at an angle of approximately 30 degrees with the centerline of the pipe, and any sharp or rough edges shall be removed.

E. Polyvinyl Chloride (PVC) Pipe Installation

1. Install pipe and appurtenance in accordance with AWWA C605.
2. Pipe bending is not permitted.
3. For shorter than standard pipe lengths, field cuts may be made with either hand or mechanical saws or plastic pipe cutters. Ends shall be cut square and perpendicular to the pipe axis. Spigots shall have burrs removed and ends smoothly beveled by a mechanical beveler or by hand with a rasp or file. Field spigots shall be stop-marked with felt tip marker or wax crayon for proper length of assembly insertion. The angle and depth of field bevels and lengths to stop-marks shall be comparable to factory pipe spigots.

F. Polyethylene (PE) Pipe Installation

1. Install pipe in accordance with ASTM D2774.

G. Pipe Embedment

1. Prestressed concrete cylinder pipe and ductile iron pipe Class "C" embedment:
 - a. Bedding:
 - 1) 4" below pipe place Soil Class A-7 or A-8 material.
 - 2) 6" below pipe place Soil Class A-7 or A-8 material if trench bottom is rock.
 - 3) Place and work bedding material by hand to insure all excavated voids are filled.
 - b. Haunching and Initial Backfill:
 - 1) From bedding material to one-sixth of pipe outside diameter use Soil Class A-7 material placed and worked by hand to insure all excavated voids are filled.
 - 2) From one-sixth of pipe outside diameter to 12" above the pipe use Soil Class G-2 material compacted in-place to 95% standard proctor density using hand tampers or impact tampers.
2. Plastic Pipe - Class "B" Embedment:
 - a. Bedding, Haunching and Initial Backfill:
 - 1) 4" below pipe to 12" above the pipe, place Soil Class A-7 or A-8 material work by hand to insure all excavated voids are filled.
 - 2) If in rock, place Soil Class A-7 or A-8 material 6" below pipe to 12" above the pipe and work by hand to insure all excavated voids are filled.

3. Block pipe installed through steel casing so as not to touch steel casing and fill the annular space between steel casing and carrier pipe.

3.2 THRUST RESTRAINTS

- A. Provide at mechanical joint and push-on joint connections including valves, hydrants, and fittings including plugs, caps, tees, reducers and bends.
 1. Alpha™ ends may be used in lieu of a mechanical restraint.
- B. Provide thrust restraint with mechanical restraints and concrete thrust blocks which physically prevent joint separation. Thrust blocks are to be constructed to transfer the thrust load from the pipe to the undisturbed soil of the trench wall.
 1. When using mechanical restraints, restrain the fitting joints within the following minimum pipe length on each side of the fitting unless manufacturer's submitted calculations and recommendations indicate otherwise:

Restrained/Tied Pipe Length Chart Minimum Length Requiring Restraints					
Fitting Type	6 inch	8 inch	10 inch	12 inch	16 inch
11.25° Bend	10	10	10	10	10
22.5° Bend	10	10	10	10	10
30° Bend	10	10	10	10	10
45° Bend	10	10	10	10	10
60° Bend	10	20	20	20	20
90° Bend*	20	20	30	40	40

Restrained/Tied Pipe Length Chart Minimum Length Requiring Restraints					
Tee (Side Tied)	20	20	30	40	40
Stubs or Dead Ends	20	20	30	40	50
Cross with Plugged End	20	20	30	40	40
Valve at End of Line	20	20	30	40	40

*Use of 90° Bends requires Engineer Approval

2. Where grade changes are made in the line by means of bends, secure the top bends by mechanical restraints and secure the bottom bends by means of poured in-place concrete thrust blocks and provide mechanical restraints within a pipe length of 30' of the joint.
- C. Install mechanical restraints in accordance with the manufacturer's recommendations. Use a torque limiting twist off nut without the need for a torque wrench to insure proper actuation of the restraint wedge.

- D. Encase mechanical restraints, associated materials, and the restrained pipe with polyethylene. Encasements are to extend five (5) feet beyond restraint.
- E. Restrain hydrants with mechanical restraints or with tie rods connecting all joints between the hydrant and the main line.

3.3 HYDRANTS

- A. Install where shown on the Drawings in accordance with AWWA C600.
- B. Install hydrants plumb with the nozzles parallel with or at right angles to the road as determined by the Owner.
- C. Set to grade with breakaway flange not more than 2 inches above or below the grade established by the Engineer.
- D. Provide drainage at the base of the hydrant placing crushed rock pipe bedding material.
- E. If groundwater is above the drain port or the drain port is within 8 feet of a sanitary sewer or storm inlet, then plug the port.
- F. Repair any paint chips or finish deficiencies that occur during construction.

3.4 VALVES

- A. Install in accordance with AWWA C600.
- B. Provide resilient wedge (gate) valves for sizes to 12 inches.
- C. Provide butterfly valves for sizes over 12 inches.
- D. Valves shall be supported on 6 inches of soil class A-7 or A-8 crushed rock pipe bedding material.
- E. Install valves in the closed position.
- F. Provide a valve box centered plumb over the operating nut of the valve and placed such that the box will not transmit shock or stress to the valve. Adjust the top of the valve box flush with finished grade.
- G. Provide and connect air release, vacuum relief valves to the main with a tee fitting and isolation valve. Install per manufacturer's recommendations.

3.5 CONNECTIONS TO EXISTING WATER MAIN

- A. Cut-in Connection

1. Cut existing main only large enough to accept a mechanical joint ductile iron fitting or valve directly connected to one end of the existing pipe.
2. Connect the other end using a ductile iron cut-in sleeve connected to the fitting or valve and the other cut end of the existing water main connected by mechanical joint end of the cut-in sleeve.
3. Fittings shall be mechanical joint ductile iron or Hymax.

B. Tapped Connection

1. Connect to the existing water main using a tapping sleeve and tapping valve.
2. The cut in the existing water main shall be full diameter.
3. Provide the type of connection stated in the drawings.

3.6 INSULATION FOR PIPE FROST SHIELD

- A. Provide where shown on the Drawings.
- B. Install insulation board in an inverted U around the pipe.
- C. The top width of the insulation board frost shield shall be the same as the trench width centered over the pipe.
- D. The sides of the U shall be 2' high with the bottom of the legs at least to the springline of the pipe.
- E. Install the insulation board in layers to provide a minimum thickness of 4" or the thickness stated on the Drawings.
- F. Install such that there are no voids under the insulation.

3.7 POLYETHYLENE ENCASEMENT

- A. Wrap underground ductile iron pipe.
- B. Wrap underground fittings, valves and valve boxes.
- C. Wrap mechanical restraints and accessories.
- D. Wrap all portions of hydrants below grade.
- E. Wrap curb stop and box below grade.
- F. Install in accordance with AWWA C105.
- G. Provide Class "C" polyethylene when exposure to sunlight will exceed two weeks.

- H. The polyethylene wrap shall be cut approximately five (5) feet longer than that of the pipe section and fittings. After assembling the pipe joint, the polyethylene shall be overlapped approximately one (1) foot and at all joints sealed with approved adhesive tape. Additional taping shall be used a three (3) foot intervals along the pipe. Any rips, punctures or other damage to the polyethylene shall be wrapped immediately with adhesive tape. Before installing the polyethylene wrap the exterior of the pipe shall be free of foreign material.
- I. When valves, tees, crosses, etc., cannot be wrapped practically in a tube, flat sheet or split tube shall be used. All seams shall be taped securely.
- J. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

3.8 TRACER WIRE

- A. Provide for water main.
- B. Tape wire directly to pipe at a minimum of three points per 20 foot length of pipe.
- C. Extend on all hydrants from the water main and the hydrant lead up the hydrant and into a tracer wire access box then continue back down to the water main so that a continuous strand of wire is achieved. The access box will be located adjacent to the hydrant, on the street side.
- D. Water main tracer wire at the curb box will be brought to the surface and with eighteen (18) inches of slack fastened to the curb box with plastic wire tie. The lateral will be marked with an eight (8) feet long, treated four by four (4"x4").
- E. Extend wire up to the surface at access points.
- F. Splices
 - 1. Maximum of one splice between access points.
 - 2. Splice connections shall be made using solder connections or other connections approved by Engineer.
- G. Connect tracer wire to ductile iron by welding when connecting new water main to existing ductile iron water main.

3.9 WATER SERVICES

- A. Location
 - 1. Install service laterals per the detail.
- B. Corporation Stops
 - 1. Install a 2 o'clock and 10 o'clock position on the pipe circumference.
 - 2. Do not install taps closer than 2 feet from the end of the pipe and not closer than 18"

between taps.

3. Tap ductile iron pipe in accordance with AWWA C600.
 4. Install service connections to PVC pipe in accordance with AWWA C605 using service saddles.
 5. Install corporation stops with the pipeline at normal working pressure to visually observe any leaks.
 6. Tap the service with the use of manual feed equipment using a cutter designed specifically for the material being tapped.
 7. Provide seven (7) feet of depth at the property line.
 8. Construct services without any coupling from the corporation to the curb box.
 9. Water services from the main to the curb box shall be HDPE or PVC per the "Materials Section".
 10. Water services from the curb box to existing copper water service shall be copper, unless HDPE is approved by the Engineer. HDPE may be allowed to accommodate bending the water service to connect to a shallower existing service. Connect tracer wire to copper water service with clamp.
- C. Install service pipe with horizontal curve from the service connection back to the straight trench to the property line.
- D. Install curb stops at the property or as shown on the Drawings.
1. Provide curb box centered over the operating nut of the valve.
 2. Provide shut-off extension rod on the curb stop valve operator.
 3. Provide a stainless steel bolt and locking nut to connect the curb stop to the stainless steel curb box rod.
 4. Top of the curb box shall be adjusted flush with the finished grade.
 5. Mark the location with a treated four by four (4"x4") board installed four (4) feet in the ground and four (4) feet out of ground. Water marker shall be painted blue.
 6. If an existing water service being replaced is shallow, the Engineer may direct the Contractor to replace the water service beyond the sidewalk.
 7. Provide valve box adapter around curb box if located in concrete.
- E. Construct a clay dam around the lateral at the end of the new lateral, prior to the curb stop.
1. Clay dam is to be 12" thick.
 2. Install in place of the bedding stone and initial backfill.
- F. Insulate water service if within 12" to the bottom of a sewer.
- G. Do not install water main above a storm sewer without approval from the Engineer.

3.10 FIELD QUALITY CONTROL

- A. Provide the following pipe tests:
1. Perform pressure and leakage test for pressurized pipelines prior to connecting water services.

2. Perform a secondary leakage test after all services and curb stops are installed.
 - a. Notify all residents of test.
 - b. Test shall be performed at water system pressure following the procedure identified in Section 01 45 23.
 - c. Close all curb stops in the section during the test.
3. Continuity testing for tracer wire installed.

3.11 DISINFECTION AND BACTERIOLOGICAL TESTING

- A. Provide disinfection and bacteriological testing according to AWWA C651-14 and section NR 811.73, Wisconsin Administrative Code.
- B. If piping was contaminated during storage, construction, or repair, the pipe shall be flushed to remove any foreign material that may have entered the pipe prior to disinfection.
- C. Disinfect with Tablet Method.
 1. Place the required number of tablets as follows:
 - a. The inlet end of each pipe section, including branch lines. The number of tablets shall be per the following:

Pipe Diameter (Inches)	13 or less feet (Number of Tablets)	18 feet (Number of Tablets)	20 feet (Number of Tablets)
4	1	1	1
6	1	1	1
8	1	2	2
10	2	3	3
12	3	4	4
16	4	6	7

Refer to AWWA C651-14 for larger diameters

- b. Each hydrant, hydrant lead, and other appurtenances.
 2. Attach tablets with food-grade adhesive to the top inside surface of the pipe.
 - a. Use adhesive approved by USDA for contact with edible products.
 - b. Adhesive shall be Permatex Form-A-Gasket No. 2, Permatex Clear RTV Silicone, or equal.
 - c. Permatex Form-A-Gasket No. 1 is not acceptable.
 3. Fill in a manner such that the water velocity within the main will not exceed 1 fps.
 4. Water is to remain in the pipe for a minimum of 24 hours. If the water temperature is less than 41 degrees F, the water is to remain in the pipe a minimum of 48 hours.
- D. Verify Chlorine Residual. Confirm the chlorine residual after 24 or 48 hours is greater than 0.2 ppm.
- E. Flush Chlorinated Water. Chlorinated water shall be flushed until the chlorine residual returns to background level for the distribution system. Water with a chlorine residual greater than

distribution system must be de-chlorinated prior to discharge to the ground surface or storm sewer.

- F. Verify by Bacteriological Testing. Following flushing, the water main shall be tested for coliform analyses as follows:
1. New water mains.
 - a. Two sets of samples collected 16 hours apart; or
 - b. Two sets of samples collected after the fresh water has remained in the main for at least 16 hours. The sets shall be collected no less than 15 minutes apart.
 - c. A set of samples includes: one sample every 1200 feet, one sample at the end of the newly installed line and one sample at each branch greater than one pipe length.
 2. Repaired mains that are depressurized and partially or wholly depressurized.
 - a. One set of samples after flushing.
 - b. The line may be reactivated prior to completion of the bacteriological analyses.
 - c. A set of samples includes: one sample downstream of the repair site (if flow direction is unknown, then one sample from each end of the repair site) and every 200 feet of pipe that was shut down.
 3. Repaired mains that were maintained under pressure at all times. No bacteriological testing is required.
- G. Water from all new mains must successfully pass a bacteriological test in accordance with the requirements of the Department of Natural Resources before the main is placed in service. This test shall be taken by the City of De Pere.
- H. Upon successful completion of disinfection, place the water main in service to maintain system pressure.

END OF SECTION

SECTION 33 31 00**SANITARY SEWER SYSTEMS****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Gravity sanitary sewer installation.
2. Precast concrete and concrete masonry manholes.
3. Manhole castings.
4. Manhole drops.
5. Sewer services.
6. Tracer wire.

1.2 REFERENCES**A. American Society for Testing and Materials (ASTM):**

1. ASTM A48 Standard Specification for Gray Iron Castings
2. ASTM C139 Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
3. ASTM A240 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
4. ASTM C270 Standard Specification for Mortar for Unit Masonry
5. ASTM C476 Standard Specification for Grout for Reinforced and Non-reinforced Masonry
6. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
7. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
8. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures
9. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
10. ASTM C1173 Standard Specification for Flexible Transition Couplings for Underground Piping Systems
11. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
12. ASTM D4101 Standard Specification for Polypropylene Plastic Injection and Extrusion Materials

B. American Association of State highway and Transportation Officials (AASHTO):**C. Federal Specifications (FS):**

1. FS SS-C-153C Cement, Bituminous, Plastic.

1.3 SUBMITTALS

- A. A manufacturer's certification for each product stating that the products were manufactured in accordance with the designated reference standards with test results and date of tests.

PART 2 – PRODUCTS

2.1 PIPE

- A. Pipe Material
 - 1. PVC Sewer Pipe shall be in accordance with Section 33 00 02 Polyvinyl Chloride (PVC) Pipe and Fittings.
 - 2. Pipeline material shall be PVC Pipe unless stated elsewhere in the proposal schedule or as shown on drawings
 - 3. Pipe diameters shall be as shown on drawings.
- B. Wyes, Tees, Risers and Fittings
 - 1. Wyes, tees and fittings shall be the same type of material and class as the mainline pipe.
 - 2. Risers and fittings shall be the same material and class as the service connections.
 - 3. Tees can only be used for connecting to existing sanitary sewers when approved by the Engineer.
 - 4. Wye branches for a lined sewer shall be a saddle type connector compatible with the lined pipe. Acceptable manufacturers:
 - a. Fernco Tap Saddle
 - b. GPK gasketed sewer fittings,
 - c. Approved equals (saddle wye gasket branch and gasket skirt with straps) will be considered.

2.2 TRANSITION COUPLINGS

- A. Couplings for transition between dissimilar pipe diameters or dissimilar pipe materials
 - 1. Fernco Inc., Mission Rubber Company, and Maxadapter are acceptable manufacturers.
 - 2. Conform to ASTM C1173.
 - 3. Provide stainless steel shear rings, bands, nuts and housings of marine grade stainless steel conforming to ASTM A240.

2.3 MANHOLES

- A. Precast Reinforced Concrete Manholes
 - 1. Components including base sections, riser sections, grade rings (adjustment rings), eccentric cone, flat slab top and manhole reducing bench shall meet ASTM C478.
 - 2. Base section shall include base riser section with integral monolithic bottom extending minimum of 6 inches beyond riser section.
 - 3. Tops for manholes shall be eccentric cone or, if required elsewhere, flat slab top.
 - 4. Adjusting rings
 - a. Precast concrete minimum of 2 inches thick.
 - b. Rubber: Infra-Riser, Pro-Ring, or approved equal.

- c. HDPE: Tadtech or approved equal.
- 5. Eccentric cones, flat slab tops and adjusting rings.
 - a. Shall have a 24 inch diameter opening.
 - b. Shall support AASHTO H-20 loadings.
- 6. Joints between components.
 - a. Joint design shall be in accordance with ASTM C990.
 - b. Gasket shall be the 1 ¼ inch thick butyl rubber material meeting requirements of AASHTO M-198 Type B flexible plastic gasket and ASTM C990 butyl rubber sealant.
- 7. Connector between Precast Reinforced Manhole Structures
 - a. Resilient flexible connector shall meet ASTM C923.
 - b. The seal between the flexible connector and the manhole shall be by casting the connector integrally with the manhole wall.
 - c. The seal between the connector and the pipe shall be by compression of the resilient material against the outside of the pipe.
 - d. Factory made manholes shall use A-Lok, Z-Lok, or equal.
 - e. Where an existing manhole is core drilled in the field, the flexible connector shall be NPC Inc., Kor-N-Seal or Press-Seal Gasket Corporation PSX:Positive Seal.

B. Bituminous plastic cement shall meet Federal Specification SS-C-153C, Type I.

C. Manhole Steps

- 1. Steel reinforced copolymer polypropylene meeting ASTM C478.
- 2. Copolymer polypropylene shall meet ASTM D4101.
- 3. Steel reinforcement shall be ASTM A615, Grade 60, ½ inch minimum steel reinforcing rod.
- 4. Step shall be 12 inches wide and project from the wall between 5 inches and 7 inches.
- 5. Minimum design live load shall be a single concentrated load of 300 lbs. when in place.

D. Castings

- 1. Shall be ASTM A48, Class 35B, gray iron.
- 2. Manhole frame and covers shall be non-rocking.
- 3. Manhole covers for sanitary sewer shall be self-sealing with concealed pick hole.
- 4. Shall be of uniform quality free from blowholes, shrinkage, discoloration and other defects.
- 5. Shall be heavy duty designed for AASHTO H-20 loads.
- 6. Type 1 Frame and Cover: Neenah Foundry No. R1500 unless stated elsewhere in the proposal or as shown on the drawings.

2.4 PIPE EMBEDMENT MATERIAL

A. Soil Class A-7 or A-8 crushed rock per section "Soils and Aggregates".

2.5 TRACER WIRE

A. Tracer wire will be continuous, single-strand #12 solid copper THHN wire with a continuous coating of polyethylene insulation suitable for direct burial in wet locations.

- B. Tracer wire on sanitary laterals will have green colored insulation.

PART 3 – EXECUTION

3.1 GRAVITY SEWER INSTALLATION

A. General

1. Vertical and Horizontal Alignment
 - a. Install sewer pipe to maintain vertical and horizontal alignment as shown on the Drawings.
 - b. Use laser equipment mounted in a manner to permit beam to shine through pipe.
 - c. Use a target to check each pipe installed.
 - d. Check laser beam alignment and grade a minimum of every 100 feet.
 - e. Use a fan to control air temperature variations in pipe and reduce bending of laser beam.
2. Commence pipe installation only after the trench has been dewatered below the trench bottom and all necessary sheeting and bracing is in place.
3. Install pipe starting at the downstream end and proceed toward the upstream.
4. Install plastic pipe in accordance with ASTM D2321, as revised by these specifications.

B. Pipe Embedment

1. Plastic Pipe – Class “B” Embedment:
 - a. Bedding, Haunching and Initial Backfill
 - 1) 4” below pipe to 12” above the pipe, place Soil Class A-7 or A-8 material work by hand to insure all excavated voids are filled.
 - 2) If in rock, place Soil Class A-7 or A-8 material 6” below pipe to 12” above the pipe and work by hand to insure all excavated voids are filled.

C. Pipe Installation

1. Open Cut Method:
 - a. Trench requirements shall conform to Section “Trenching, Backfilling, and Compacting.”
 - b. Do not use support blocking.
 - c. Proceed pipe laying upgrade with spigot pointing in direction of flow.
 - d. Lay each pipe true to line and grade within tolerances required for lamping.
 - e. When pipe installation is not in progress, provide the forward end of the pipe with a temporary plug to prevent foreign material from entering.
 - f. Push “home” the spigot end of the pipe joint in the socket before proceeding to install the next pipe.

When connecting to an existing sewer not terminating in a manhole, uncover the end of the existing sewer prior to laying sewer to allow horizontal and vertical adjustments.
 - g. Install pipe such that pipe joints are located far enough from the manhole outside wall to permit future pipe repair without damaging the manhole and the joints shall not fall within manhole walls.
2. Trenchless Excavation Method
 - a. Auger horizontal earth boring (boring and jacking)
 - 1) Bore and jack steel casing pipe at location and diameter or larger shown on the

- 2) Drawings in accordance with Section "Trenchless Excavation Construction" at line and grade to accommodate the gravity carrier pipe.
- 3) Install the gravity carrier pipe at line and grade through the casing pipe blocked to prevent contact with the casing pipe.
- 4) Fill the annular space between casing pipe and gravity carrier pipe with sand or Engineer approved equal.
- b. Horizontal directional drilling
 - 1) Install gravity carrier pipe in accordance with Section "Trenchless Excavation Construction" at line and grade and location shown on the Drawings.
 - 2) Fill the annular space between the bore hole and the gravity carrier pipe with a bentonite slurry.

D. Manholes

1. General Installation Requirements:
 - a. Depths shown on Drawings shall be considered approximate.
 - b. Establish flow lines and casting elevations from grade stakes and cut sheets.
 - c. Provide 6 feet minimum height from top of casting to flowline.
 - d. Place bases on a minimum of four (4) inches of bedding material:
 - 1) Soil Class A-7 or A-8.
 - 2) Place and work by hand to insure all excavated voids are filled.
 - 3) The maximum amount of adjusting rings is twelve inches.
 - e. Seal exterior of lift holes with bituminous plastic cement.
 - f. Fill the following with mortar and finished smooth.
 - 1) Interior lift holes.
 - 2) Annular space around pipes: interior bottom half only.
 - g. Construct manholes in accordance with the appropriate detail drawings.
 - h. Install structures plumb.
2. Detailed Installation:
 - a. Unless indicated otherwise, provide precast concrete manhole construction.
 - b. Four foot diameter shall be considered standard.
 - c. Pitch casting to match street crowns where applicable.
 - d. Provide precast risers in a combination of lengths to minimize the number of joints.
 - e. Install Butyl Rubber Joint Sealant at risers:
 - 1) Rope configuration.
 - 2) Install to be compressed by subsequent riser.
 - f. Manhole adjusting
 - 1) Manholes must have only **ONE** concrete ring (2", 4", or 6") on top of the cone section.
 - a) Asphaltic Concrete Pavement - Secure ring to the pre-cast cone section with a 3 and ½ inch wide Kent Seal or equal.
 - b) Concrete Pavement – Secure ring to pre-cast cone section with concrete vibrated in place during the paving operation.
 - 2) For manholes in pavement, above the concrete ring attach ½ inch thru 3 inch thick tapered rubber ring using two (2) 5/16 inch bead above and below the ring, of sealant type as recommended by the rubber ring manufacturer. There shall be a

minimum of 2" in depth of rubber rings.

- g. The maximum amount of adjusting rings is twelve inches. Do not enter manhole with pipe through cone section.
The pipe shall enter the barrel of the manhole through a flexible, watertight gasket or connector.
- h. Precast flat top may be used in lieu of a cone section when elevation is limited.
Provide Type 1 frames and covers for each manhole unless otherwise shown on the plan details.
- i. Manhole Drops:
 - 1) Conform to the detail Drawings.
 - 2) Furnish where designated on Drawings.
- j. Inverts:
 - 1) Shall conform to the following:
 - a) Shape to the lower half diameter of the largest connecting pipe.
 - b) Slope concrete bench upward to manhole wall.
 - c) Maintain a uniform flow line slope through manhole which matches minimum pipe slope.
 - 2) Precast manholes shall be furnished with a manufacturer installed invert.
- k. Future Sewer Connections:
 - 1) Pipe stubs shall be provided as shown on the drawings.
 - 2) Stubs shall extend a maximum of 12 inches from outer wall of structure unless otherwise stated.
 - 3) Stub shall be capped or bulkheaded and water tight.

E. Sewer Services

- 1. Laterals:
 - a. Unless otherwise specified, terminate laterals at the property line.
 - b. In the absence of grade stakes, install laterals deep enough to pick up the lowest service point, or a minimum depth of 10 feet, whichever is greater.
 - c. Install laterals in conformance with all plumbing codes and ordinances.
 - d. Provide cleanouts required by plumbing codes and ordinances as part of the lateral installation.
 - e. When a lateral is not connected for immediate use:
 - 1) Mark the location with a 4" x 4" pressure treated board, installed 4 feet in the ground and 4 feet out of the ground. Sanitary marker shall be painted green.
 - 2) Provide a watertight cap on the lateral end.
 - f. Install sewer lateral and water services with location and separation per the details.
 - g. Construct a bentonite clay dam around the lateral at the right-of-way, or at end of the new lateral.
 - 1) Clay dam is to be 12" thick
 - 2) Install in place of the bedding stone and initial backfill
- 2. Risers:
 - a. Risers shall be located at the mainline pipe unless noted otherwise on the plans or in the special provisions.
 - b. Bends shall be 45 degrees.

- c. Riser pipe shall be placed on a minimum of four (4) inches of bedding material.
- 3. Service Branches:
 - a. New Sewers: Install a factory assembled wye branch wherever possible.
 - b. Existing and Lined Sewers:
 - 1) Provide "Y" branches with a saddle type connector compatible to the pipe material being used.
 - 2) Provide concrete or hard wood blocking under the wye.

F. Connecting New Pipe to Existing Pipe

- 1. If pipe are of the same material and size, then use a coupling of the same pipe material designed for coupling of the same material and size.
- 2. If pipe are of dissimilar material or size or there is no coupling made of the same material, then provide a transition coupling with a stainless steel shear ring or approved equal. Provide bushings or inserts to maintain the flow line through the connection.

G. Joints

- 1. Construct joints in compliance with manufacturer's recommendations.
- 2. Utilize full length pipe except at manholes or service branches.

3.2 INSULATION FOR PIPE FROST SHIELD

- A. Provide where shown on the Drawings.
- B. Install insulation board in an inverted U around the pipe.
- C. Install insulation board with the top insulation board the same width as the trench centered over the pipe.
- D. Install the sides of the U-shape two feet high with the bottom of the legs at least to the springline of the pipe.
- E. Install the insulation board in layers to provide a minimum thickness of 4 inches or the thickness stated on the Drawings.
- F. Install such that there are no voids under the insulation.

3.3 BULKHEADS

- A. Bulkhead new construction to protect existing sewers from water, dirt, and debris.
- B. Do not remove bulkheads until new construction is accepted for use.
- C. Prior to removal of bulkhead, remove all material (liquid or solid) which accumulated behind bulkheads.

3.4 CLEANING AND REPAIRING SEWER LINES

- A. Clean as follows:
 - 1. All new sewer lines installed under this contract.
 - 2. Any existing sewer lines which are affected by construction.
- B. Furnish water and jetting equipment for cleaning operation.
- C. Repair all visible leads and defects, whether or not the sewer lines have been subject to all required tests.
- D. Remove any stuck cleaning, inspection or testing equipment from sewer lines.

3.5 TRACER WIRE

- A. Provide for all non-metallic service laterals within public right-of-way.
- B. Lateral or branch tracer wire splice connections will be typical Western Union-type solder splice made by stripping the coating off the main run tracer wire and then tightly wrapping the branch tracer wire around the main run tracer wire a minimum of 8 times. Both wire splices would then be soldered with a self-flux, 50-50 rosin core solder and tightly wrapped with a 1 ½" wide by 3.2 mm Scotchfill™ electrical insulation tape, or equivalent then coated with 3M Scotchkote™ electrical coating, or equivalent so that no copper wire is exposed. A stripping tool shall be used to remove the plastic coating on the wire. The Contractor will be responsible to have all the correct types of tools necessary to install the tracer wire materials as specified above and to ensure that the tools are in good working order.
- C. Tracer wire will be securely attached to the mainline sewer pipe, within (6) six inches of each end of the pipe, and at equally spaced locations with a maximum spacing of (6) six feet. Any exposed copper wire will be sealed and covered with materials approved by the Engineer.
- D. Tracer wire at the end of laterals on new sewer construction shall be brought to the surface at the right-of-way perpendicular to the end of the lateral and will be inserted into a three (3) foot long piece of a one (1) inch PVC with a double slotted cap and securely attached to the treated four by four (4"x4"). The top of the four by four will be placed such that four (4) feet extends above the finished grade. The one (1) inch PVC shall be placed such that eighteen (18) inches extend above the finished grade. The tracer wire at the top of the PVC will protrude out of one of the slots and back into the PVC pipe through the other slot with at least eighteen inches of slack.
- E. Tracer wire at the end of laterals on sanitary sewer replacements with connections to existing laterals shall be as follows:
 - 1. Wrapped around the curb stop if near the curb stop.
 - 2. Extended to the surface and installed in a tracer wire box if not near the curb stop.

3.6 FIELD QUALITY CONTROL

- A. Provide the following service in accordance with the section on Testing and Inspection of Pipeline Appurtenances.
1. Televiser all sanitary sewers.
 2. Lamp sanitary sewers if required by the Engineer.
 3. Perform a low pressure air test.
 4. Perform a deflection test on all plastic pipes.
 5. Perform a continuity test on all tracer wire.

END OF SECTION

SECTION 33 41 00**STORM SEWER SYSTEMS****PART 1 – GENERAL****1.1 SUMMARY****A. Section Includes**

1. Gravity storm sewer installation.
2. Precast concrete manholes.
3. Precast concrete inlets.
4. Manhole, inlet and catch basin castings.
5. Sewer services.

1.2 REFERENCES**A. American Society for Testing and Materials (ASTM):**

1. ASTM A48 Standard Specification for Gray Iron Castings
2. ASTM A240 Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
3. ASTM C139 Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes
4. ASTM C91 Standard Specification for Masonry Cement
5. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes
6. ASTM C270 Standard Specification for Mortar for Unit Masonry
7. ASTM C476 Standard Specification for Grout for Reinforced and Nonreinforced Masonry
8. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
9. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
10. ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
11. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures
12. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
13. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
14. ASTM C1173 Standard Specification for Flexible Transition Couplings for Underground Piping Systems
15. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
16. ASTM D4101 Standard Specification for Propylene Plastic Injection and Extrusion Materials

B. American Association of State highway and Transportation Officials (AASHTO):

1. AASHTO H-20 Standard Specification for Highway Bridges.

2. AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.

C. Federal Specifications (FS):

1. FS SS-C-153C Cement, Bituminous, Plastic.

1.3 SUBMITTALS

- A. A manufacturer's certification for each product stating that the products were manufactured in accordance with the designated reference standards with test results and date of tests.

PART 2 – PRODUCTS

2.1 PIPE

A. Sewer Pipe

1. Concrete sewer pipe shall be in accordance with 33 00 01 Concrete Pipe-Reinforced.
2. PVC Sewer Pipe shall be in accordance with Section 33 00 02 Polyvinyl Chloride (PVC) Pipe and Fittings.
3. CMCP shall be in accordance with Section 33 00 04 Corrugated Metal Culvert Pipe and Fittings.
4. Polypropylene sewer pipe shall be in accordance with Section 33 00 05 Double and Triple Walled Polypropylene Pipe.
5. Pipeline material shall be as stated in the proposal schedule or as shown on drawings
6. Pipe diameters shall be as shown on drawings.

B. Wyes, Tees, Risers and Fittings

1. Wyes, tees and fittings shall be the same type of material and class as the mainline pipe.
2. Risers and fittings shall be the same material and class as the service connections.
3. Allowable lateral connections for mainline pipe greater than 12" diameter is as follows below. Installation shall conform to manufacturer's recommendation based on pipe type.
 - a. RCP Pipe - NPC Kor-N-Tee, Multi-Tite Gasket, ProFlow Gasket, ADS Inserta Tee Onefit or Engineer approved equal.
 - b. PVC/PP – Kor-N-Tee Saddle, Multi-Tite Pipe Saddle, ADS Inserta Tee Onefit or Engineer approved equal.
 - c. Lateral, Fernco Multi-Tite Pipe Gaskets or Saddle Connector as recommended by the manufacturer may be used where mainline pipe is greater than 12" diameter.

2.2 TRANSITION COUPLINGS

A. Couplings for transition between dissimilar pipe diameters or dissimilar pipe materials

1. Fernco Inc., Mission Rubber Company, and Maxadapter are acceptable manufacturers.
2. Conform to ASTM C1173.
3. Provide stainless steel shear rings, bands, nuts and housings of marine grade stainless steel conforming to ASTM A240.

2.3 MANHOLES AND INLETS

A. Precast Reinforced Concrete Manholes and Inlets

1. Components including base sections, riser sections, grade rings (adjustment rings), eccentric cone, flat slab top and manhole reducing bench shall meet ASTM C478 and rectangular, inlets and catch basins shall meet ASTM C913.
2. Base section shall include base riser section with integral monolithic bottom extending minimum of 6 inches beyond riser section.
3. Tops for manholes shall be eccentric cone or, if required elsewhere, flat slab top.
4. Adjusting rings
 - a. Precast concrete: minimum of 2 inches thick.
 - b. Rubber: Infra-Riser, Pro-Ring, or approved equal.
 - c. HDPE: Tadtech or approved equal. Inlet rings shall be tapered longitudinally when the inlet is not at the low point.
5. Eccentric cones, flat slab tops and adjusting rings.
 - a. Shall have a 24 inch diameter opening.
 - b. Shall support AASHTO H-20 loadings.
6. Joints between components.
 - a. Joint design shall be in accordance with ASTM C990.
 - b. Gasket shall be the 1 ¼ inch thick butyl rubber material meeting requirements of AASHTO M-198 Type B flexible plastic gasket and ASTM C990 butyl rubber sealant.
7. Connection between Manhole Structures and Storm Sewer Pipe.
 - a. Provide a non-shrink grout.

B. Bituminous plastic cement shall meet Federal Specification SS-C-153C, Type I.

C. Manhole Steps

1. Steel reinforced copolymer polypropylene meeting ASTM C478.
2. Copolymer polypropylene shall meet ASTM D4101.
3. Steel reinforcement shall be ASTM A615, Grade 60, ½ inch minimum steel reinforcing rod.
4. Step shall be 12 inches wide and project from the wall between 5 inches and 7 inches.
5. Minimum design live load shall be a single concentrated load of 300 lbs. when in place.

D. Castings

1. Shall be ASTM A48, Class 35B, gray iron.
2. Manhole frame and covers shall be non-rocking.
3. Shall be of uniform quality free from blowholes, shrinkage, discoloration and other defects.
4. Shall be heavy duty designed for AASHTO H-20 loads.
5. Manhole Castings: Neenah Foundry No. R1500, unless stated elsewhere in the proposal or as shown on the drawings.
6. Type A Field Inlet Casting: Neenah Foundry No. 1500 with R2100 Grate Type "A".
7. Type B Inlet Casting: Neenah Foundry No. 3067-L, 7007B curb box with language for dump no waste drains to freshwater.
8. Beehive Grate and Casting: Neenah Foundry No. R-2560-D3.

2.4 MORTAR

A. Cement

1. Furnish masonry cement conforming to ASTM C91, type S.
2. Furnish hydrated lime conforming to ASTM C207.

B. Sand

1. Use sand conforming to 501.2.5, WisDOT State Specifications, except as follows:
 - a. Ensure that sand subjected to the mortar strength test has a tensile or compressive strength at 3 days and 7 days of not less than 85 percent of that developed by mortar of the same proportions and consistency, made of the same cement and standard Ottawa sand.
 - b. Use sand uniformly graded from coarse to fine conforming to the following gradation requirements:

SIEVE	PERCENT PASSING BY WEIGHT
No. 8	95-100
No. 100	25 Maximum
No. 200	10 Maximum

C. Mortar

1. Use mortar composed of 3 parts of sand for mortar, and one part of either a mixture of 50 percent portland cement and 50 percent of masonry cement, or a mixture of 75 percent portland cement and 25 percent hydrated lime.
2. Use a machine to mix the mortar unless the engineer allows otherwise.
 - a. Prepare machine-mixed mortar in an engineer-approved mixer and mix not less than 1 ½ minutes.
 - b. If preparing hand-mixed mortar, mix the sand and cement thoroughly in a clean, tight mortar box until uniform in color, then add clean water in a quantity that forms a stiff paste.
 - c. Do not use mortar mixed longer than 30 minutes or that develops its initial set.

2.5 GEOTEXTILE FABRIC FOR FILTRATION AND SEPARATION

- A. Fabric shall be non-woven polyester, polypropylene or polyethylene conforming to the following minimums:
 1. Grab Tensile Strength: 180 lbs.
 2. Puncture strength: 68 lbs.
 3. Apparent Breaking Elongation: 30%
 4. Apparent Opening Size (Sieve Size): 50
 5. Permittivity

2.6 PIPE EMBEDMENT MATERIAL

- A. Soil Class A-7, or A-8 crushed rock per section "Soils and Aggregates."

2.7 TRACER WIRE

- A. Tracer wire will be continuous, single-strand #12 solid copper THHN wire with a continuous coating of polyethylene insulation suitable for direct burial in wet locations.
- B. Tracer wire on storm sewer laterals will have brown colored insulation.

2.8 ENDWALLS

- A. Reinforced concrete apron endwalls shall be installed on the outlets of reinforced concrete storm sewer as called for on the plans. The concrete apron endwalls shall be constructed to conform to Section 33 00 01 Reinforced Concrete Pipe.
- B. Corrugated metal apron endwalls shall be installed on outlets corrugated metal culverts as called for on the plans. The metal apron endwalls shall be constructed to conform to Section 33 00 04 Corrugated Metal Culvert Pipe.

PART 3 – EXECUTION

3.1 GRAVITY SEWER INSTALLATION

A. General

- 1. Vertical and Horizontal Alignment
 - a. Install sewer pipe to maintain vertical and horizontal alignment as shown on the Drawings.
 - b. Use laser equipment mounted in a manner to permit beam to shine through pipe.
 - c. Use a target to check each pipe installed.
 - d. Check laser beam alignment and grade a minimum of every 100 feet.
 - e. Use a fan to control air temperature variations in pipe and reduce bending of laser beam.
- 2. Commence pipe installation only after the trench has been dewatered below the trench bottom and all necessary sheeting and bracing is in place.
- 3. Install pipe starting at the downstream end and proceed toward the upstream.
- 4. Install plastic pipe in accordance with ASTM D2321, as revised by these specifications.

B. Pipe Embedment

- 1. Circular Concrete Pipe – Class “C” Embedment:
 - a. Bedding:
 - 1) 4” below pipe place Soil Class A-7 or A-8 material.
 - 2) 6” below pipe place Soil Class A-7 or A-8 material if trench bottom is rock.
 - 3) Place and work bedding material by hand to insure all excavated voids are filled.
 - b. Haunching and Initial Backfill:
 - 1) From bedding material to one-sixth of pipe outside diameter, use Soil Class A-7 or A-8 material place and worked by hand to insure all excavated voids are filled.
 - 2) From one-sixth of pipe outside diameter to 12” above the pipe, use Soil Class G-2

material compacted in-place to 95% standard proctor density using hand tampers or impact tampers.

2. Plastic Pipe and Corrugated Metal Pipe – Class “B” Embedment:
 - a. Bedding, Haunching and Initial Backfill
 - 1) 4” below pipe to 12” above the pipe, place Soil Class A-7 or A-8 material work by hand to insure all excavated voids are filled.
 - 2) If in rock, place Soil Class A-7 or A-8 material 6” below pipe to 12” above the pipe and work by hand to insure all excavated voids are filled.
3. Perforated Pipe – Class “B” Embedment
 - a. Bedding, Haunching and Initial Backfill
 - 1) 4” below pipe to 12” above the pipe, place Soil Class A-7 or A-8 material work by hand to insure all excavated voids are filled.
 - 2) If in rock, place Soil Class A-7 or A-8 material 6” below pipe to 12” above the pipe and work by hand to insure all excavated voids are filled.

C. Pipe Installation

1. Open Cut Method:
 - a. Trench requirements shall conform to Section “Trenching, Backfilling, and Compacting.”
 - b. Do not use support blocking.
 - c. Proceed pipe laying upgrade with spigot pointing in direction of flow.
 - d. Lay each pipe true to line and grade within tolerances required for lamping.
 - e. When pipe installation is not in progress, provide the forward end of the pipe with a temporary plug to prevent foreign material from entering.
 - f. Push “home” the spigot end of the pipe joint in the socket before proceeding to install the next pipe.

When connecting to an existing sewer not terminating in a manhole, uncover the end of the existing sewer prior to laying sewer to allow horizontal and vertical adjustments.
 - g. Install pipe such that pipe joints are located far enough from the manhole outside wall to permit future pipe repair without damaging the manhole and the joints shall not fall within manhole walls.
2. Trenchless Excavation Method
 - a. Auger horizontal earth boring (boring and jacking)
 - 1) Bore and jack steel casing pipe at location and diameter or larger shown on the Drawings in accordance with Section “Trenchless Excavation Construction” at line and grade to accommodate the gravity carrier pipe.
 - 2) Install the gravity carrier pipe at line and grade through the casing pipe blocked to prevent contact with the casing pipe.
 - 3) Fill the annular space between casing pipe and gravity carrier pipe with sand or Engineer approved equal.
 - b. Horizontal directional drilling
 - 1) Install gravity carrier pipe in accordance with Section “Trenchless Excavation Construction” at line and grade and location shown on the Drawings.
 - 2) Fill the annular space between the bore hole and the gravity carrier pipe with a bentonite slurry.

D. Manholes and Inlets

1. General Installation Requirements:

- a. Depths shown on Drawings shall be considered approximate.
- b. Establish flow lines and casting elevations from grade stakes and cut sheets.
- c. Provide four feet eight inches (4'-8") minimum height from top of casting to base.
- d. Place bases on a minimum of four (4) inches of bedding material:
 - 1) Soil Class A-7 or A-8.
 - 2) Place and work by hand to insure all excavated voids are filled.
- e. Seal exterior of lift holes with bituminous plastic cement.
- f. Fill the following with mortar and finished smooth.
 - 1) Interior lift holes.
 - 2) Annular space around pipes
- g. Construct manholes and inlets in accordance with the appropriate detail drawings.
- h. Install structures plumb.

2. Detailed Installation:

- a. Unless indicated otherwise, provide precast concrete manhole construction.
- b. Four foot diameter shall be considered standard.
- c. Pitch casting to match street crowns where applicable.
- d. Provide precast risers in a combination of lengths which minimize the number of joints.
- e. Install Butyl Rubber Joint Sealant at Risers:
 - 1) Rope configuration.
 - 2) Installed to be compressed by subsequent riser.
- f. Manhole and Inlet Adjusting.
 - 1) Manholes and inlets must have only ONE concrete ring (2", 4", or 6") on top of the cone section.
 - a) Asphaltic Concrete Pavement – Secure ring to the pre-cast cone section with a 3 and ½ inch wide Kent Seal or equal.
 - b) Concrete Pavement – Secure ring to pre-cast cone section with concrete vibrated in place during the paving operation.
 - 2) For manholes in pavement, above the concrete ring attach a ½ inch thru 3 inch thick tapered rubber ring using two (2) 5/16 inch bead above and below the ring, of sealant type as recommended by the rubber ring manufacturer. There shall be a minimum of 2" in depth of rubber rings.
 - 3) For inlets in pavement, above the concrete ring attach a ½ inch thru 3 inch thick rubber ring using two (2) 5/16 inch bead above and below the ring, of sealant type as recommended by the rubber ring manufacturer. The ring shall be tapered along the flow line for at all locations excluding inlets at low points. There shall be a minimum of 2" in depth of rubber rings.
 - 4) The maximum amount of adjusting rings is 12 inches.
- g. Do not enter manhole with pipe through cone section.
- h. Pipe connections to manholes
 - 1) Grout pipe in-place inside and outside the manhole with mortar or gasket providing a soil tight seal.
- i. Precast flat top may be used in lieu of a cone section when elevation is limited.
- j. Provide Type 1 frames and covers for each manhole unless otherwise shown on the plan

details.

k. Inverts:

1) Shall conform to the following:

- a) Shape to the lower half diameter of the largest connecting pipe.
- b) Slope concrete bench upward to manhole wall.
- c) Maintain a uniform flow line slope through manhole which matches minimum pipe slope.

2) Precast manholes shall be furnished with a manufacturer installed invert.

l. Future Sewer Connections:

1) Pipe stubs shall be provided as shown on the drawings.

Stubs shall extend a maximum of 12 inches from outer wall of structure unless otherwise stated.

2) Stub shall be capped or bulkheaded and water tight.

E. Sewer Services

1. Laterals:

- a. Unless otherwise specified, terminate laterals at the property line.
- b. In the absence of grade stakes, install laterals deep enough to pick up the lowest service point.
- c. Install laterals in conformance with all plumbing codes and ordinances.
- d. Provide cleanouts required by plumbing codes and ordinances as part of the lateral installation.
- e. When a lateral is not connected for immediate use:
 - 1) Mark the location with a 4" x 4" pressure treated board installed 4 feet in the ground and 4 feet out of the ground. Storm marker shall be painted brown.
 - 2) Provide a watertight cap on the lateral end.
- f. Install sewer laterals and water service with location and separation per the details.

2. Risers:

- a. Risers shall extend from the main and be installed to maintain at least ten feet of depth on the lateral at the right-of-way or at the height shown on the plans.
- b. Bends shall be 45 degrees.
- c. Riser pipe shall be placed on a minimum of four (4) inch of bedding material.

3. Service Branches:

a. New Sewers:

- 1) Install a factory assembled wye branch wherever possible.
- 2) For concrete pipe, core drill and use a flexible water tight tee connector that mechanically expands in the cored opening.

b. Existing Sewers:

- 1) Provide "Y" branches with a saddle type connector compatible to the pipe material being used.
- 2) For concrete pipe, core drill and use a flexible water tight tee connector that mechanically expands in the cored opening.

F. Connecting New Pipe to Existing Pipe

- 1. If pipe are of the same material and size, then use a coupling of the same pipe material

designed for coupling of the same material and size.

2. If pipe are of dissimilar material or size or there is no coupling made of the same material, then provide a transition coupling with a stainless steel shear ring. Provide bushings or inserts to maintain the flow line through the connection.

G. Joints

1. Construct joints in compliance with manufacturer's recommendations.
2. Utilize full length pipe except at manholes or service branches.

H. Endwalls

1. Reinforced concrete endwalls shall be connected to concrete pipe with steel bolts conforming to WisDOT Standard Specifications for Highway Construction, Latest Edition.
2. Reinforced concrete endwalls shall be connected to PVC Pipe with a band on the PVC and steel bolt on the endwall.
3. Corrugated metal endwalls and pipe shall be banded.

3.2 INSULATION FOR PIPE FROST SHIELD

- A. Provide where shown on the Drawings.
- B. Install insulation board in an inverted U around the pipe.
- C. Install insulation board with the top insulation board the same width as the trench centered over the pipe.
- D. Install the sides of the U-shape tow feet high with the bottom of the legs at least to the springline of the pipe.
- E. Install the insulation board in layers to provide a minimum thickness of 4 inches or the thickness stated on the Drawings.
- F. Install such that there are no voids under the insulation.

3.3 BULKHEADS

- A. Bulkhead new construction to protect existing sewers from water, dirt, and debris.
- B. Do not remove bulkheads until new construction is accepted for use.
- C. Prior to removal of bulkhead, remove all material (liquid or solid) which accumulated behind bulkheads.

3.4 CLEANING AND REPAIRING SEWER LINES

- A. Clean as follows:

1. All new sewer lines installed under this contract.
 2. Any existing sewer lines which are affected by construction.
- B. Furnish water and jetting equipment for cleaning operation.
- C. Repair all visible leads and defects, whether or not the sewer lines have been subject to all required tests.
- D. Remove any stuck cleaning, inspection or testing equipment from sewer lines.

3.5 TRACER WIRE

- A. Provide for all non-metallic service laterals within public right-of-way.
- B. Lateral or branch tracer wire splice connections will be typical Western Union-type solder splice made by stripping the coating off the main run tracer wire and then tightly wrapping the branch tracer wire around the main run tracer wire a minimum of eight (8) times. Both wire splices would then be soldered with a self-flux, 50-50 rosin core solder and tightly with a 1 1/2 " wide 3.2 mm Scotchfill™ electrical insulation tape, or equivalent then coated with 3M Scotchkote™ electrical coating, or equivalent so that no copper wire is exposed. A Klein™ stripping tool shall be used to remove the plastic coating on the wire. The Contractor will be responsible to have all the correct types of tools necessary to install the tracer wire materials as specified above and to ensure that the tools are in good working order.
- C. Tracer wire will be securely attached to the mainline sewer pipe, within (6) six inches of each end of the pipe, and at equally spaced locations with a minimum spacing of (6) six feet. Any exposed copper wire will be sealed and covered with materials approved by the Engineer.
- D. Tracer wire at the end of laterals will be brought to the surface at the right-of-way perpendicular to the end of the lateral and will be inserted into a three (3) foot long piece of a one (1) inch PVC with a double slotted cap and securely attached to an eight (8) foot long, treated four by four ("4x4"). The top of the four x four will be placed such that thirty (30) inches extend above the finished grade. The one (1) inch PVC shall be placed such that eighteen (18) inches extend above the finished grade. The tracer wire at the top of the PVC will protrude out of one of the slots and back into the PVC pipe through the other slot with at least eighteen inches of slack.
- E. Tracer wire at the end of laterals on storm sewer replacements with connections to existing laterals shall be as follows:
1. Wrapped around the curb stop if near the curb stop.
 2. Extended to the surface and installed in a tracer wire box if not near the curb stop.

3.6 FIELD QUALITY CONTROL

- A. Provide the following service in accordance with the section on Testing and Inspection of Pipeline Construction.

1. Televiser all storm sewers.
2. Perform a deflection test on all mains that are not reinforced concrete.
3. Perform a continuity test on all tracer wire.

END OF SECTION

DE PERE[®]



DEPARTMENT OF PUBLIC WORKS

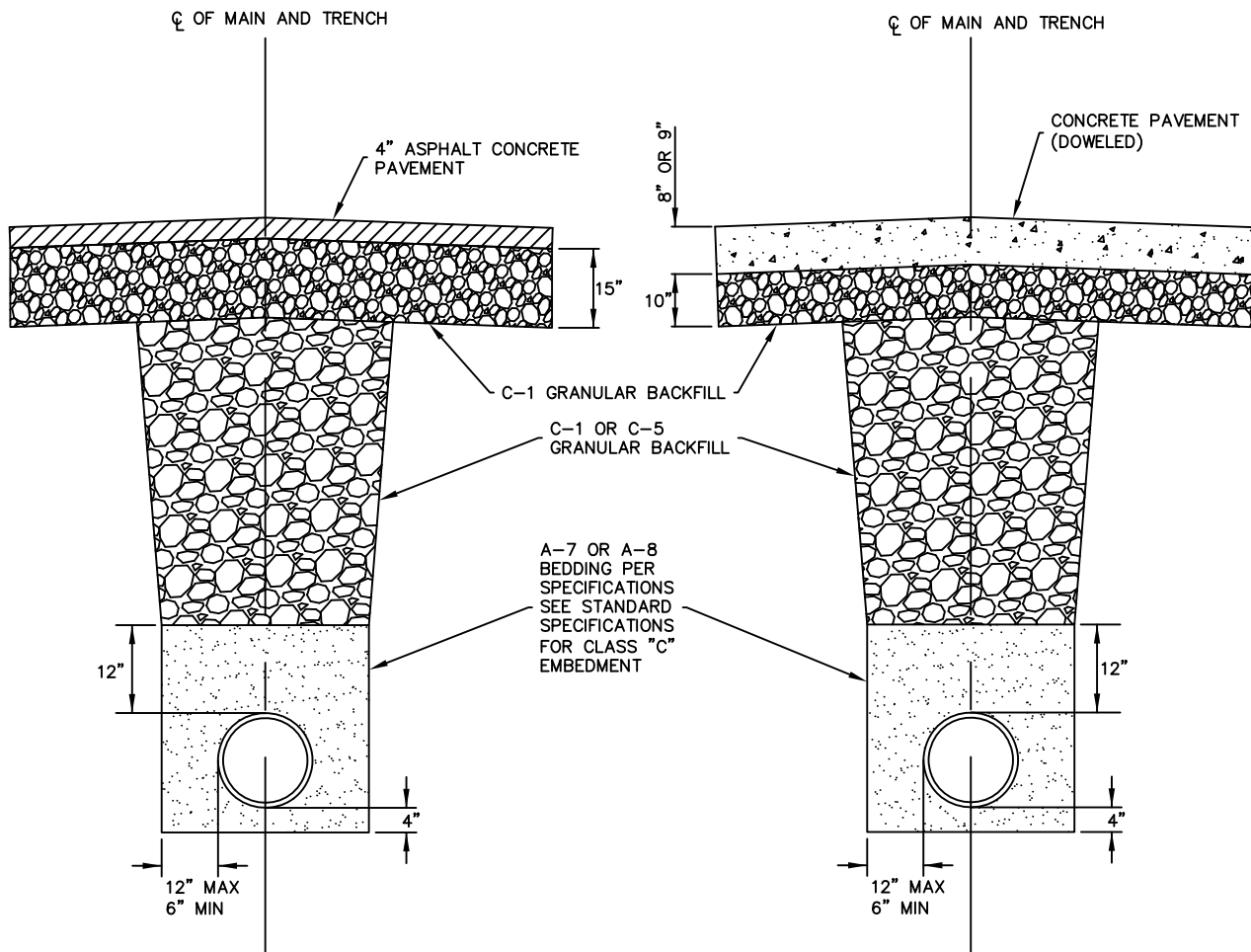
STANDARD DETAILS

JANUARY 8, 2024

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ASPHALT PAVEMENT BACKFILL

CONCRETE PAVEMENT BACKFILL

NOTES:

1. SIDE SLOPE BELOW ELEVATION ON FOOT ABOVE OF PIPE SHALL BE VERTICAL.
2. BACKFILL TO ONE FOOT ABOVE THE TOP OF THE PIPE SHALL BE TAMPED UNDER AND AROUND THE PIPE.



ENGINEERING DIVISION

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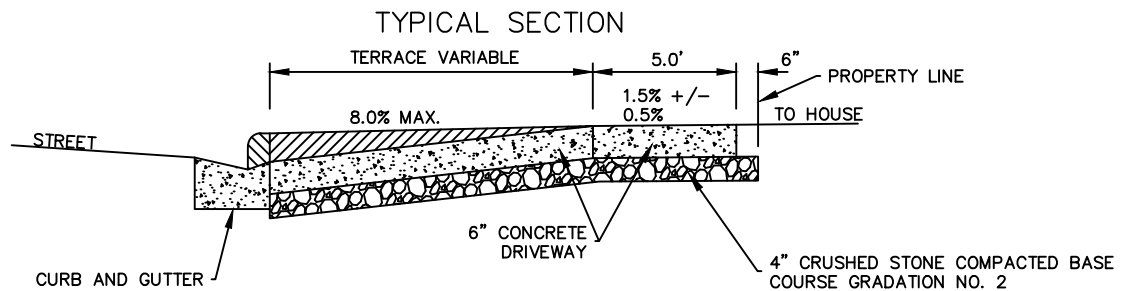
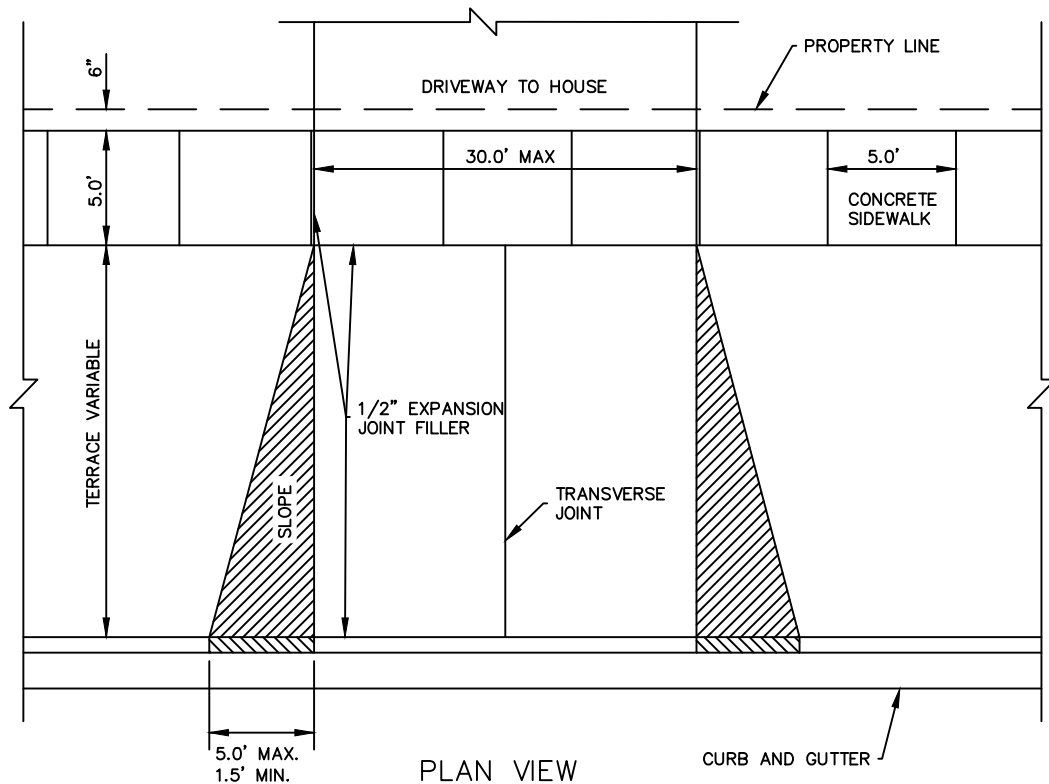
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FAX 920-339-4071

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TRENCHING AND
BACKFILLING

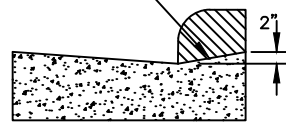
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TB-1

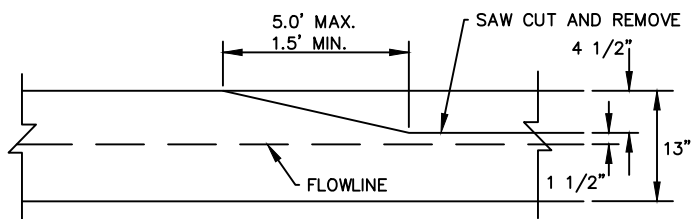
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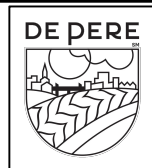
ALL CURB CUTS WILL BE MADE BY A RAIL MOUNTED, HYDRAULICALLY CONTROLLED OR HIGH CYCLE ELECTRIC, LARGE DIAMETER CONCRETE SAW DESIGNED SPECIFICALLY FOR THIS METHOD OF THE CURB HEAD REMOVAL.



CURB CUT SIDE VIEW



CURB CUT BACK VIEW



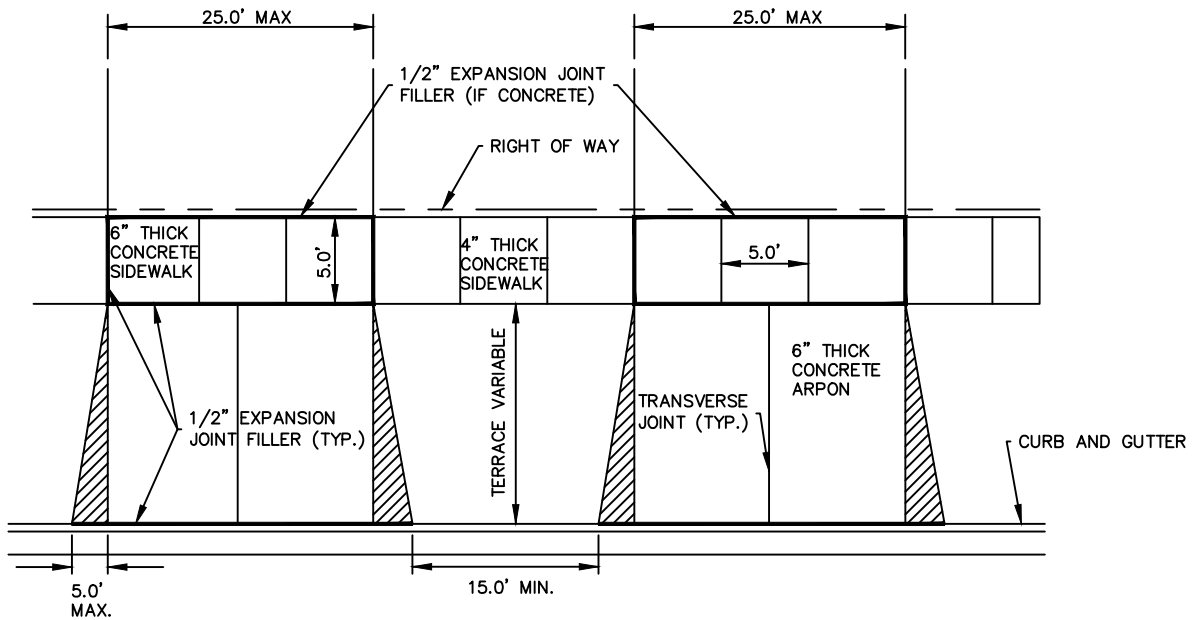
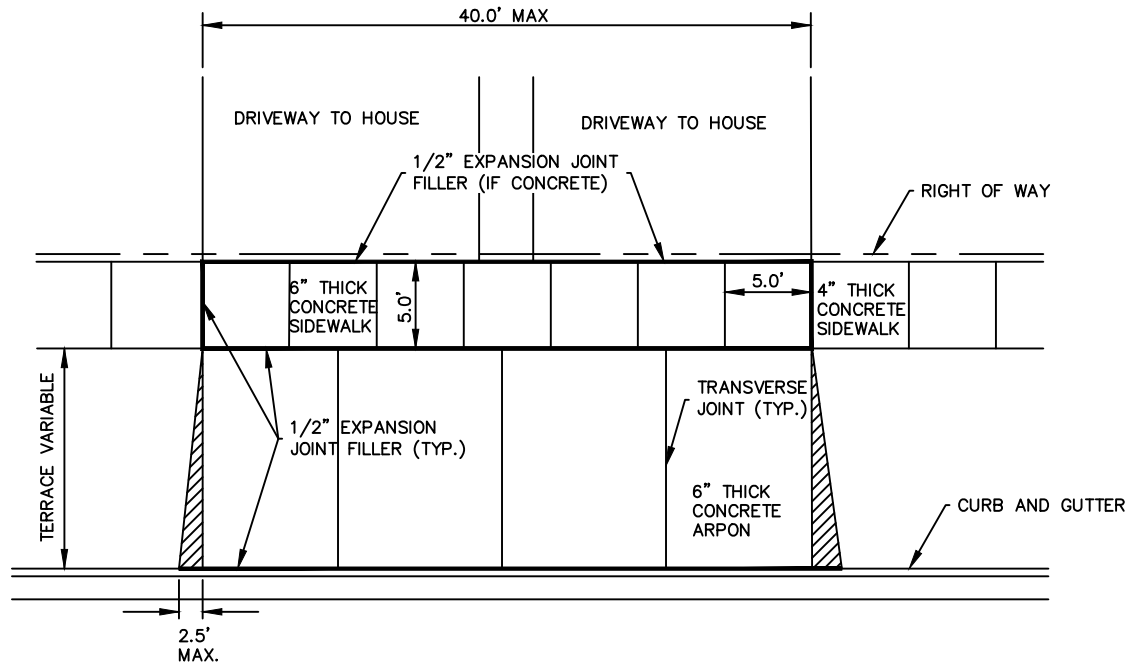
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FAX 920-339-4071

TITLE:
RESIDENTIAL
CONCRETE DRIVEWAYS

DIVISION: 32

DRAWING NO:
C-1

DATE: 01/2024
BY: MJT
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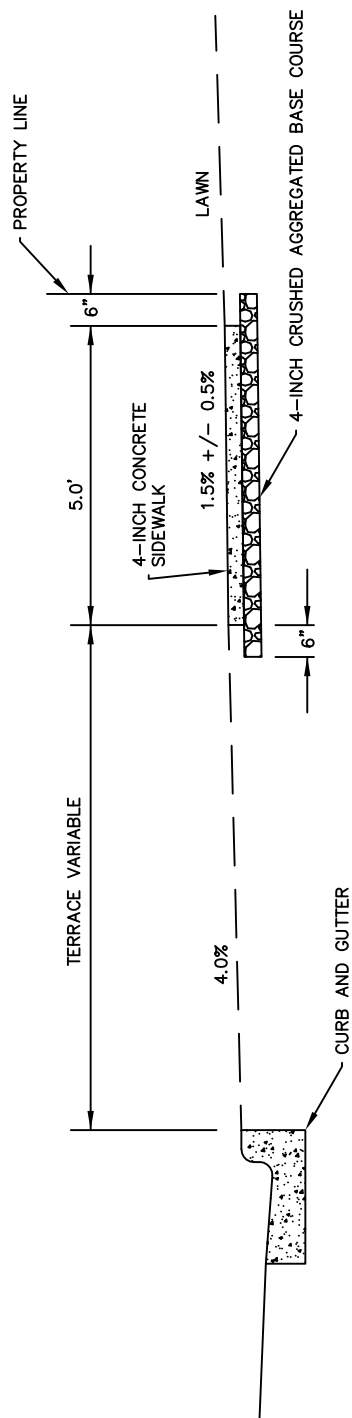
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DE PERE, WI 54115
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FAX 920-339-4071

TITLE:
DUPLEX DRIVEWAYS

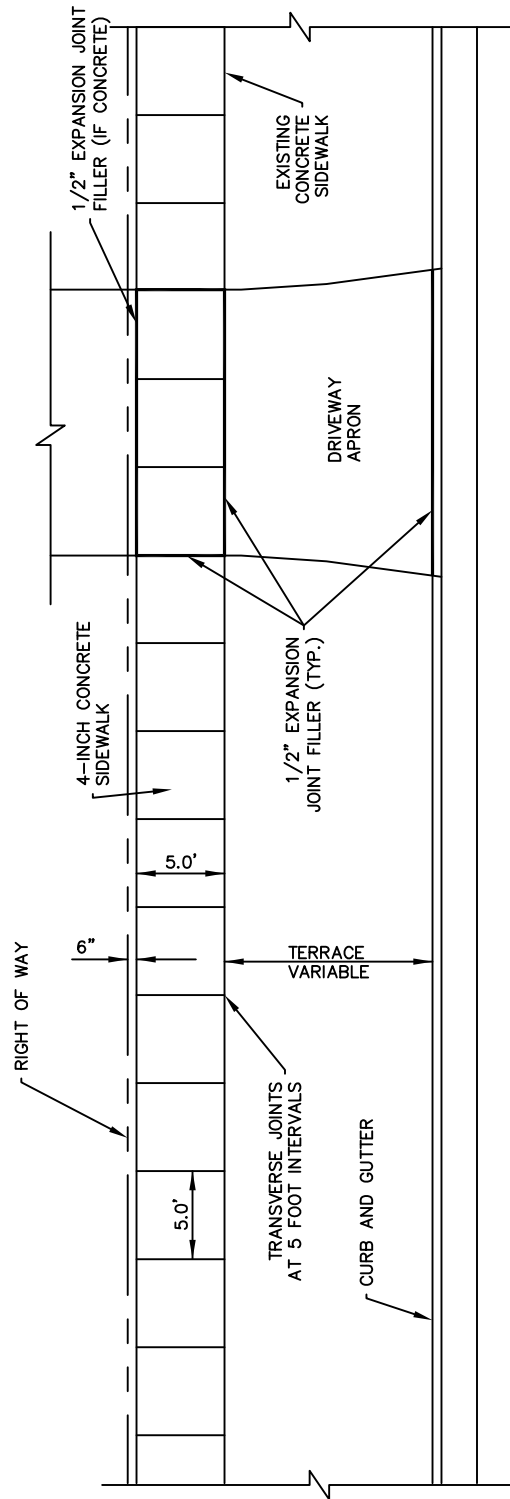
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C-2

DATE: 01/2024
BY: MJT
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TYPICAL SECTION



NOTE:

1. CONCRETE DRIVEWAY THICKNESS:

- RESIDENTIAL - 6" DEPTH
- COMMERCIAL/INDUSTRIAL - 8" DEPTH



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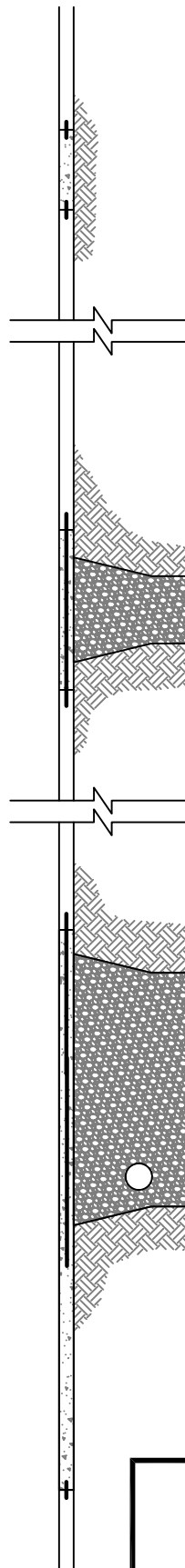
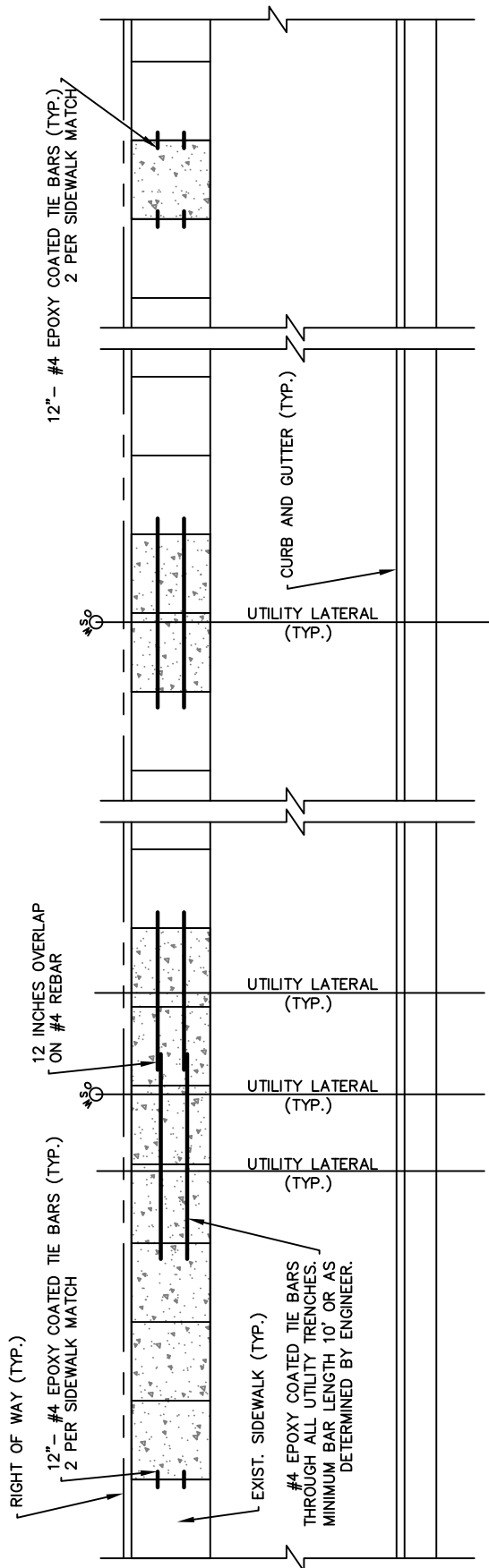
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TITLE:
CONCRETE SIDEWALKS
AND DRIVEWAY

DIVISION: 32

DRAWING NO:
C-3

DATE: 12/2018
BY: KAD
CHECKED: EPR



SIDEWALK REPLACEMENT-
UTILITY PLUS ADDITIONAL SLABS

SIDEWALK REPLACEMENT
WITH UTILITY CONSTRUCTION

INDIVIDUAL SIDEWALK
REPLACEMENT



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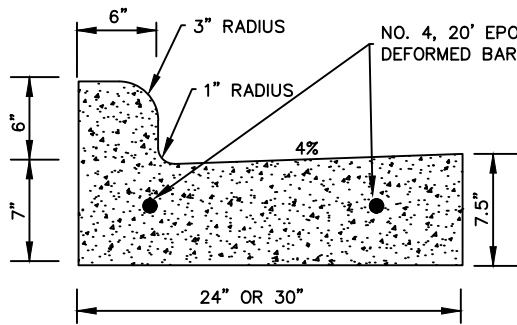
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FAX 920-339-4071

TITLE:
CONCRETE SIDEWALK
REINFORCEMENTS

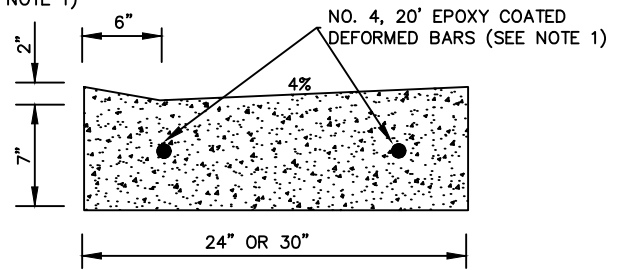
DIVISION: 32

DRAWING NO:
C-4

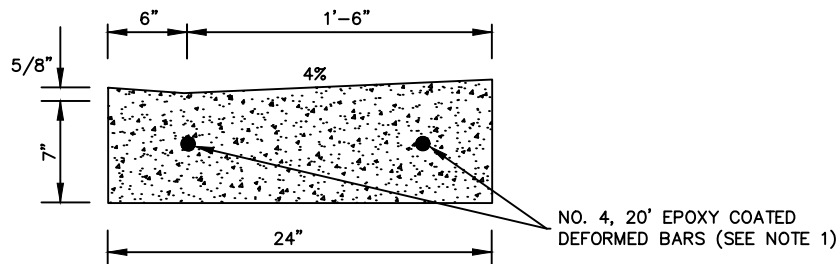
DATE: 12/2018
BY: KAD
CHECKED: EPR



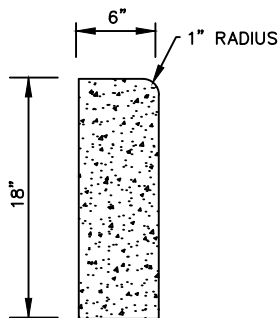
CURB AND GUTTER



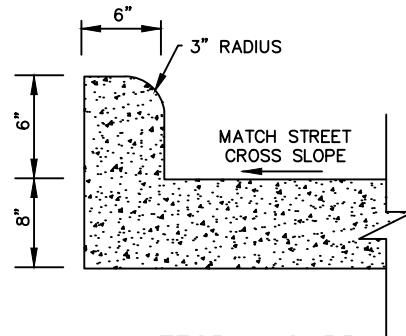
DRIVEWAY
GUTTER



PEDESTRIAN CURB RAMP
GUTTER



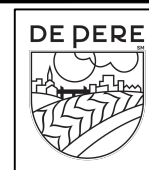
CURB



INTEGRAL CURB

NOTES:

1. 2-NO. 4, 20' EPOXY COATED DEFORMED BARS SHALL BE INSTALLED CENTERED OVER EACH SERVICE AND UTILITY TRENCH OR AS DIRECTED BY THE ENGINEER. FOR TRENCHES LYING UNDER THE CURB AND RUNNING PARALLEL TO THE CURB THE BARS SHALL BE INSTALLED FULL LENGTH OF THE TRENCH.
2. ALL EXPOSED EDGES OF THE CONCRETE SHALL BE FINISHED WITH AN EDGING TOOL HAVING A RADIUS OF 1/4 INCH UNLESS OTHERWISE NOTED.



ENGINEERING DIVISION

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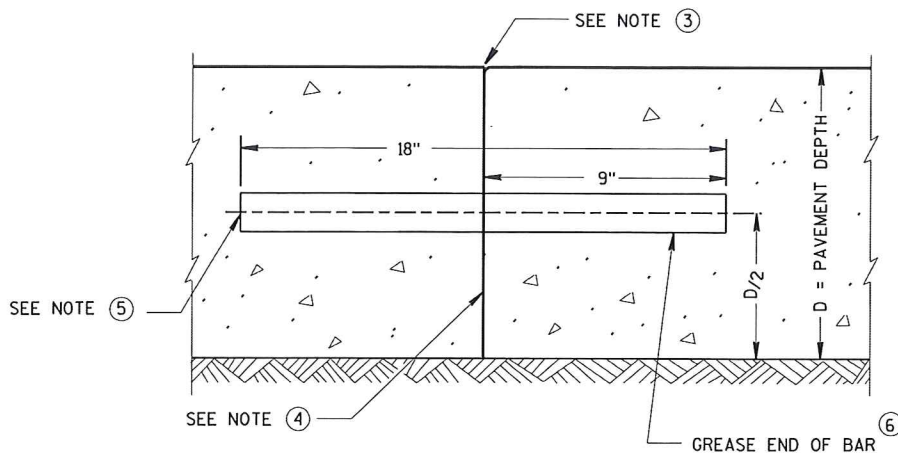
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CONCRETE CURB
CURB AND GUTTER
AND GUTTER

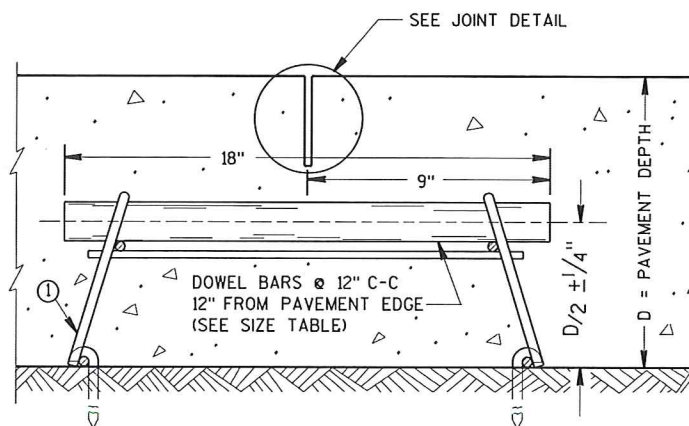
DIVISION: 32

DRAWING NO:
C-5

DATE: 01/2024
BY: MJT
CHECKED: EPR



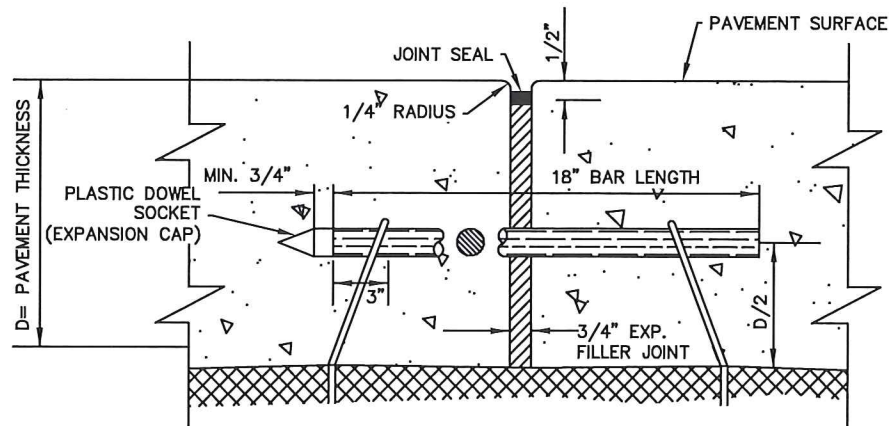
TRANSVERSE CONSTRUCTION JOINT



DOWELED CONTRACTION JOINT

PAVEMENT DEPTH, DOWEL BAR SIZE
AND JOINT SACING TABLE

PAVEMENT DEPTH (D)	DOWEL BAR DIAMETER	CONTRACTION JOINT SPACING
5 1/2", 6", 6 1/2"	NONE	12'
7", 7 1/2"	1"	14'
8", 8 1/2"	1 1/4"	15'
9", 9 1/2"	1 1/4"	15'
10" & ABOVE	1 1/2"	15'



EXPANSION JOINT

NOTES:

- OBTAIN ENGINEER'S APPROVAL FOR THE USE OF ALTERNATE DESIGNS OF THE DOWEL ASSEMBLY. USE MECHANICAL DOWEL BAR INSERTERS OR DOWEL ASSEMBLIES WHEN CONSTRUCTION CONTRACTION JOINTS.
- SECURE BASKETS WITH ANCHORS TO HOLD DOWEL BARS IN CORRECT POSITION AND ALIGNMENT. TYPE, LOCATION, NUMBER AND LENGTH OF ANCHORS ARE DEPENDENT UPON FIELD CONDITIONS.
- FORM OR SAW CONSTRUCTION JOINTS. PROVIDE A 1/4-INCH RADIUS AT FORMED JOINTS.
- PROVIDE A SMOOTH VERTICAL FACE FOR THE ENTIRE DEPTH OF THE PAVEMENT WHEN FORMING CONSTRUCTION JOINTS.
- INSTALL DOWEL BARS AT CONSTRUCTION JOINTS BY FORMING OR DRILLING. INSTALL FORMED DOWEL BARS 12 INCHES C-C AND 12 INCHES FROM PAVEMENT EDGE. REMOVE EXCESS CONCRETE FROM THE FREE END OF THE DOWEL BAR IF DOWEL BARS ARE FORMED THROUGH A HEADER BOARD. INSTALL DRILLED DOWEL BARS ACCORDING TO DRILLED DOWEL BAR CONSTRUCTION JOINT DETAIL.
- APPLY A THIN UNIFORM COATING OF SURFACE TREATMENT TO THE FREE END OF THE DOWEL BARS TO PREVENT BONDING.



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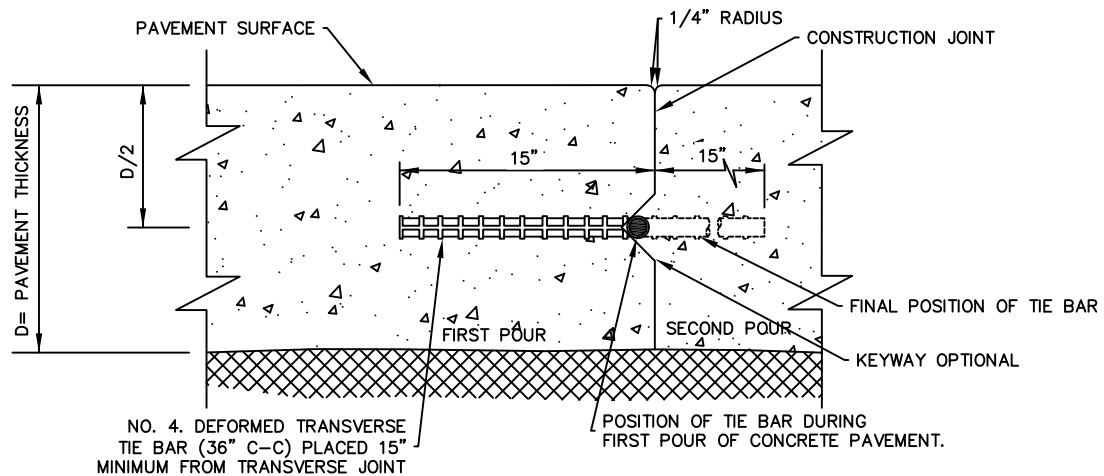
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
TRANSVERSE
JOINTS

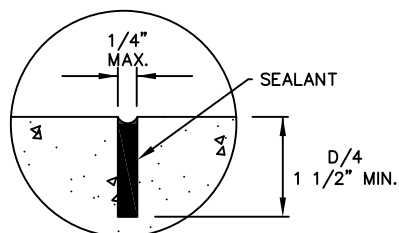
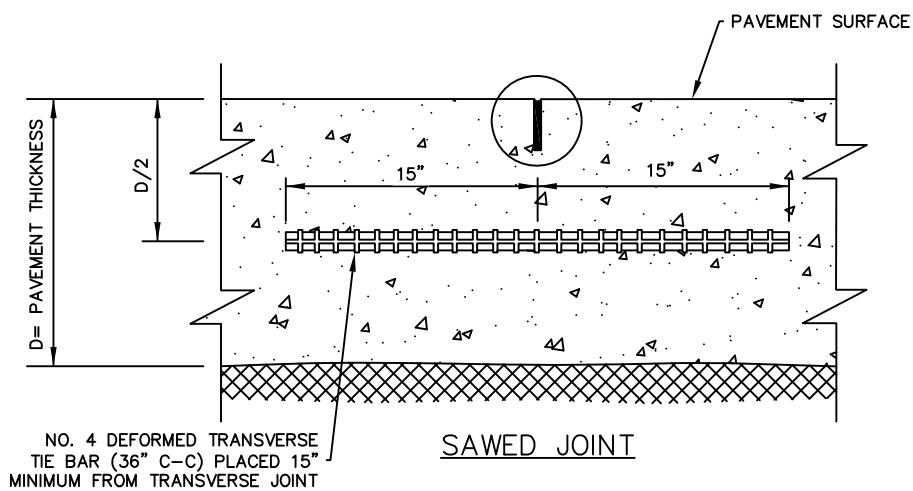
DIVISION: 32

DRAWING NO:
C-6

DATE: 12/2019
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CONSTRUCTION JOINT



NOTE:

1. ALL TIE BARS, PAVEMENT TIES AND DOWELS SHALL BE EPOXY COATED.



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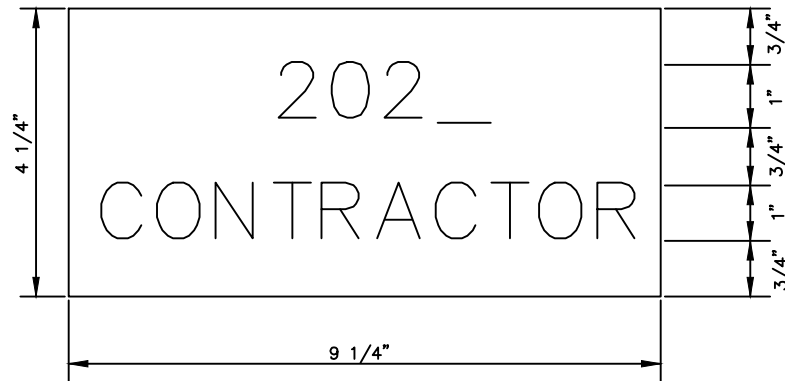
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
LONGITUDINAL
JOINTS

DIVISION: 32

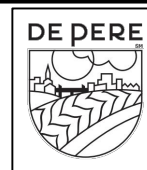
DRAWING NO:
C-7

DATE: 12/2019
BY: KAD
CHECKED: EPR



NOTE:

1. THE ENDS OF ALL CONCRETE WORK SHALL BE MARKED WITH A STAMP AS SHOWN, WITH THE CURRENT YEAR.
2. THE DATE OF CONSTRUCTION SHALL BE STAMPED ON ALL CONCRETE PAVEMENTS AND ALLEYS WITH 1-INCH NUMERALS AT THE ENDS OF EACH SECTION PAVED.



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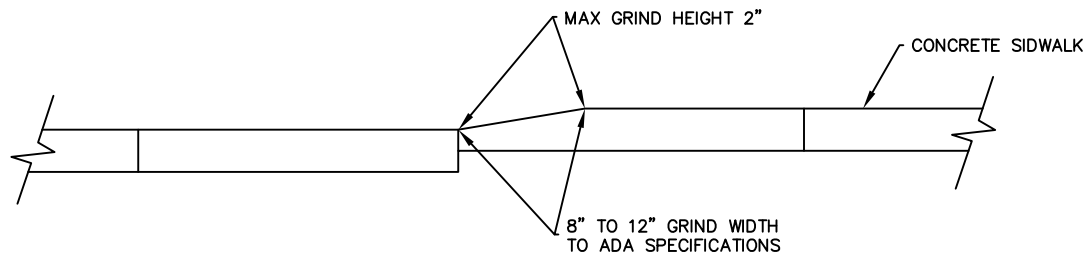
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CONCRETE STAMP

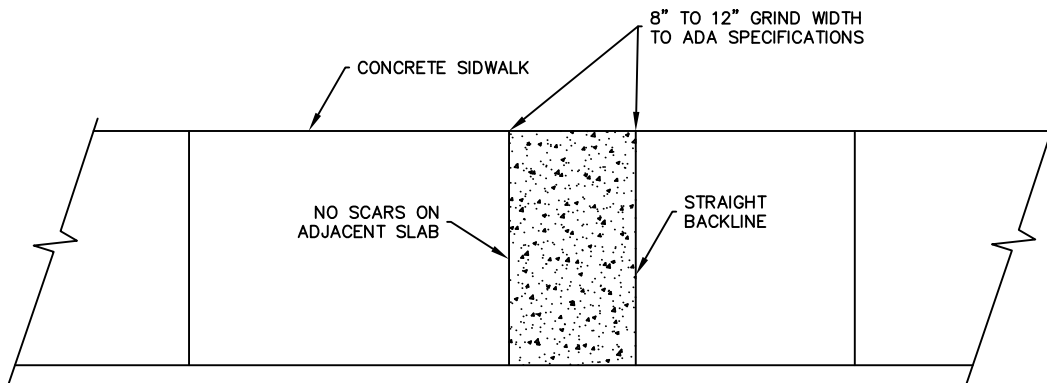
DIVISION: 32

DRAWING NO:
C-8

DATE: 12/2019
BY: KAD
CHECKED: EPR



TYPICAL SECTION



PLAN VIEW



ENGINEERING DIVISION

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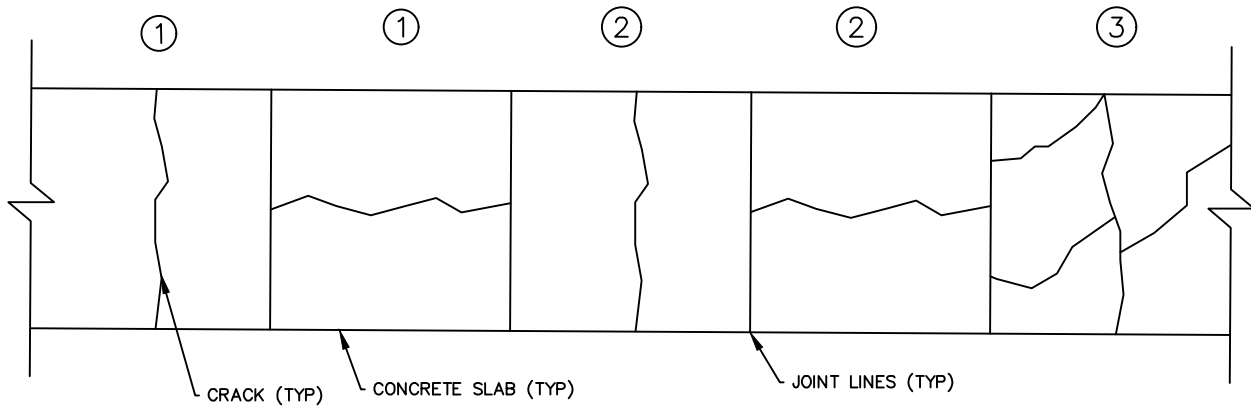
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CONCRETE SIDEWALKS
GRINDING DETAIL

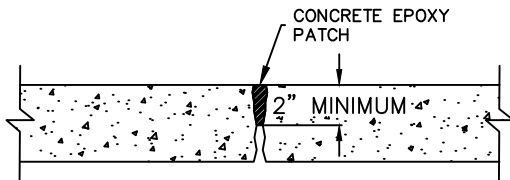
DIVISION: 32

DRAWING NO:
C-9

DATE: 12/2018
BY: KAD
CHECKED: EPR



PLAN VIEW—CRACK LOCATION



① TYPICAL SECTION



② TYPICAL SECTION

NOTES:

- ① IF THE SIDEWALK PANEL IS CRACKED WITH NO HEIGHT VARIATION ACROSS THE CRACK, THE SIDEWALK PANEL MAY BE REPAIRED USING CONCRETE EPOXY. IF REPAIRED WITH ANY MATERIAL OTHER THAN CONCRETE EPOXY, THE SIDEWALK PANEL WILL BE REMOVED AND REPLACED.
- ② IF SIDEWALK PANEL IS CRACKED WITH A HEIGHT VARIATION ACROSS THE CRACK, THE SIDEWALK PANEL MUST BE REMOVED AND REPLACED.
- ③ IF SIDEWALK PANEL HAS MORE THAN 10 FEET OF HORIZONTAL CRACKS, THE SIDEWALK PANEL MUST BE REMOVED AND REPLACED.

REQUIRED REPAIR (PER NOTE 1 ABOVE)—
CRACKS THAT CAN BE REPAIRED WITH CONCRETE EPOXY SHALL BE REPAIRED BY ROUTING THE CRACK AND REMOVING LOOSE MATERIAL TO A DEPTH OF AT LEAST 2 INCHES. THE CRACK SHALL BE FILLED TO BE FLUSH WITH THE SURROUNDING CONCRETE.



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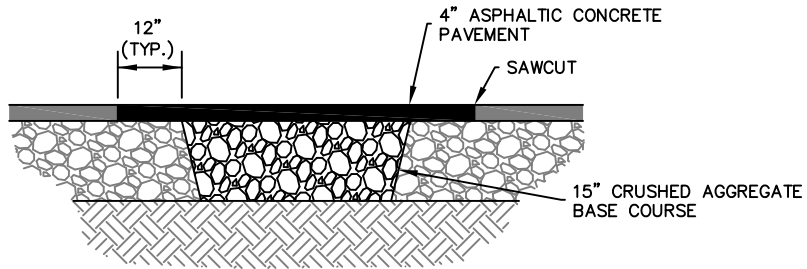
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CRACKED CONCRETE
SIDEWALK REPAIR
DETAIL

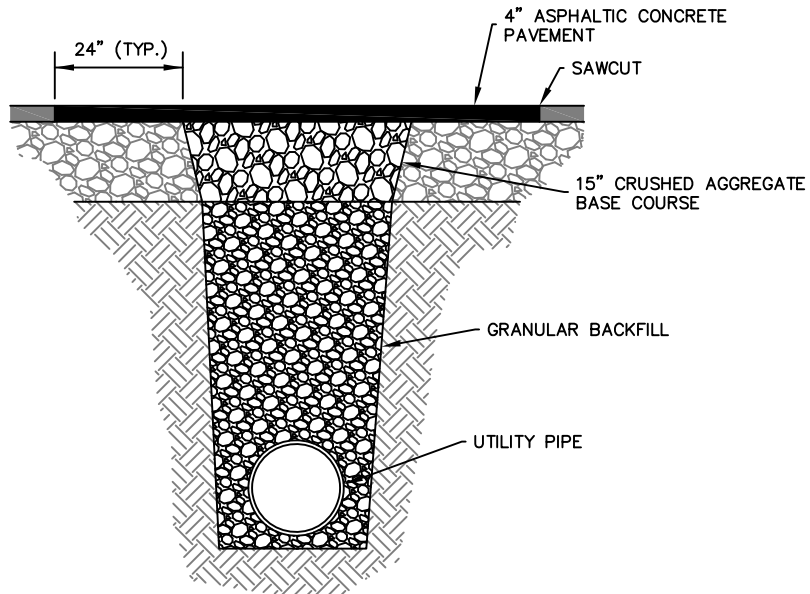
DIVISION: 32

DRAWING NO:
C-10

DATE: 01/2022
BY: KAD
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WORK WITHIN ASPHALT AND AGGREGATE



EXCAVATION EXTENDS INTO THE SUBGRADE



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TITLE:
EXCAVATION IN
ASPHALT PAVEMENT

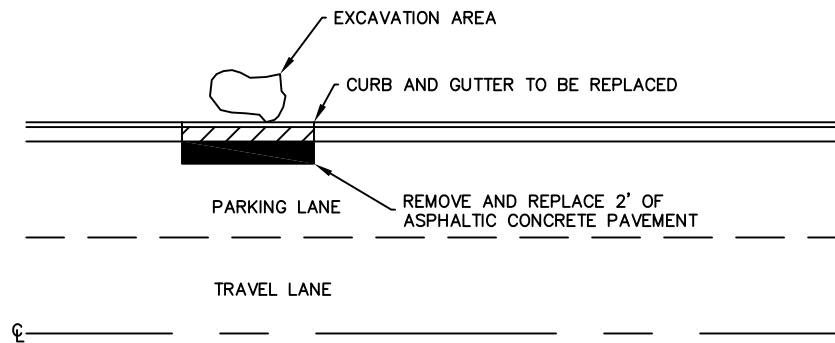
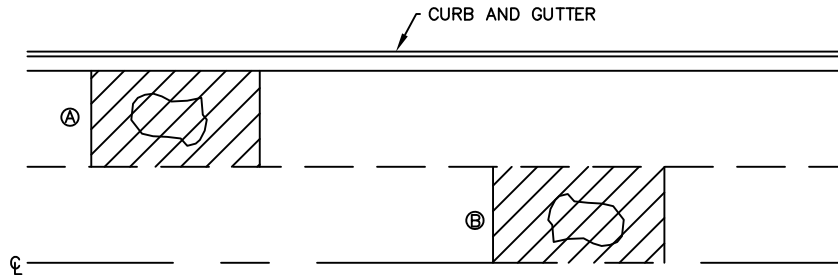
DIVISION: 32

DRAWING NO:
P-1

DATE: 12/2018
BY: KAD
CHECKED: EPR

EXCAVATION IN ASPHALT

- Ⓐ - EXCAVATION IN PARKING LANE
- REPAIR PARKING LANE
- Ⓑ - EXCAVATION IN TRAVEL LANE
- REPAIR TRAVEL LANE



CURB AND GUTTER REMOVAL ON ASPHALTIC CONCRETE PAVEMENT

NOTE:

1. IF EXCAVATION OCCURS BEHIND THE CURB AND GUTTER AND INVOLVES CURB AND GUTTER REMOVAL AND REPLACEMENT, A TWO (2) FEET WIDE STRIP OF ASPHALT CONCRETE PAVEMENT SHALL BE REMOVED AND REPLACED.



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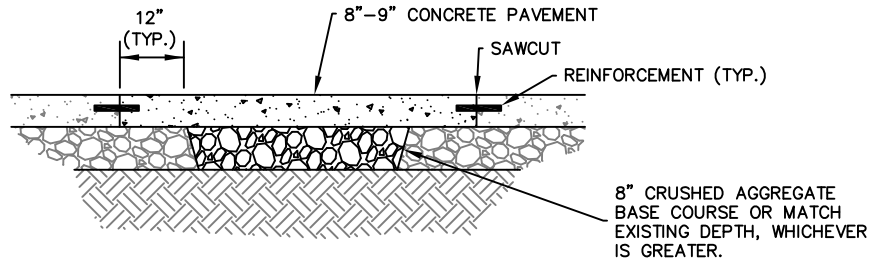
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
PATCH WORK IN
ASPHALT PAVEMENT

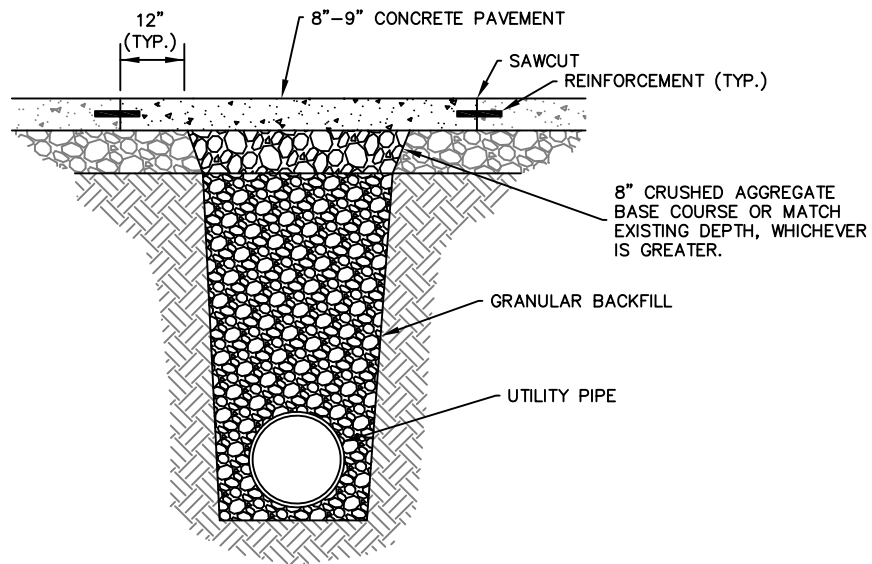
DIVISION: 32

DRAWING NO:
P-2

DATE: 12/2018
BY: KAD
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WORK WITHIN CONCRETE AND AGGREGATE



EXCAVATION EXTENDS INTO THE SUBGRADE

NOTE:

1. INSTALL REINFORCEMENT PER SPECIFICATIONS.



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OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
EXCAVATION IN
CONCRETE PAVEMENT

DIVISION: 32

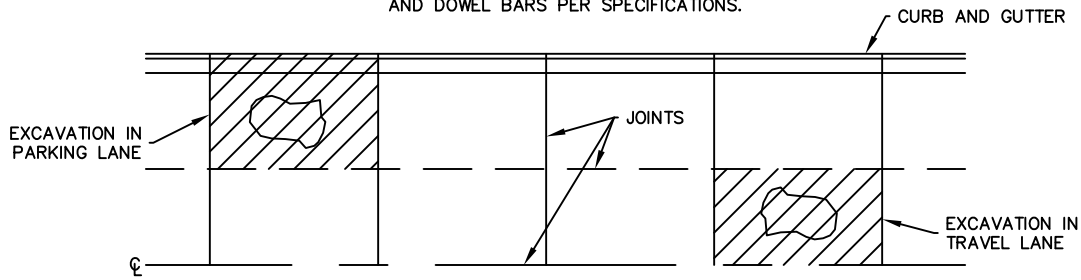
DRAWING NO:
P-3

DATE: 12/2019
BY: KAD
CHECKED: EPR

EXCAVATION ON CONCRETE STREETS LESS THAN 15 YEARS

NOTE:

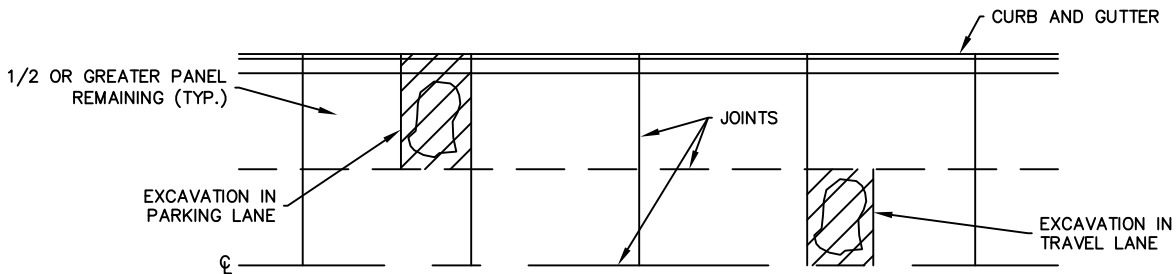
1. REPAIR TO A JOINT LINE. INSTALL TIE BARS AND DOWEL BARS PER SPECIFICATIONS.



EXCAVATION ON CONCRETE STREETS GREATER THAN 15 YEARS

NOTES:

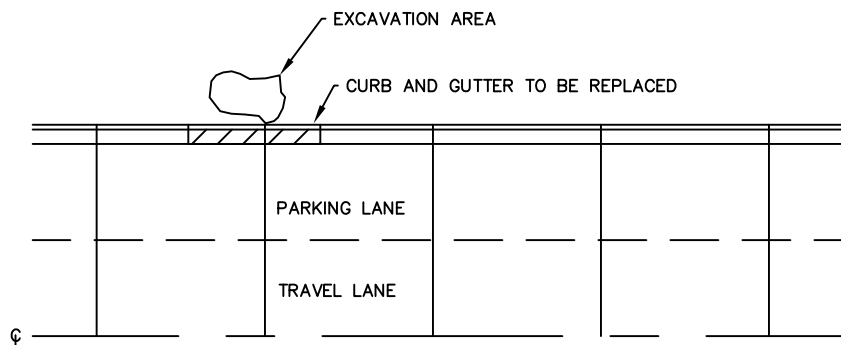
1. REMOVE TO THE JOINT IF REMAINDER OF PANEL IS CRACKED.
2. SAWCUT 12 INCHES BEYOND TRENCH WALL OR DAMAGED CONCRETE. MINIMUM PATCH MUST BE 7 FEET.
3. INSTALL TIE BARS AND DOWEL BARS PER SPECIFICATIONS.



CURB AND GUTTER REMOVAL ON ASPHALTIC CONCRETE PAVEMENT

NOTE:

1. IF EXCAVATION OCCURS BEHIND THE CURB AND GUTTER AND INVOLVES CURB AND GUTTER REMOVAL AND REPLACEMENT. INSTALL TIE BARS PER SPECIFICATIONS.



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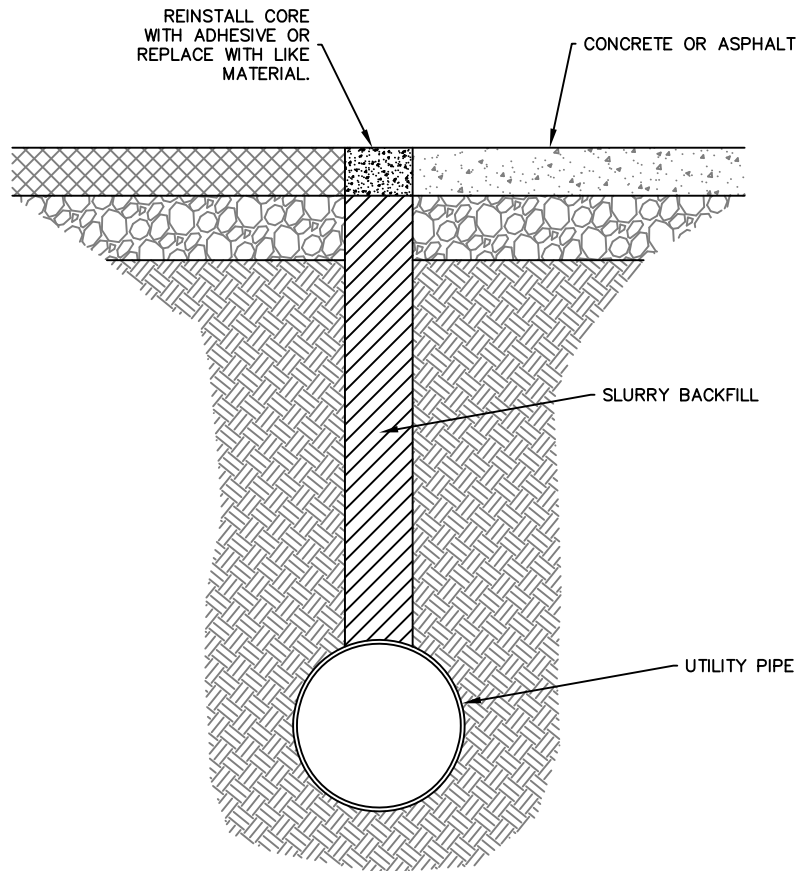
TITLE:
PATCH WORK IN
CONCRETE PAVEMENT

DIVISION: 32

DRAWING NO:
P-4

DATE: 12/2019
BY: KAD
CHECKED: EPR

CORING OR BORE HOLE REPLACEMENT DETAIL



NOTE:

1. IF CORE IS TO BE REPLACED, IT SHALL BE INSTALLED IMMEDIATELY AFTER PLACEMENT OF THE SLURRY. IT SHALL BE FLUSH WITH THE ADJACENT PAVEMENT.



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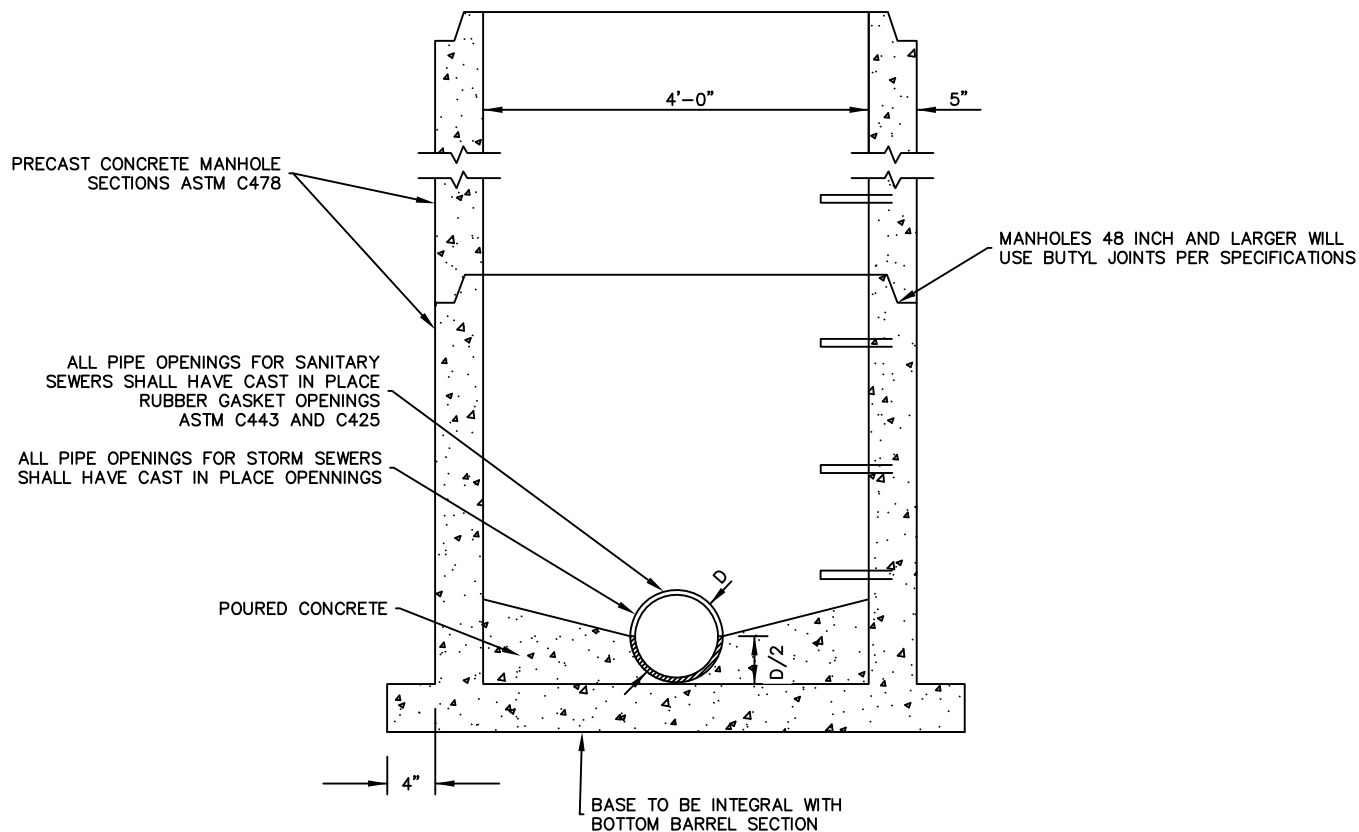
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CORE OR BORE HOLE
REPLACEMENT DETAIL
IN CONCRETE OR
ASPHALT

DIVISION: 32

DRAWING NO:
P-5

DATE: 12/2018
BY: KAD
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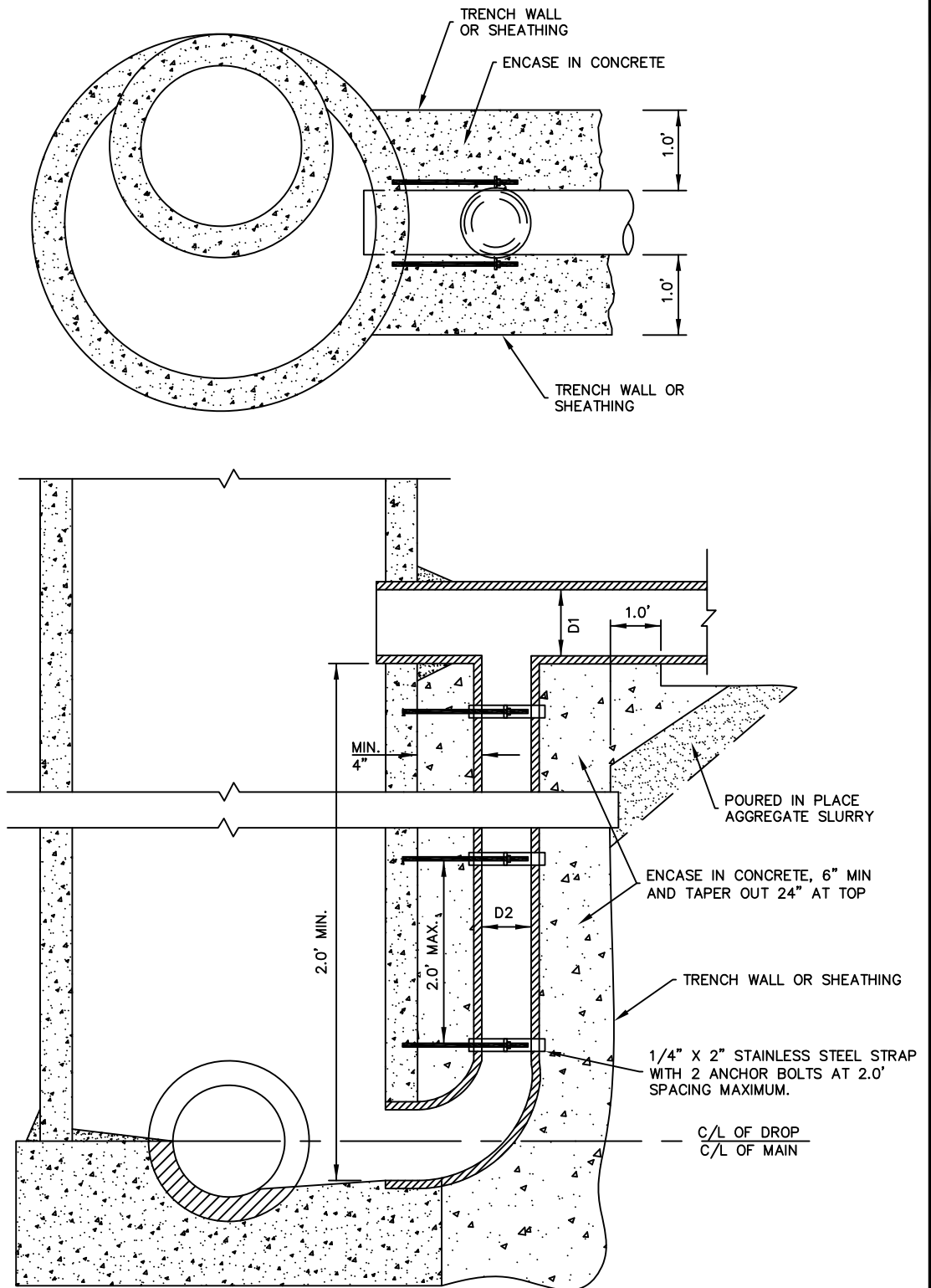
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
PRECAST CONCRETE
MANHOLE

DIVISION: 33

DRAWING NO:
S-1

DATE: 12/2018
BY: KAD
CHECKED: EPR



PIPE SCHEDULE OUTSIDE DROP MANHOLE	
LATERAL D1	DROP PIPE D2
24	18
21	15
18	12
15	10
12	10
10	8
8	8



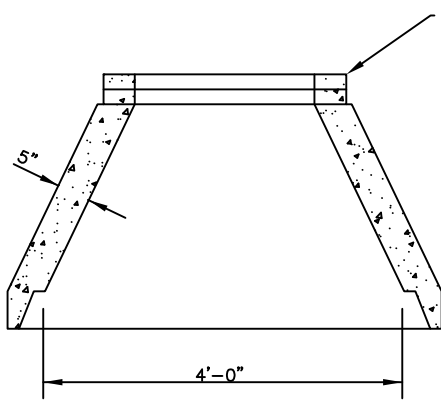
ENGINEERING DIVISION
925 S. SIXTH ST
DE PERE, WI 54115
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
OUTSIDE DROP
MANHOLE

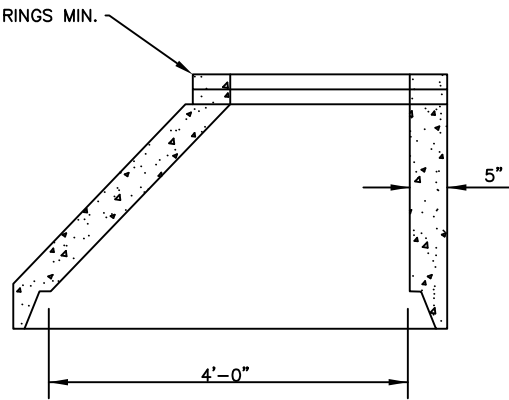
DIVISION: 33

DRAWING NO:
S-2

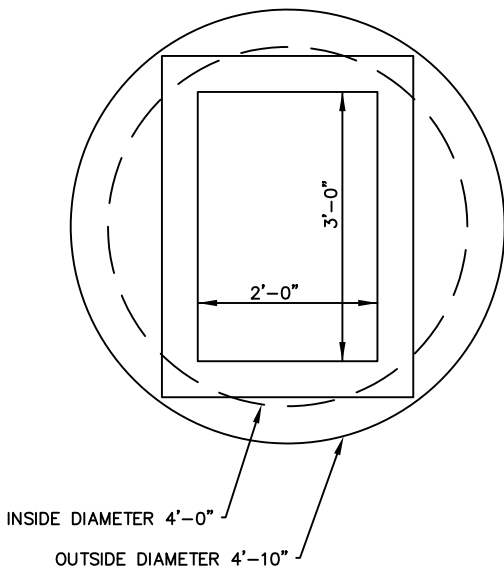
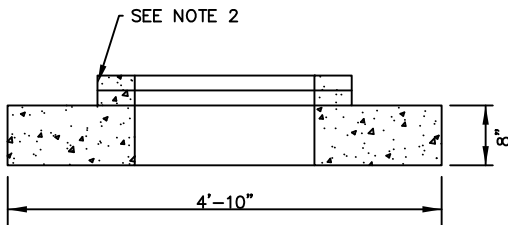
DATE: 12/2018
BY: KAD
CHECKED: EPR



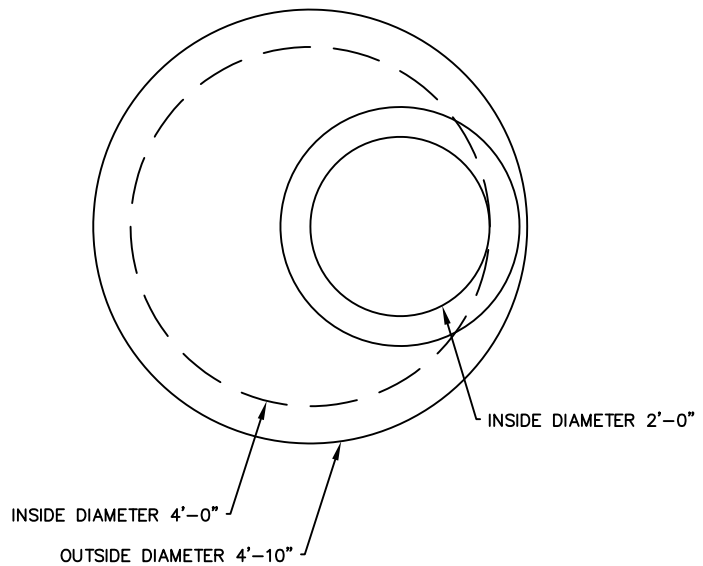
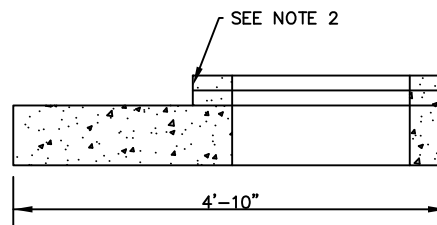
CONCENTRIC CONE
WHERE DIRECTED BY ENGINEER



ECCENTRIC CONE STANDARD



INLET MANHOLE COVER



MANHOLE COVER

NOTE:

1. THE TOP ADJUSTING RING (MINIMUM OF 2" AND MAXIMUM OF 3") ON ALL MANHOLES AND INLETS THAT FALL WITHIN THE PAVEMENT SHALL BE RUBBER RISER RINGS.
2. ASPHALT STREET:
 - MIN. 2-2" ADJUSTMENT RINGS, BOTTOM RING CONCRETE AND THE TOP RING RUBBER.
- CONCRETE STREET:
 - MINIMUM 2" RUBBER RING ON TOP WITH CONCRETE VIBRATED UNDER RUBBER RING OR AN ADDITIONAL 2" CONCRETE RING.



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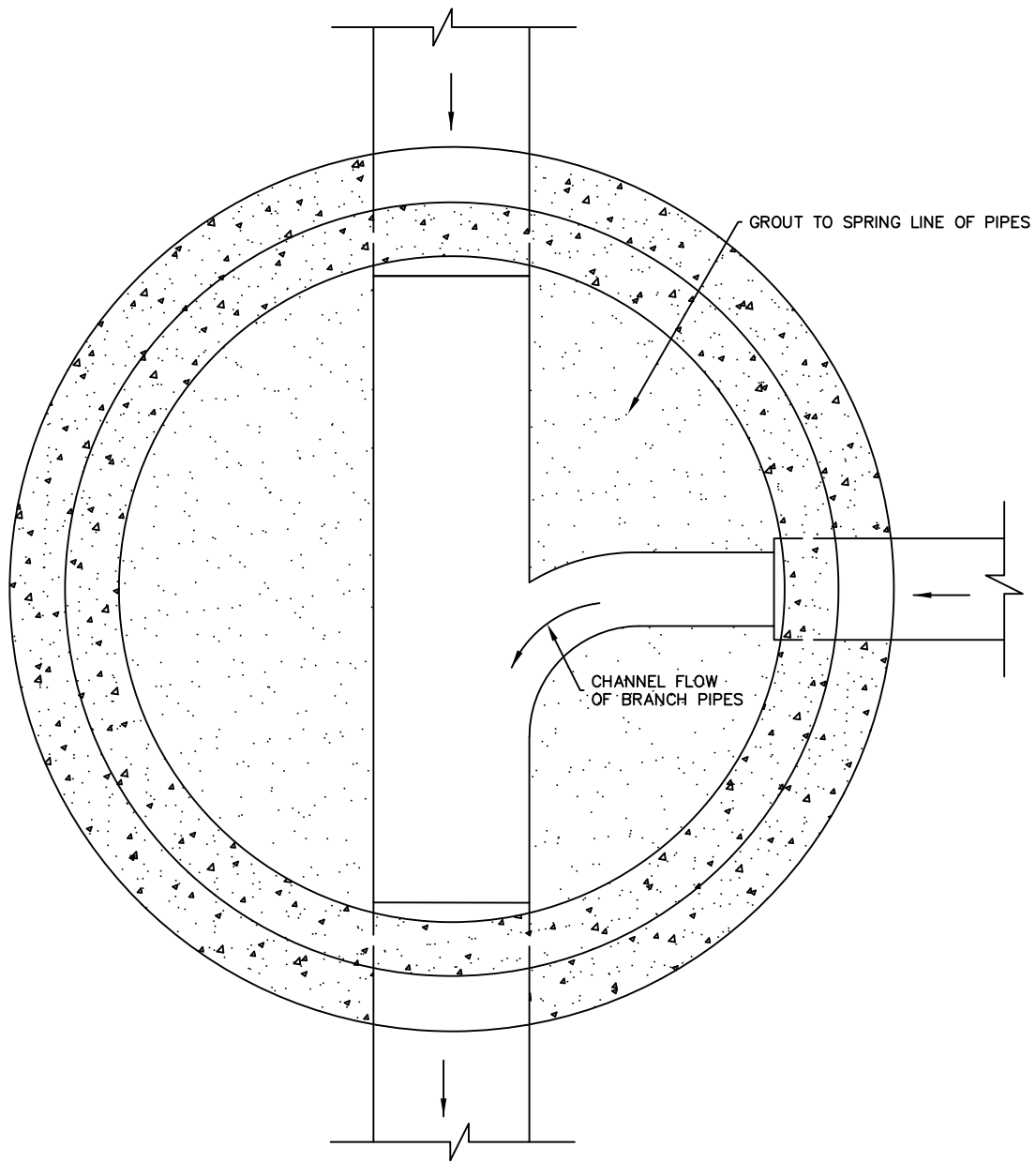
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
PRECAST CONCRETE
CONES AND COVERS
ASTM C478

DIVISION: 33

DRAWING NO:
S-3

DATE: 12/2018
BY: KAD
CHECKED: EPR



STANDARD MANHOLE



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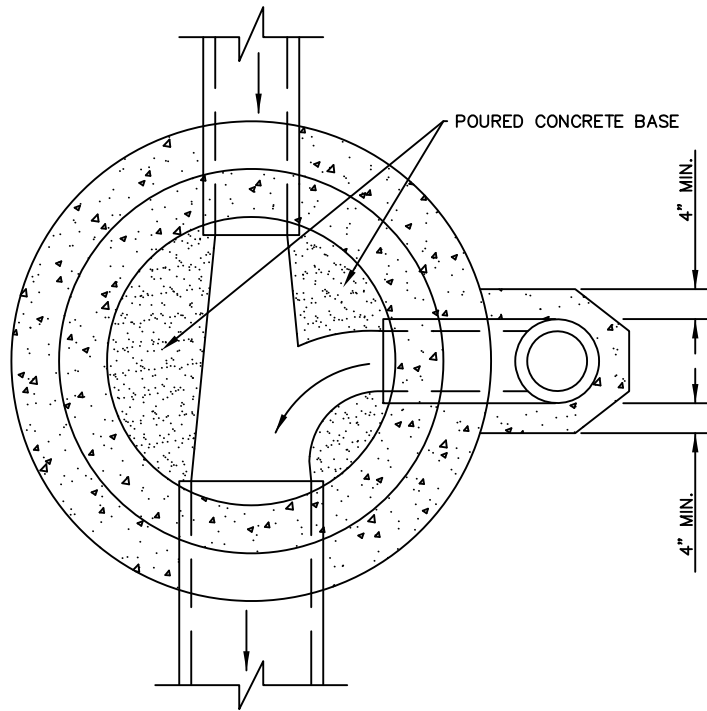
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CHANNELIZATION

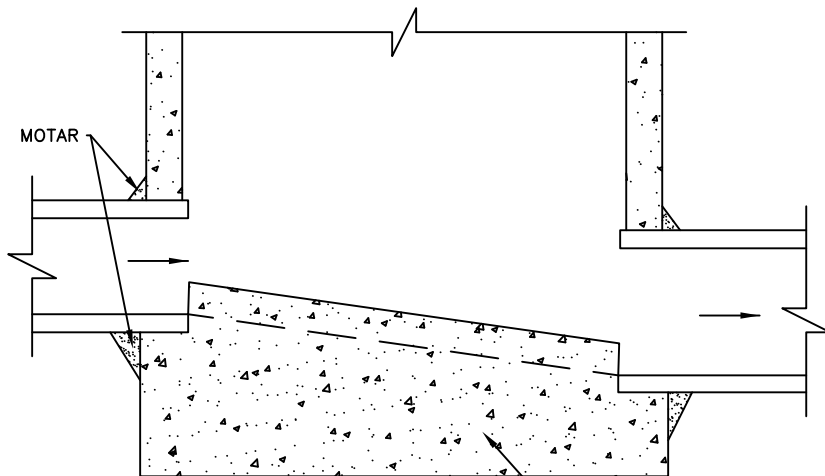
DIVISION: 33

DRAWING NO:
S-4

DATE: 12/2018
BY: KAD
CHECKED: EPR



DROP MANHOLE



PIPE SIZE CHANGE



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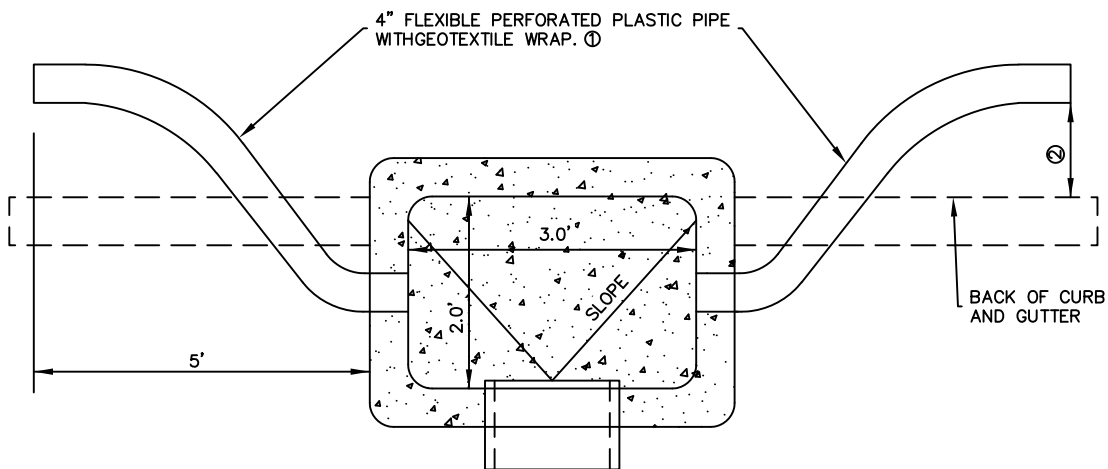
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
CHANNELIZATION

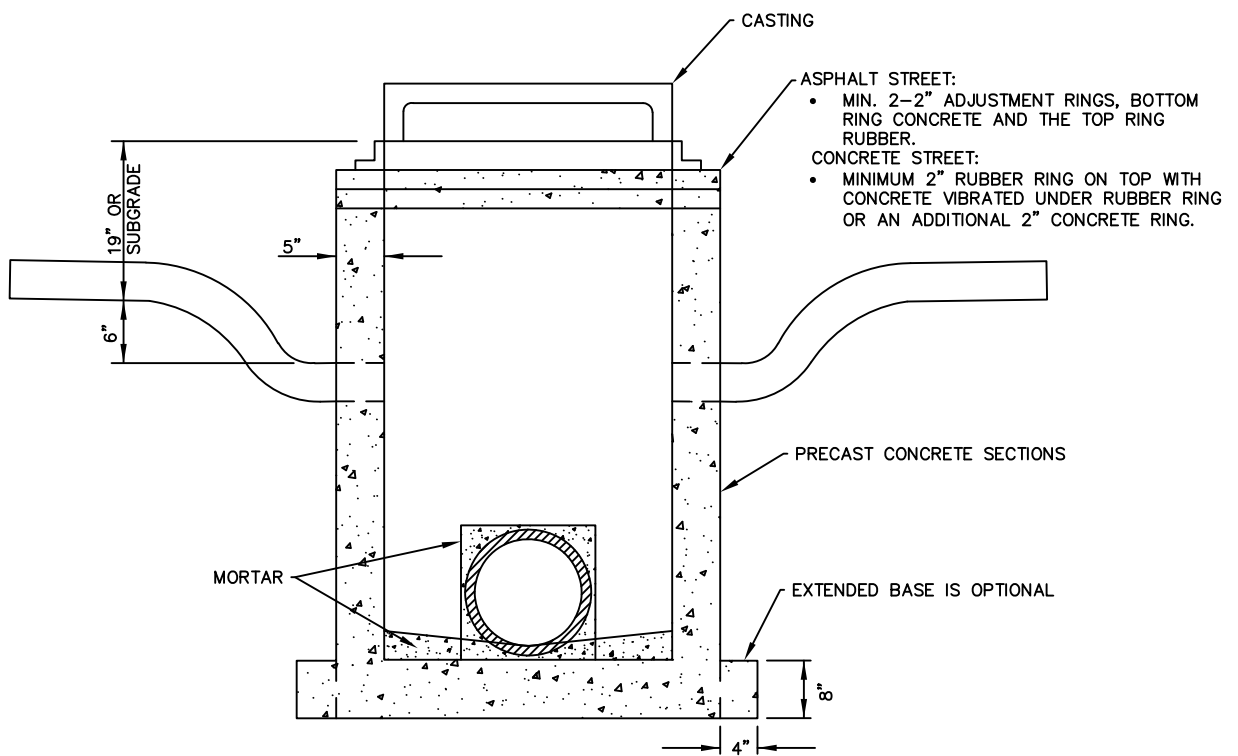
DIVISION: 33

DRAWING NO:
S-5

DATE: 12/2018
BY: KAD
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- ① IF THERE IS LESS THEN 5' OF CURB AND GUTTER BEING REPLACED, EXTEND TO THE LIMITS OF THE CURB AND GUTTER REPLACEMENT.
- ② EDGE DRAIN TO BE LOCATED AT EDGE OF CRUSHED AGGREGATE BASE COURSE.



NOTES:

1. THE MINIMUM DEPTH OF TYPE B INLETS FROM GRATE TO BOTTOM OF BASE SHALL BE 4'-8".
2. PROVIDE INLET BARRIERS FOR NEW CONSTRUCTION.
3. TYPE B INLETS SHALL MEET ALL SPECIFICATIONS OF ASTM C478.
4. 1", 2" OR TAPERED RUBBER RINGS ARE ACCEPTABLE TO PROVIDE FOR FIELD CONDITIONS.



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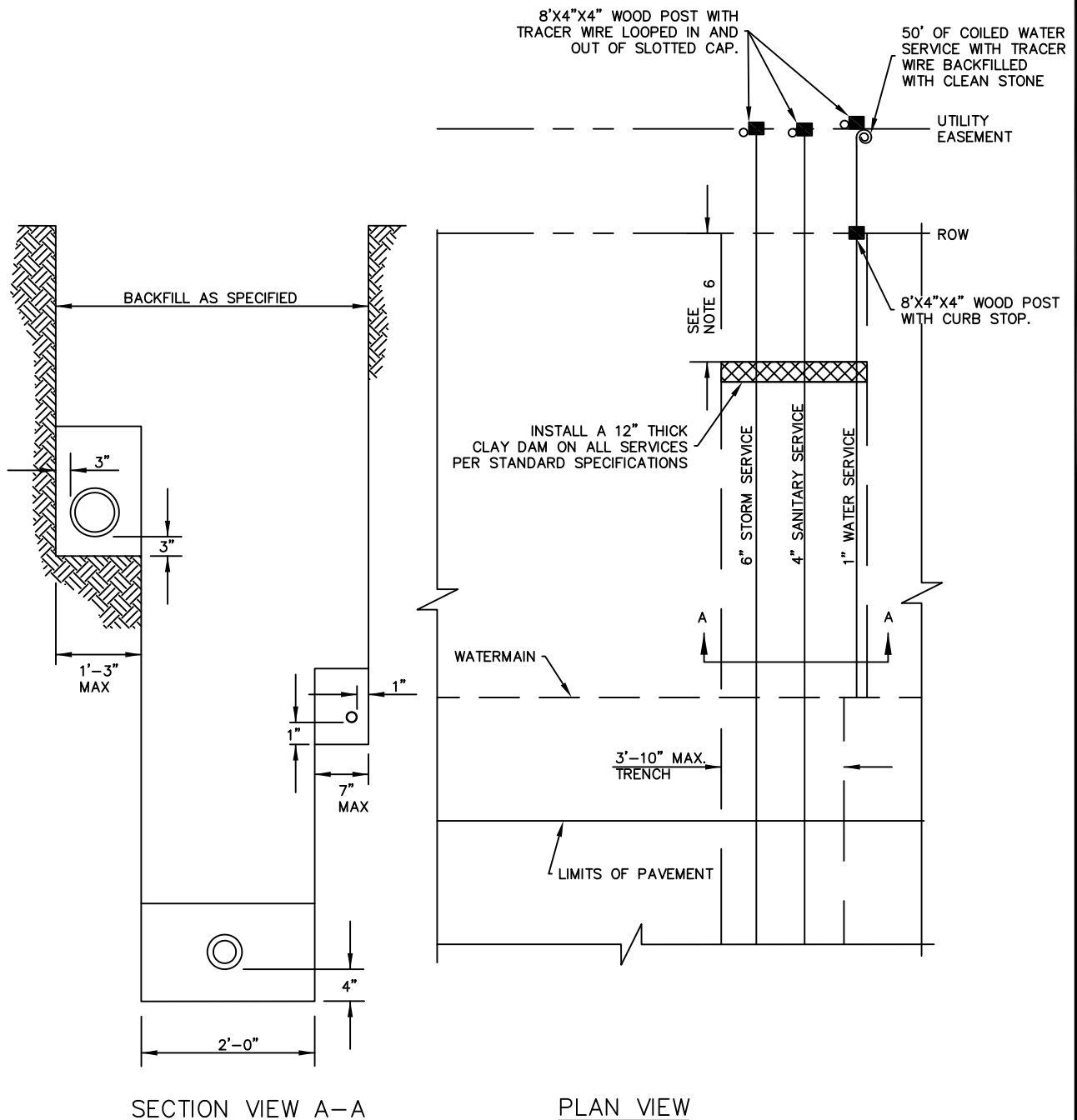
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
TYPE B INLET

DIVISION: 33

DRAWING NO:
S-6

DATE: 12/2018
BY: KAD
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NOTES:

1. ON A NORTH-SOUTH STREET, STORM SERVICES SHALL BE PLACED ON THE NORTH SIDE OF TRENCH.
2. ON AN EAST-WEST STREET, STORM SERVICES SHALL BE PLACED ON THE WEST SIDE OF TRENCH.
3. STORM SERVICES SHALL BE PLACED TO A DEPTH OF 4 FEET AT THE PROPERTY LINE OR AS DIRECTED.
4. SANITARY SEWER SERVICES SHALL BE A MINIMUM OF 10 FEET OR A MAXIMUM OF 11 FEET OF DEPTH AT THE PROPERTY LINE.
5. GRANULAR BACKFILL SHALL BE PLACED A MINIMUM OF 6 INCHES OVER THE SERVICES.
6. LOCATION OF CLAY DAM TO BE DETERMINED BY ENGINEER BASED ON SIDEWALK AND OTHER PAVED SURFACES



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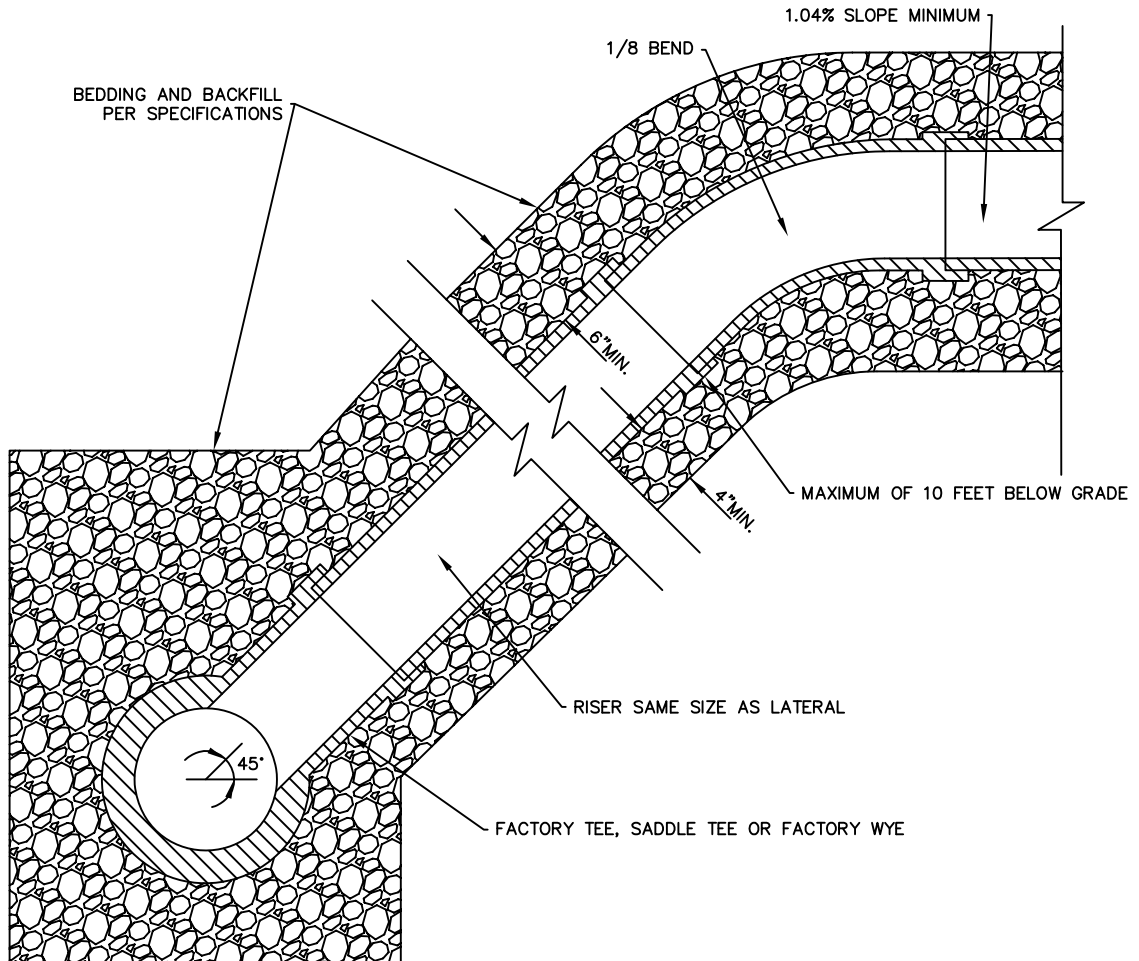
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
SANITARY, STORM
AND WATER
SERVICES

DIVISION: 33

DRAWING NO:
S-7

DATE: 12/2019
BY: KAD
CHECKED: EPR



ENGINEERING DIVISION

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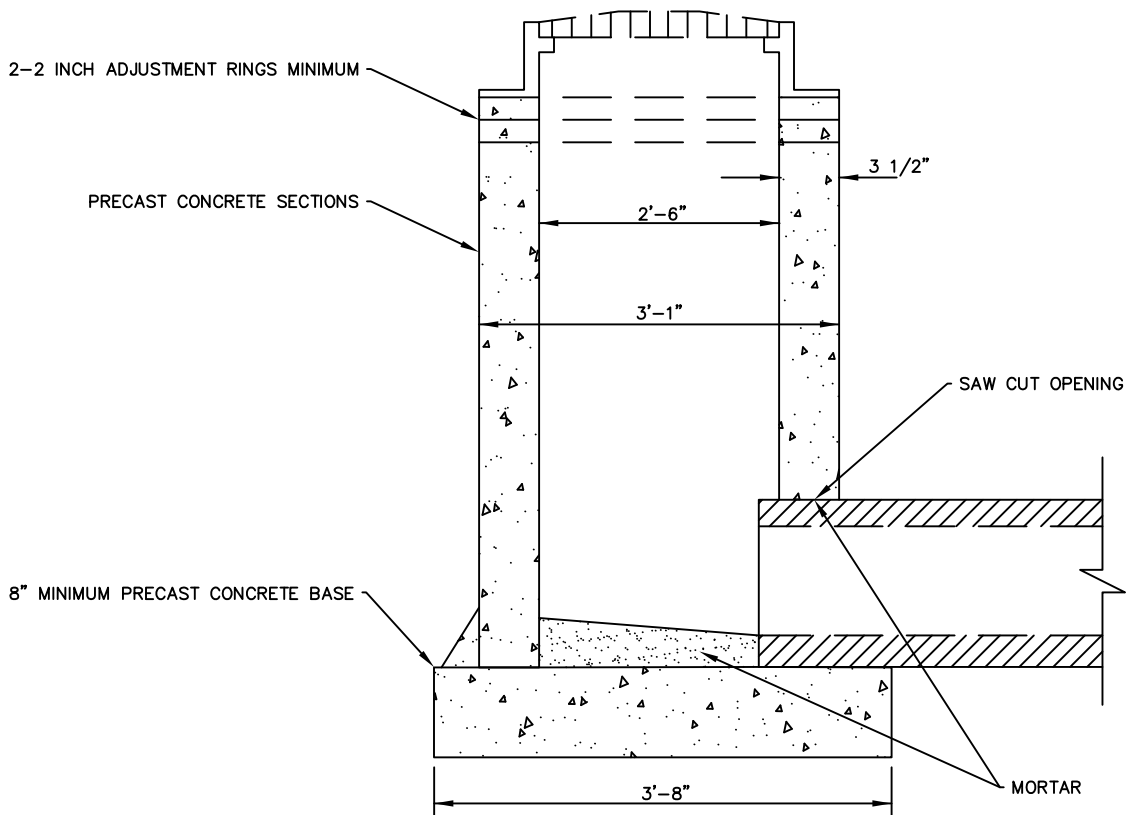
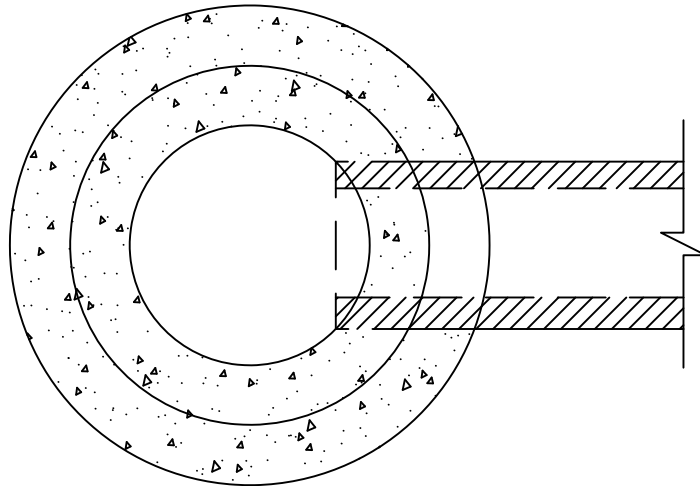
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
RISER FOR SERVICE
CONNECTIONS

DIVISION: 33

DRAWING NO:
S-8

DATE: 12/2018
BY: KAD
CHECKED: EPR



NOTE:

1. THE MINIMUM DEPTH OF FIELD INLETS FROM GRATE TO BOTTLM OF BASE SHALL BE 4'-8".



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DE PERE, WI 54115

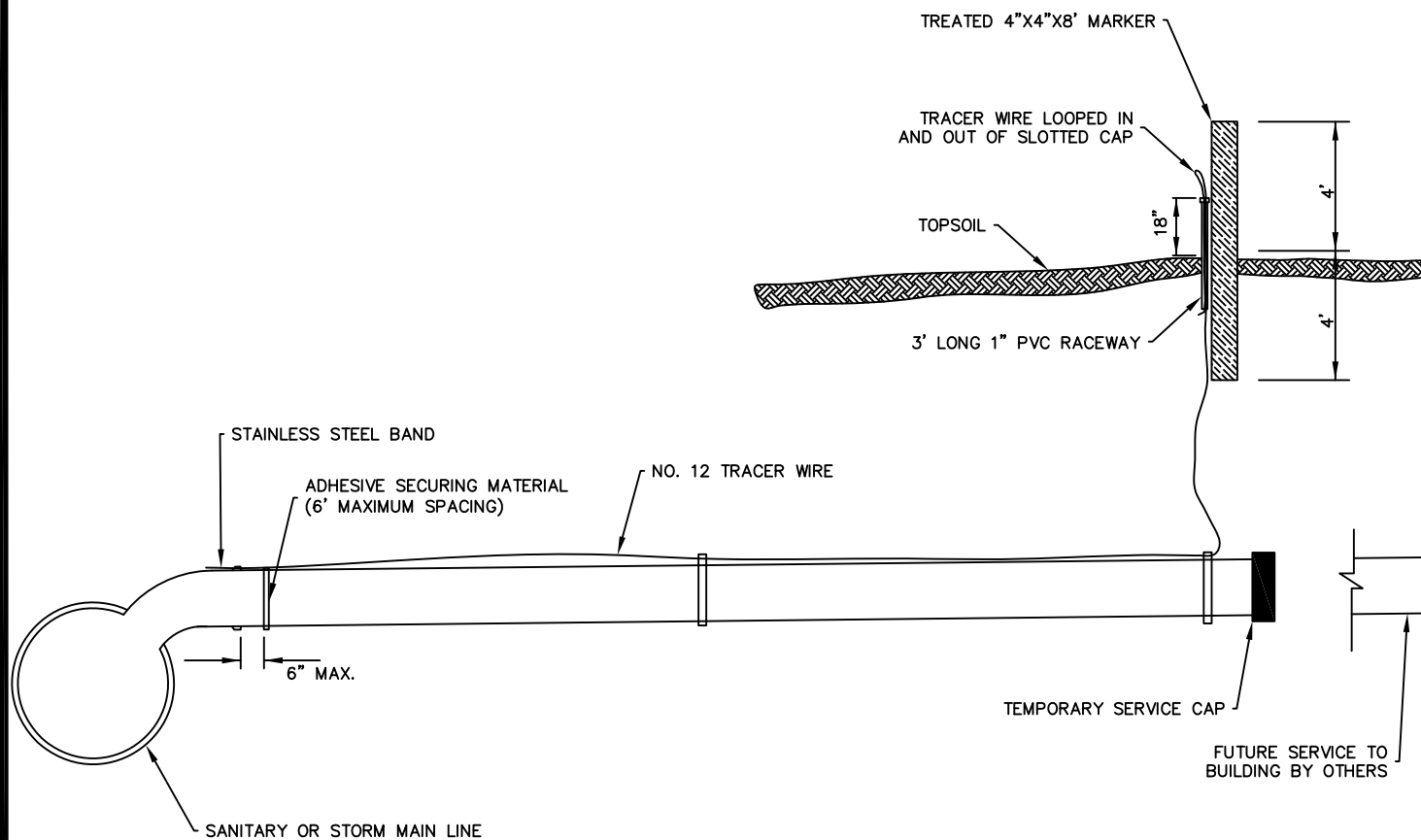
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
TYPE A FIELD INLET

DIVISION: 33

DRAWING NO:
FI-1

DATE: 12/2018
BY: KAD
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NOTE:

1. TRACER WIRE — BROWN FOR STORM AND GREEN FOR SANITARY.



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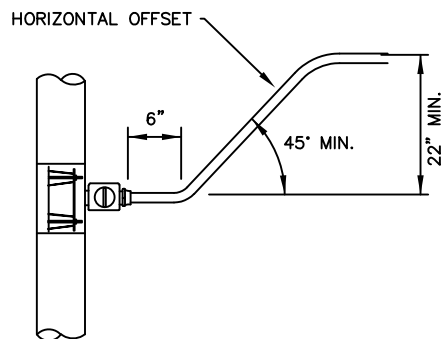
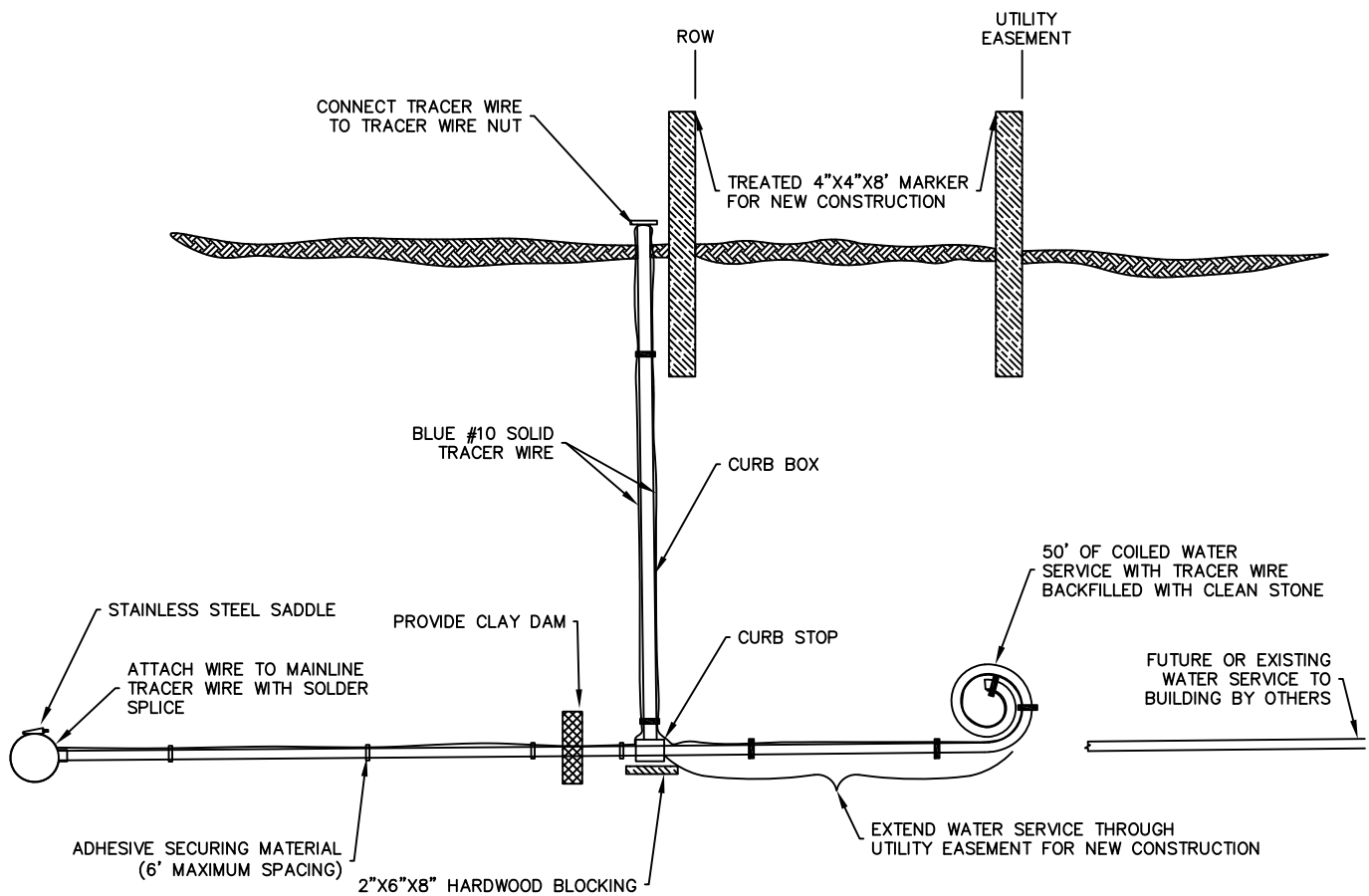
OFFICE 920-339-4061
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TITLE:
SEWER TRACER WIRE

DIVISION: 33

DRAWING NO:
TW-1

DATE: 12/2018
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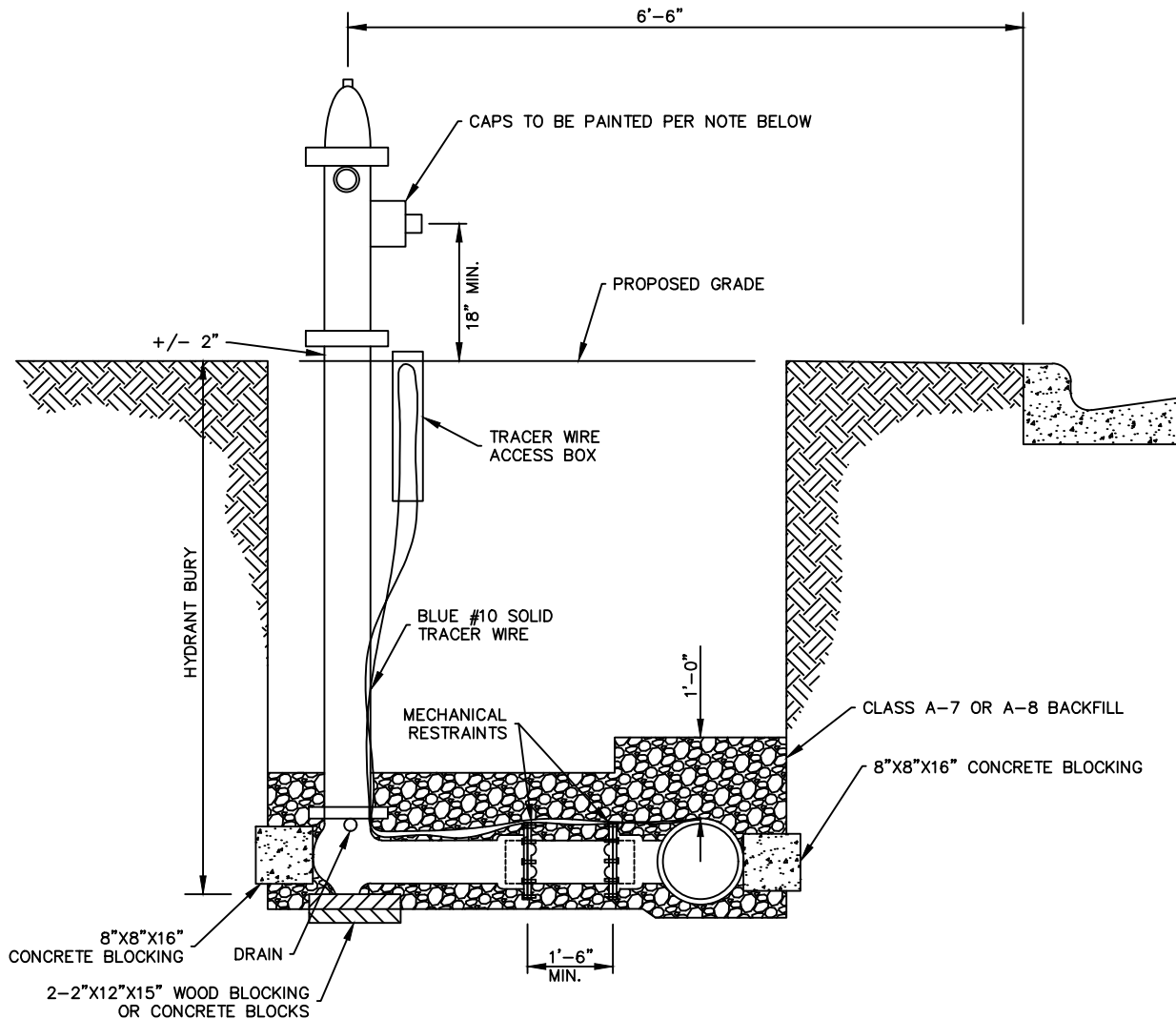
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
WATER TRACER WIRE

DIVISION: 33

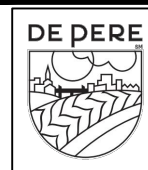
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TW-2

DATE: 12/2019
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NOTES:

- HYDRANTS SHALL BE SET VERTICAL.
- CONCRETE BLOCKING AND WOOD BLOCKING SHALL BE INSTALLED AGAINST FIRM NATURAL GROUND AS REACTION BACKING FOR TEE AND HYDRANT SHOE.
- REGARDLESS OF DEPTH OF MAIN, THE BREAKAWAY FLANGE MUST BE +/- 2 INCHES ABOVE THE PROPOSED GRADE.
- ALL HYDRANTS SHALL BE CLEANED AND REPAINTED TO ELIMINATE ANY SCRATCHED AND SURFACE IMPERFECTIONS. THIS SHALL BE ACCOMPLISHED AFTER THE HYDRANT HAS BEEN INSTALLED, BACKFILLED AND TESTED.
- ENCASE ENTIRE HYDRANT IN POLYETHYLENE ENCASEMENT.
- TRACER WIRE SHALL BE RUN UP HYDRANT.
- BLOCKING AND MEGA LUGS REQUIRED.
- HYDRANT CAPS TO BE PAINTED PER THE NFPA STANDARD 291, BASED ON FLOWS AS DETERMINED BY THE ENGINEER:
 - CLASS AA- LIGHT BLUE - RATED CAPACITY OF 1500 GPM
 - CLASS A - GREEN - RATED CAPACITY OF 1000-1499 GPM
 - CLASS B - ORANGE - RATED CAPACITY OF 500-999 GPM
 - CLASS C - RED - RATED CAPACITY OF LESS THAN 500 GPM



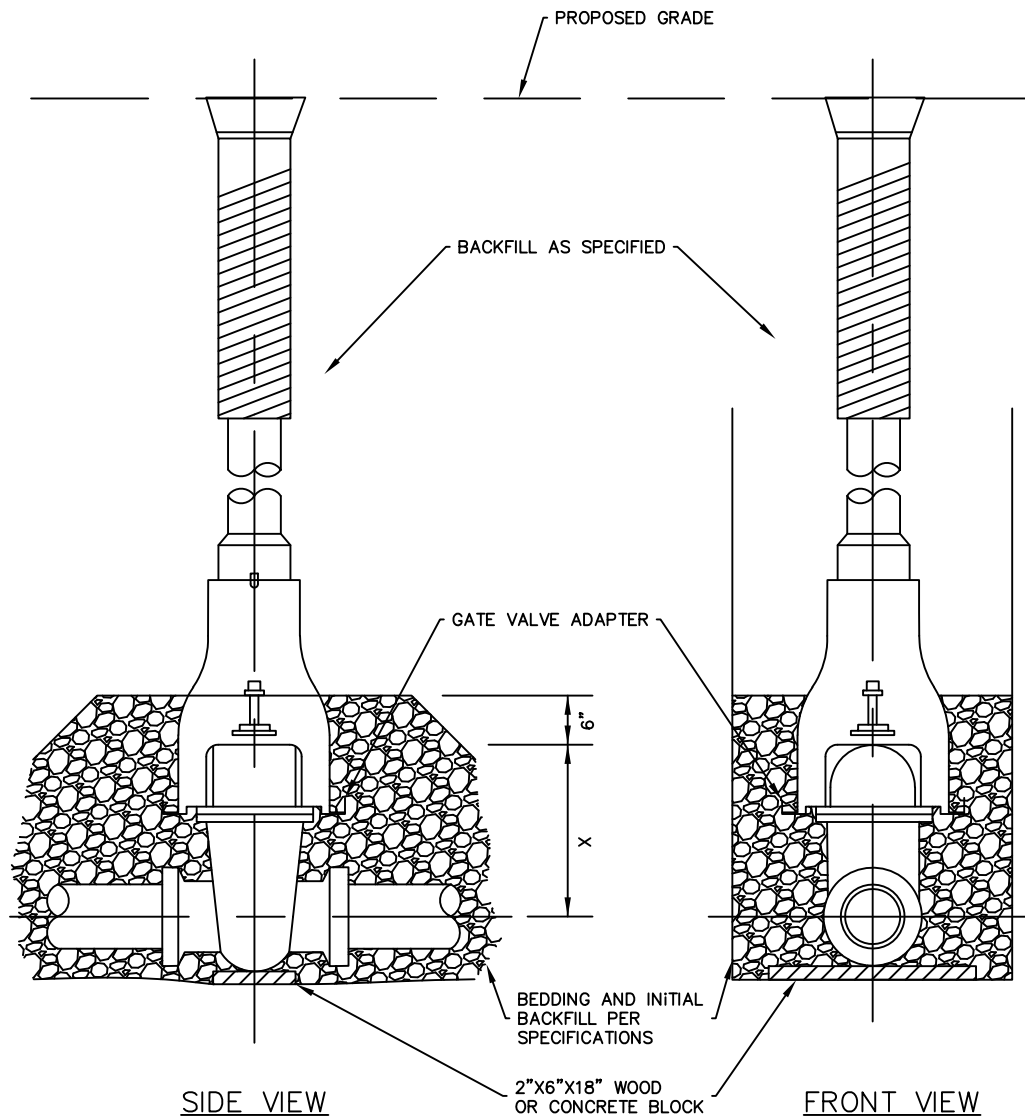
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925 S. SIXTH ST
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OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
HYDRANT

DIVISION: 33

DRAWING NO:
W-1

DATE: 12/2021
BY: KAD
CHECKED: EPR



PIPE DIA. INCHES	X=SETTING INCHES
6	12
8	13
10	17
12	21

NOTES:

1. ENCASE ENTIRE VALVE IN POLYETHYLENE ENCASEMENT.
2. VALVE BOXES SHALL BE SET VERTICAL.
3. JOINT RESISTANT PER SPECIFICATIONS.
4. VALVE EXTENTION STEM REQUIRED.



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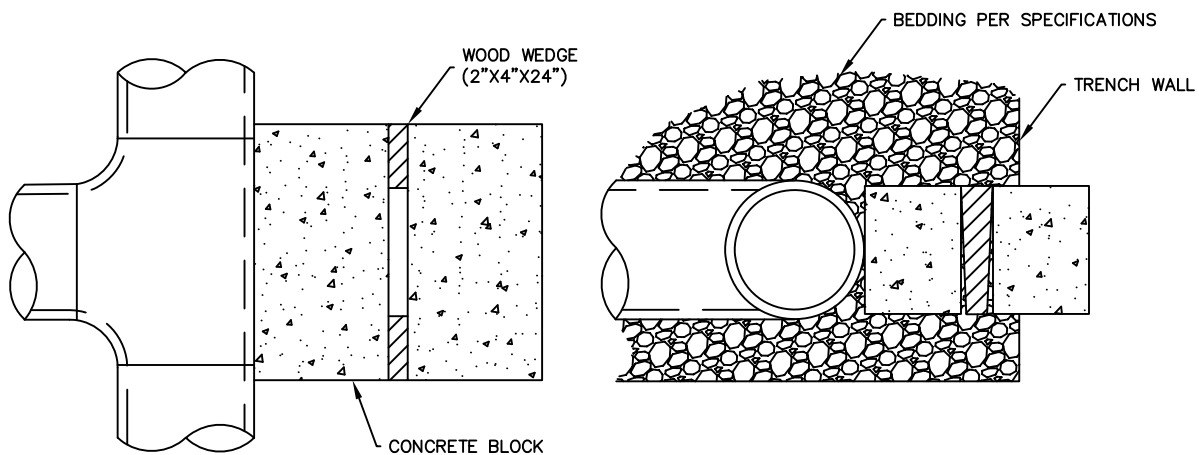
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
RESILIENT SEATED
GATE VALVE

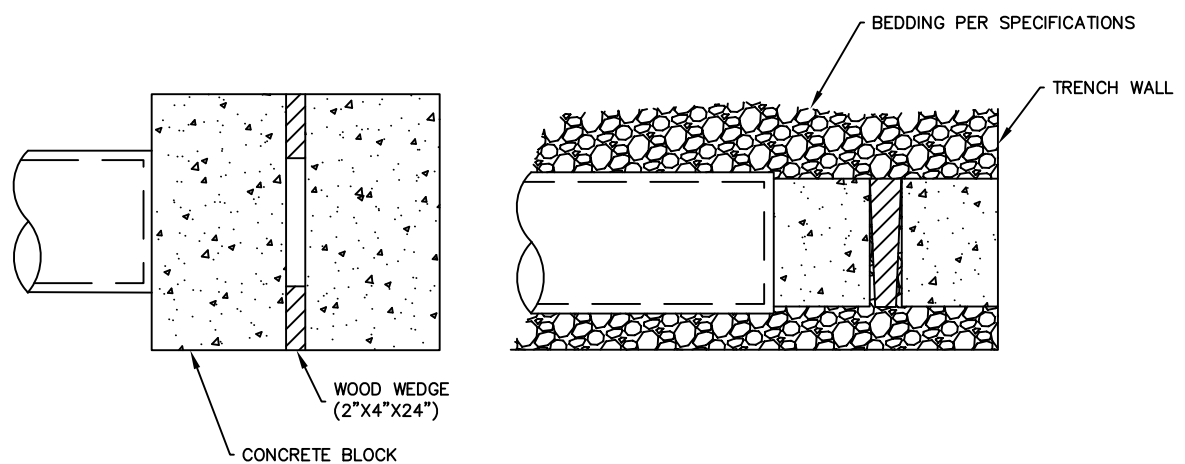
DIVISION: 33

DRAWING NO:
W-2

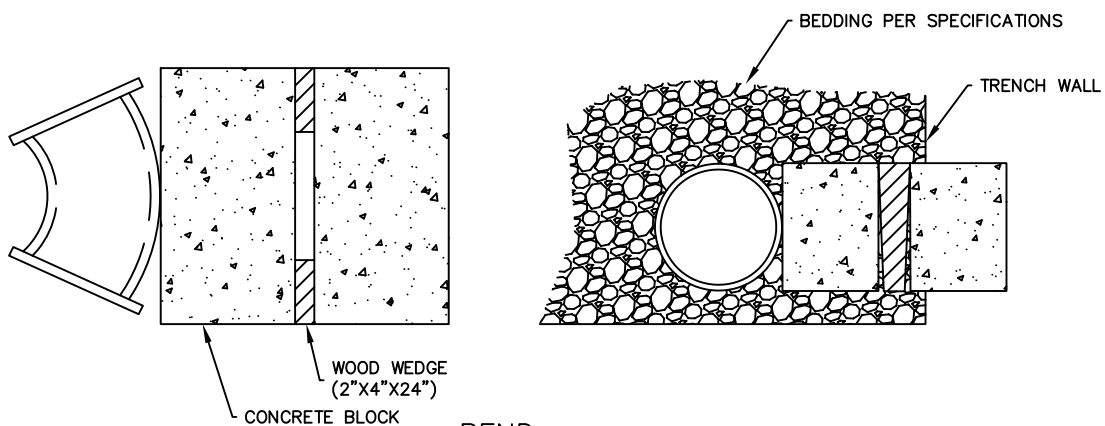
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TEE



CAP AND PLUG



BEND

NOTES:

1. USE 8"X8"X16" CONCRETE BLOCK FOR 6" OR 8" DIA. PIPE.
2. USE 12"X8"X16" CONCRETE BLOCK 10" AND 12" DIA. PIPE.
3. CONCRETE BLOCKING SHALL BE INSTALLED AGAINST FIRM NATURAL GROUND.



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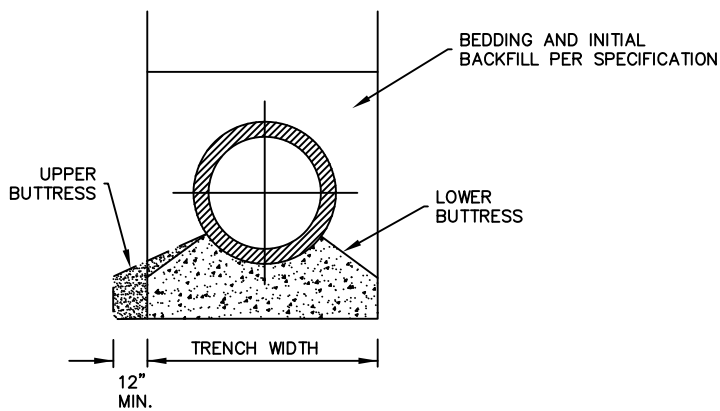
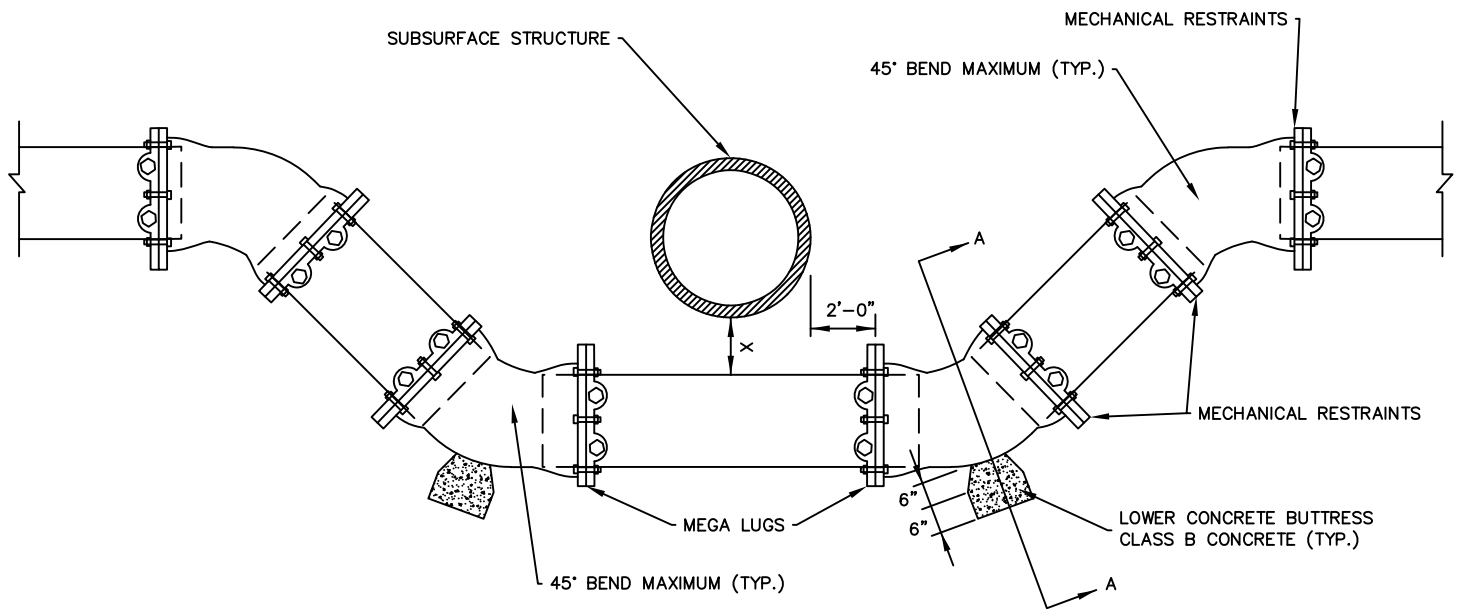
OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
BUTTRESS FOR TEES
PLUGS AND BENDS

DIVISION: 33

DRAWING NO:
W-3

DATE: 12/2018
BY: KAD
CHECKED: EPR



SECTION A-A

SEPERATION TABLE

DESCRIPTION	X=DISTANCE
STRUCTURE	12"
UNDER SEWER	18"
OVER SEWER	6"

NOTES:

1. ALL FITTINGS TO BE WRAPPED WITH POLYETHYLENE ENCASEMENT BEFORE PLACEMENT OF BUTTRESSES.
2. MECHANICAL RESTRAINTS WILL BE REQUIRED IN ADDITION TO BLOCKING.



ENGINEERING DIVISION

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OFFICE 920-339-4061
FAX 920-339-4071

TITLE:
WATER MAIN OFFSET

DIVISION: 33

DRAWING NO:
W-4

DATE: 12/2018
BY: KAD
CHECKED: EPR