CITY OF MARSHFIELD

2020

STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

PUBLISHED BY:
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CITY OF MARSHFIELD, WISCONSIN

STANDARD SPECIFICATIONS

FOR

PUBLIC WORKS CONSTRUCTION

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SECTION 1.1 GENERAL INFORMATION

1.1.1 SCOPE

These Specifications are to be considered as one Document. Each Section is mutually applicable to each other Section and all work shall conform to all applicable Sections unless specifically stated otherwise. The Sections are established for the convenience of the user in locating the provisions most specifically related to his work. The absence of a reference to another Section does not relieve the Contractor of the responsibility of performing work in accordance with all Sections of the Specifications applicable to that work.

1.1.2 THE CONTRACT DOCUMENTS

The Contract Documents shall consists of the Official Notice to Bidders/Advertisement for Bids, Information for Bidding and Execution of Contract/Instructions to Bidders, Special Conditions, Wage Rate Schedule, City of Marshfield Standard Specifications for Public Works Construction, Permits and Approvals, Contract, Proposal for Contract, Plans and Drawings, Addenda, Field Orders and Contract Change Orders; appropriate provisions of which shall apply to all Contractors and Subcontractors.

In resolving inconsistencies among two or more sections of the Contract Documents, precedence shall be given in the following order:

First:	Field Orders
Second:	Change Orders
Third:	Addenda
Fourth:	Contract
Fifth:	Special Conditions
Sixth:	Permits and Approvals
Seventh:	Standard Specifications for Public Works Construction
Eighth:	Plans and Drawings

Figure dimensions (numerical) on Drawings shall take precedence over dimensions measured utilizing a scale.

1.1.3 DEFINITIONS

a. AASHO

The American Association of State Highway Officials.

b. AREA

The American Railway Engineering Association.

c. ASTM

The American Society for Testing and Materials.

d. Bidder

Any person, firm, or corporation submitting a Proposal to perform work or furnish materials in response to the Advertisement for Bids, either directly or through a duly authorized representative.

e. Contract Change Order

A written agreement made and entered into by and between the Contractor and the Owner covering unforeseen work, or regarding revisions in or amendments to the Contract or specific provisions of the Contract Documents. Such Contract Change Order becomes a part of the Contract when it has been executed in the same manner as the Contract.

f. Contractor

The person, firm, or corporation to whom the within Contract is awarded by the Owner and who is subject to the terms hereof.

g. Engineer

Understood to mean the City Engineer of the City of Marshfield, Wisconsin, or the designated representative of the City Engineer.

h. Field Order

A written order issued to the Contractor or his representative at the site of the project by the City Engineer, or designated representative of the City Engineer, directing changes in the work within the provisions of the Contract Documents.

i. Inspector

The authorized representative of the Engineer assigned to make detailed inspection of any or all portions of the work, the materials to be incorporated herein, or the production and preparation of such materials.

j. Notice

Where in any of the Contract Documents there is any provision with respect to the giving of any notice, such notice shall be deemed to have been given; as to the Owner, when written notice shall be delivered to the Engineer, or shall have been placed in the United States Mail addressed to the City Engineer at the place to which bids or Proposals for the Contract were addressed; as to the Contractor, when a written notice shall be delivered to the chief representative of the Contractor at the site of the project or by mailing such written notice in the United States Mail addressed to the Contractor at the place stated in his Proposal as the address of his principal place of business; as the Surety when written notice is placed in the United States Mail addressed to the Surety at the home office of such Surety or to the agent or agents who execute the bond or policy in behalf of such Surety.

k. Official Notice to Bidders/Advertisement for Bids

The notice, published in the official newspaper, inviting Proposals for performing the work to be completed under any one Contract.

l. Owner

Understood to mean the City of Marshfield, Wisconsin.

m. NASSCO

National Association of Sewer Service Companies

n. Project

The entire public improvement proposed by the Owner to be constructed in part or in whole pursuant to this Contract.

o. Standards

Standard drawings for various types of work which are currently on file in the Office of the City Engineer.

p. Subcontractor

A person, firm, or corporation, other than the Contractor, supplying labor, equipment, or materials for work at the site of the project.

q. Surety

Any person, firm, or corporation licensed to do business by the State of Wisconsin that has executed as Surety the Contractor's Performance Bond securing the performance of the within Contract in accordance with the provisions of the Contract Documents.

r. WisDOT

State of Wisconsin Department of Transportation

s. Work

All the work to be performed under the terms of this Contract including work specified in the Contract Documents, indicated on the Plans or normally performed to produce a complete, usable public improvement of good workmanship.

1.1.4 REFERENCES

All references to “Highway Specifications” or “Wis DOT Standard Specifications” shall be interpreted to refer to the State of Wisconsin Department of Transportation “Standard Specifications for Highway and Structure Construction”, latest edition, including current supplemental specifications.

1.1.5 CONTRACT SECURITY

The Contractor shall furnish a Surety Bond in an amount not less than 100% of the Contract Price as security for the faithful performance of this Contract and for the payment of all persons performing labor or furnishing materials in connection with this Contract. Also see Performance and Payment Bond requirements.

1.1.6 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 any elected or appointed City official, or upon the Engineer or his assistants, it being understood that in such matters they act as agents and representatives of the Owner.

1.1.7 CONTRACTOR'S RESPONSIBILITY FOR WORK

The work shall be under the charge and care of the Contractor until acceptance by the Engineer, except as may be otherwise provided in these Contract Documents, and the Contractor shall preserve the work against injury or damage to any part thereof at his own expense.

1.1.8 RESPONSIBILITY FOR DAMAGE CLAIMS

The Contractor shall indemnify and save harmless the Owner, and the Owner's officers and employees, from all suits, actions, or claims of any sort brought because of injuries or damages to any person, persons, or property on account of the operations of said Contractor; or on account of or in consequence of any neglect in safeguarding the work, or through the use of unacceptable materials in constructing the project, or because of any act or omission, neglect, or misconduct of said Contractor of his employees; 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, or legal order. The Contractor's Surety and the Contractor shall indemnify and hold harmless the Owner and the Engineer against any claims, demands, liabilities, and damages caused by the hauling of materials

and equipment, installation of materials and equipment, movement or dirt or materials of any kind, and the erection of any structure included in this Contract. This provision shall include indemnification to the Owner for any damage caused to streets, sidewalks, or other public property.

The Owner may use all or any part of any monies owed to the Contractor or any retained payments due him to satisfy such legal and valid claims, rendering an accounting to the Contractor of such claims paid; or in case there are no monies owed the Contractor or if such monies are insufficient, the Contractor's Surety shall be held liable for such claims.

1.1.9 **CONTRACTOR'S LIABILITY INSURANCE REQUIREMENTS**

Contractor shall purchase and maintain, at its sole expense, insurance as outlined below until all services to be rendered have been fully completed, unless otherwise required herein:

a. Minimum Scope of Insurance for Contractor

Coverage shall be at least as broad as:

(1) Insurance Services Office Form #CG 00 01 07 98 or the most recent State of Wisconsin approved version of this form, covering Commercial General Liability, including coverage for Products Liability, Completed Operations and Contractual Liability; and

The Commercial General Liability Coverage will provide the General Aggregate Limit on a per project basis. The policy will provide coverage at least as broad as the Amendment-Aggregate Limits of Insurance Per Project Endorsement, Insurance Services Office Form #CG 25 03 11 85 or the most recently approved State of Wisconsin version of this form; and

Products and Completed Operations coverage shall be maintained for a minimum period of at least two (2) years after either 90 days following Substantial Completion or Final Payment of any projects, whichever is earlier; and

(2) Insurance Services Office Form #CA 00 01 07 97 or the most recently approved State of Wisconsin version of this form covering Automobile Liability Symbol 1 “any auto”; with the City of Marshfield listed as Additional Insured (per subsection ‘d’ of this section); and

(3) Workers’ Compensation as required by the State of Wisconsin including Employer’s Liability coverage. Coverage shall be modified to include a Waiver of Subrogation endorsement in favor of the following parties including their trustees, directors, elected or appointed officials, officers, agents and employees:

(a) City of Marshfield

(4) Umbrella Liability providing coverage at least as broad as the underlying Commercial General Liability, Automobile Liability and Employer’s Liability; Products and Completed Operations coverage shall be maintained for a minimum period of at least two (2) years after either 90 days following Substantial Completion or Final Payment of any project, whichever is earlier; and

(5) All insurance policies shall contain a provision stating that coverage will not be cancelled, non-renewed or materially changed until at least thirty (30) days prior written notice has been given to the Owner.

b. Minimum Limits of Insurance for Contractor

Contractor shall maintain limits no less than:

(1) Commercial General Liability for bodily injury, personal injury, advertising injury and property damage.

General Aggregate Limit (other than Products-Completed Operations)	Per project $2,000,000
Products-Completed Operations Aggregate	$2,000,000
Auto Liability	$1,000,000
Umbrella	$2,000,000
Personal and Advertising Injury Limit	$1,000,000
Each Occurrence	$1,000,000
Medical Expense Limit – Any One Person	$5,000

c. Acceptability of Insurers

Unless otherwise agreed to in writing by Owner, insurance is to be placed with insurers who have a Best's Insurance Reports rating of no less than A- and a financial size of no less than Class VIII, and who are authorized as an admitted insurance company in the State of Wisconsin.

d. Additional Insureds

The following parties including their trustees, directors, elected or appointed officials, officers, agents and employees shall be named as additional insureds on all Contractor Commercial General Liability and Umbrella Liability policies for liability arising out of the project work:

(1) City of Marshfield

The Commercial General Liability coverage for these additional insureds shall be on a primary and non-contributory basis. The Commercial General Liability policy shall provide that any insurance maintained by the additional insureds is excess and non-contributing with any insurance required hereunder. The insurance coverage for the additional insureds shall be at least as broad as that provided by endorsements including:

- Primary and Noncontributory - Other Insurance Condition (ISO Form GC 20 01 04 13).
- Additional Insured – Owners, Lessees or Contractors – Completed Operations (ISO Form GC 20 37 04 13).
- Additional Insured – Owners, Lessees or Contractors – Scheduled Person or Organization (ISO Form GC 20 10 04 13).

as applicable and on the most recently approved State of Wisconsin version of this form.

e. Contractor shall require any of their contractors, subcontractors, or subcontractors of any tier to maintain insurance of the same kind, terms and conditions as required of the Contractor described above.

f. Additional Insurance Requirements

(1) Any and all deductibles or other forms of retention are the responsibility of the Contractor. All deductibles or other forms of retention are subject to the approval of Owner.

(2) Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

(3) The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

(4) Neither the issuance of any insurance policy hereunder, nor the minimum limits specified herein, with respect to the Contractor's insurance coverage, shall be deemed to limit or restrict in any way Contractor's liability in connection with or arising out of its obligations under this Agreement.

g. Certificate of Insurance

(1) Prior to the Owner's execution of the Contract, the Contractor shall deliver to the Owner, with copies to each additional insured, certificates of insurance and all endorsements, riders, etc. as evidence of insurance requested by Owner which Contractor is required to purchase and maintain.

(2) Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

(3) Not less than two business days prior to the expiration of the insurance coverage required by the Contract, the Contractor must provide to the Owner certificates of insurance which evidence renewal or continuation of the required insurance policies or certified copies of such insurance policies.

(4) Upon failure to provide such evidence of coverage and/or policies or certified copies of insurance policies within the time periods required, Owner has the authority to:

(a) Order the Contractor to cease all operations until the required documents have been provided.

(b) Find the Contractor in material breach and default under this Contract.

(5) The contractor and subcontractor shall supply the engineer with their federal employer identification number prior to the execution of the contract.

(6) Contractor shall, at its own expense, appear, defend, and pay all fees of attorneys and all costs and other expenses arising there from or incurred in connection therewith; and, if any judgments shall be rendered against any individual or entity indemnified hereunder in any such action, Contractor shall, at its own expense, satisfy and discharge same. Contractor expressly understands and agrees that any Letter of Credit or insurance protection required by the Contract, or otherwise provided by Contractor, shall in no way limit the responsibility to indemnify, keep and save harmless, and defend any individual or entity indemnified hereunder as herein provided.

(7) For any matter for which Owner or Engineer is indemnified, Contractor shall pay for the Owner and Engineer's reasonable defense, including, but not limited to, all fees and charges of Engineer, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs or awards until Owner or Engineer is found negligent. If Owner or Engineer is found negligent, Owner or Engineer shall reimburse the Contractor for the prorate extent of Owner or Engineer's negligence for the cost of Owner or Engineer's reasonable defense.

1.1.10 ACCIDENT PREVENTION AND EMERGENCIES

Precaution shall be exercised at all times for the protection of persons, including employees, and property. The safety provisions of applicable laws and building and construction codes shall be observed. Machinery, equipment, and hazards shall be guarded or eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America to the extent that such provisions are not in contravention of applicable laws.

The Contractor shall be responsible for furnishing or erecting and maintaining suitable barricades, signs, warning lights, watchmen, or flagmen for the protection of the public and the project. The costs of such protective devices and personnel shall be paid by the Contractor. Whenever, in the opinion of the Owner or Engineer, the protective devices or personnel supplied by the Contractor are insufficient or inadequate, the Contractor shall forthwith provide adequate protection upon the receipt of notice.

If serious injury or damage occurs, the accident shall be reported immediately by telephone or messenger to Owner and Engineer and to appropriate local authorities. Contractor must submit to Owner and Engineer a report of each accident reportable under Worker's Compensation Law, which includes identification of corrective actions to reduce the probability of a similar accident. This report shall be prepared and signed by Contractor's safety professional.

In emergencies affecting the safety or protection of persons or property or maintenance of temporary construction at the site or adjacent thereto when Contractor cannot be reached, Owner or Engineer may act to attempt to prevent threatened damage, injury, or loss. Owner or Engineer will give Contractor and Engineer prompt written notice of such action and the cost of the correction or remedy shall be charged against Contractor. A Change Order will be issued to document the change in Contract Price.

If a claim is made by anyone against Contractor or any SubContractor resulting from an incident or accident, Contractor shall promptly report the facts in writing to Owner, giving full details of the claim, including investigation and restitution.

The provisions of this section shall apply to actual or perceived emergencies. The Contractor shall be solely responsible for all costs associated with said actual or perceived emergency, resultant actions and claims.

1.1.11 ROYALTIES AND PATENTS

The Contractor shall pay for all royalties and patents and shall defend all suits or claims for infringement of any patent right and shall save the owner harmless for loss on account thereof.

1.1.12 WARRANTY

The Contractor shall guarantee that all equipment, material and workmanship supplied, provided and/or installed by said Contractor and/or his subcontractors, suppliers or agents, will be free from all defects and strictly in accordance with the plans and specifications, at the time of its completion and acceptance by the Owner and for a time of one (1) year thereafter. In the case of any cracks, leaks, settlement or any other defects which exist or appear in any part of the work constructed within the one (1) year warranty period the Contractor shall be responsible for repair or replacement of the same upon notifications by the Owner, using the same material(s) required by these specifications. Street repairs shall comply with City of Marshfield Standards for Repair of Street Pavements. If the Contractor fails to make such repairs or cause the same to be made, the Contractor will be responsible for the costs thereof. The Contractor further agrees and guarantees to pay for or otherwise be responsible for all labor and material

used in or about the construction of said work in this contract, which may become a lien or a claim against the Owner. Such agreement and guarantee will be made part of the contract.

The Contractor and associated subcontractors and suppliers shall be deemed to impliedly warrant that their products and all component materials incorporated into them are suitable and fit for the intended use of such products and shall be free from defect in material, workmanship or design, such warranty to run to the benefit of Owner. The Contractor shall guarantee individual components and composite equipment, including the compatibility of components and equipment. The foregoing applies whether the products or their component materials are specified in the Contract Documents or are of supplier's design.

1.1.13 DEDUCTIONS OF COSTS FOR WARRANTY DEFECTS

The Owner reserves the right to deduct costs for repair or replacement of warranty defects, including but not limited to materials and workmanship, and substandard, damaged or incomplete items, from the amount due to the Contractor. Per the Engineer's discretion, the Engineer shall determine if a defect will be repaired/replaced by the Contractor or if costs will be deducted (for future repair by others). The costs for all deductions shall be based upon the current "Street Surface Replacement Costs" as adopted by the Board of Public Works and/or reasonable repair costs for specific repair work (per the Engineer's discretion). Costs for deductions shall include all work necessary to make said warranty repairs including but not limited to removals, traffic control, erosion control, temporary facilities, etc.

SECTION 1.2 PLANS AND SPECIFICATIONS

1.2.1 PLANS AND SPECIFICATIONS

All work shall be in strict conformity with the Plans and Specifications, and the Contractor shall do no work without proper drawings and Specifications. Except as otherwise provided in the Contract Documents, the Owner will furnish, free of charge, all copies of drawings and Specifications reasonably necessary to complete the work.

The Contractor shall keep at the site of the project an approved or conformed copy of the drawings and Specifications and shall, at all times, give the Owner, the Engineer, and their representatives access thereto. In case of differences between the drawings and the Specifications, the Engineer shall determine which shall govern.

1.2.2 DISCREPANCIES

On all Plans and drawings, figured dimensions shall govern in case of discrepancies between the scale and the figures. The Contractor shall not take advantage of any error or omission in the Plans or of any discrepancy between the Plans and the Specifications but shall refer all such conditions to the Engineer and the explanation of the Plans and Specifications as construed by the Engineer shall be considered final and binding on all parties concerned.

1.2.3 QUANTITIES

The approximate quantities shown on the Plans or elsewhere in these Contract Documents have been compiled for the purpose of comparing proposals. The Contractor shall field verify quantities as necessary to resolve any possible misunderstanding, error or discrepancy because of these quantities as to the character, location(s) or other conditions of the work.

The Owner will only pay the Contractor for the actual quantities for the work successfully completed. The quantities of work shall be measured as described in the specifications.

The Owner reserves the right to alter the quantities of work at any time during which the Contract is in force without invalidating the bid/contract prices. Alteration may include increasing, decreasing and/or deleting items of work as desired by the Owner, and said alterations shall not operate to waive or invalidate any condition of the Contract. When the amount/quantity of work is altered, no allowance will be made for any real or supposed damage, including loss of profit, by such alteration.

1.2.4 EXTRA WORK

The provisions of these Specifications shall not prevent the City from requiring the Contractor to perform extra work, including work exceeding One Thousand ($1,000.00) Dollars, which is not a modification of the Plan but clearly an addition to it, done in connection with public construction by compliance with the bid statute.

Extra work shall be paid for at a price as mutually agreed to by the Owner and Contractor, prior to the start of such work. The Owner reserves the right to order said extra work via a Written Amendment, Work Change Directive or Contract Change Order. It shall be the Contractor's responsibility to notify any surety and adjust amounts of applicable bonds.

The City reserves the right, in case of any extra work not shown on the Plans and not required in any manner by the Specifications, to have such extra work done by any other person, firm, or corporation, other than the Contractor; and should any such work be so let, the Contractor shall not interfere or molest said person, firm, or corporation, and shall suspend such part of his work, or perform the same in such manner as the Engineer shall direct so as to afford all reasonable facilities for the execution of the same, and the Contractor shall make no claim for damages or for any rights or privileges on account of said work.

All claims for extra work must be made to the Engineer in writing before the payment of the next succeeding estimate after the work shall have been performed; and failing to do this, the Contractor shall be considered as having abandoned his claim.

SECTION 1.3 PROSECUTION OF WORK

1.3.1 NAMED MATERIALS

Whenever, in any of the Contract Documents, an article, material, or equipment is defined by describing a proprietary product or by using the name of a manufacturer or vendor, the term 'or equal', if not inserted, shall be implied. The specific article, material, or equipment mentioned shall be understood as indicating the type, function, minimum standard of design, efficiency, and quality desired and shall not be construed in such a manner as to exclude manufacturer's products of comparable quality, design, and efficiency. The Contractor shall comply with the requirements of the Contract Documents relative to the approval of the Owner or Engineer before any material or equipment is incorporated in the project.

1.3.2 MATERIALS AND WORKMANSHIP

Unless otherwise stipulated in the Specifications, all workmanship, articles, equipment, and materials incorporated in the work covered by this Contract are to be new and of the best grade of its respective kind for the purpose. The Contractor shall, if requested, furnish evidence to the Owner as to the kind and quality of all materials or equipment.

If not stipulated, work or material called for in this Contract shall be furnished and performed in accordance with well known established practice and standards recognized by Engineers, Architects, and the trade.

When required by the Specifications, or when called for by the Engineer, the Contractor shall furnish the Engineer, for approval, full information concerning the materials or articles which he contemplates incorporating in the work. Samples of material shall be submitted for approval when so directed by the Engineer. Materials, articles, or equipment installed or used without the Engineer's approval shall be at the risk of subsequent rejection.

1.3.3 CONSTRUCTION SCHEDULE OF OPERATIONS

Prior to beginning construction operations, the Contractor shall, in writing, submit his proposed schedule of operations to the Engineer for approval and such scheduling shall conform with the traffic requirements set forth. The schedule shall be required to be submitted at the preconstruction conference. The work shall be performed in substantial conformance with such schedule except that modifications of scheduling may be approved by the Engineer in writing.

1.3.4 WORK DAYS AND HOURS

Normal work days shall include weekdays, Monday through Friday, and shall not include weekends (Saturday and Sunday) or Holidays (as recognized by the Owner). Normal work hours shall be from 7:00 AM to 7:00 PM (Central Standard Time).

All work requiring inspection as determined by the City Engineer shall occur during normal work days and normal work hours as defined herein. Work which does not require inspection may occur outside of the normal work hours/days however the Contractor shall comply with pertinent City ordinances and regulations (including but not limited to noise and vibrations).

If a Contractor desires to work additional hours and/or days, beyond normal work days/hours, and is performing work which requires inspection, said Contractor shall request permission from the City Engineer, in writing, at least three (normal) working days prior to this proposed work. The City Engineer will approve or disallow this request based upon the availability of an inspector or welfare of the general public.

1.3.5 PERMITS, SURVEYS, AND COMPLIANCE WITH LAWS

The Contractor shall obtain and pay for all permits and licenses necessary for the prosecution of the work unless otherwise specifically provided.

The Owner will furnish all surveys unless otherwise provided in the Contract Documents.

The Contractor shall give all notices, pay all fees, and comply with all laws, rules, ordinances, and regulations bearing on the conduct of the work.

Contractor shall submit to Owner and Engineer, within two days of receipt, a copy of any citations concerning safety aspects of the project received from OSHA or any other agency.

1.3.6 SUPERINTENDENCE

The Contractor shall give his personal superintendence to the work or have, at the site of the project at all times, a competent superintendent, foreman, or other representative satisfactory to the Owner and having authority to act for the Contractor.

The Contractor shall provide to the Engineer the name and phone number of an individual available after working hours and on weekends should problems arise concerning the projects. This contact name and phone number shall be required in writing to the Owner prior to the start of any work on this contract.

1.3.7 INSPECTION

All materials, equipment, and workmanship, if not otherwise designated by the specifications, shall be subject to inspection, examination, and test by the Owner at any and all times during the manufacture and construction and at any and all places where such manufacture or construction is carried on. The Engineer shall have the right to reject materials or workmanship which are defective or require correction thereof. Rejected workmanship shall be satisfactorily replaced with proper material without charge therefore to the Owner. The Contractor shall promptly segregate and immediately remove from the site of the project all rejected material, equipment, or supplies.

The Contractor shall furnish promptly, without additional charge, all reasonable facilities, labor, and materials necessary for safe and convenient inspections and tests that may be required by the Engineer or Owner. All inspections and tests shall be performed in such manner as not to delay the work unnecessarily.

Should it be considered necessary or advisable by the Engineer at any time before final acceptance of the entire project to make an examination of work already completed by removing or tearing out the same, the Contractor shall, upon request, promptly furnish all necessary facilities, labor, material, and supplies. If such work is found to be defective in any material respect due to fault of the Contractor or his Subcontractors, he shall defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and materials necessarily involved in the examination and replacement plus 15% shall be allowed the Contractor; and he shall, in addition, if completion of the project has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

Inspection of materials and finished articles to be incorporated in the work will ordinarily be made at the site of this project. If, for the convenience of the Contractor, it is desired that any particular test or inspection be made at a point outside the boundaries of the City of Marshfield, the Contractor shall arrange for such tests or inspections with the Engineer and shall defray the necessary traveling expenses of the Engineer or the Inspector making the tests. The manner of paying such expenses shall be by reimbursing the Owner, or as the alternate, the Owner may reimburse himself for such expenses by retaining monies otherwise due the Contractor.

1.3.8 USE OF PROJECT SITE

The Contractor or any Subcontractor shall confine his equipment, apparatus, material storage, and operations to limits indicated by law, ordinances, permits, or directions of the Owner and shall not encumber the project site.

1.3.9 OWNER'S RIGHT TO DO WORK

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the Owner, after three (3) days written notice to the Contractor and his Surety, may, without prejudice to any other remedy he may have,

make good such deficiencies and may deduct the cost thereof from the payment due the Contractor.

1.3.10 **OTHER CONTRACTS**

The Owner may award other Contracts for additional work and the Contractor shall fully cooperate with such other Contractors and carefully fit his own work to that provided under other Contracts as may be directed by the Owner. The Contractor shall not permit or commit any act which will interfere with the performance of work by other Contractors.

1.3.11 **DELAYS**

If the Contractor is delayed in completion of the work by any act or neglect of the Owner or the Owner's representative or by any other Contractor employed by the Owner or by other causes beyond the Contractor's control, including strikes, lockouts, fire, or unavoidable casualties, then the time of completion may be extended for such reasonable time as may be agreed upon by the Owner and the Contractor after notice in writing to the Owner of the cause of such delay within five (5) calendar days of the commencement thereof. Upon demand, the Contractor shall furnish the Owner with full particulars regarding delays, including names and addresses of any and all persons, firms, corporations, or associations who may be involved therein.

1.3.12 **UNFORESEEN DIFFICULTIES**

The Contractor agrees that he will sustain all losses or damages arising from the action of the elements or the nature of the work to be performed under this Contract.

1.3.13 **CONTRACT DOCUMENTS INTENT**

The Contract Documents are complimentary and what is called for by any one shall be as binding as if called for by all. The intention of the Contract Documents is to include in the Contract price the equipment, lighting, transportation, and all other expenses that may be necessary for the proper execution of the work.

In interpreting the Contract Documents, work describing materials, work or methods of work which have a well known technical or trade meaning, unless otherwise specifically defined in the Contract Documents, shall be construed in accordance with such well known meaning recognized by Engineers, Architects and the trade.

1.3.14 **ASSIGNMENT OF CONTRACT**

The Contractor shall not assign this Contract or any part hereof or any monies due or to become due hereunder without the written consent of the Owner. No assignment of this Contract shall be valid unless it contains a provision that the monies to be paid the assignee under the assignment are subject to a prior lien, for services rendered or materials supplied for the performance of the work called for in said Contract, in favor of persons, firms, or corporations rendering services or supplying materials used or delivered to the site of the project for use in construction thereof. Such provision, however, need not be inserted if the assignment technically constitutes a novation; i.e., the assignee not only acquires the benefits under the Contract, but also assumes the obligations thereunder in place of the assignor.

This Section shall not be so construed as to require the Owner to make any payment for faulty, defective, or rejected materials or workmanship.

1.3.15 **SUBCONTRACTING**

If the Contractor shall sublet any part of this Contract, the Contractor shall be as fully responsible to the Owner for the acts and omissions of his Subcontractor and of the persons either directly or indirectly employed by his Subcontractor as he is by acts or omissions of persons directly employed by himself. All Subcontractors, if any, shall be listed in the spaces provided on the Proposal Form and said list shall not be added to or altered without the written consent of the Owner.

1.3.16 CLAIMS FOR LABOR AND MATERIAL

The Contractor shall be obligated by this Contract for the payment of all claims for labor performed and materials furnished, used, or consumed in making the public improvement covered by this Contract or performing such public work, including, without limitations because of specific enumeration, fuel, lumber, painting materials, machinery, vehicles, tractor equipment, fixtures, apparatus, tools, appliances, supplies, electrical energy, gasoline, and other motor oil, lubricating oil, grease, the premiums for Worker's Compensation insurance, and the contributions for unemployment compensation.

In the event such claims are not paid by the Contractor, the City shall satisfy the claims as provided in Section 1.1.5 of these General Conditions. If there is not a sufficient amount on hand to satisfy such claims, the Contractor's Surety shall be liable for payment thereof.

1.3.17 CLEANLINESS OF PROJECT SITE

The Contractor shall at all time keep the project site free of accumulations of waste materials or rubbish caused by the work or by his employees.

1.3.18 MATERIALS

All materials or equipment required on any Contract, unless definitely specified to the contrary, shall be furnished by the Contractor. Materials furnished shall in all respects comply with the Specifications and will be inspected by the Engineer or by his representative. All work and materials not otherwise described shall be of the best description and should any workmanship or materials be needed which are not directly or indirectly noted in the Specifications or the Plans but are nevertheless necessary to the proper execution according to the obvious intent thereof, the Contractor shall provide for such materials or workmanship in his bid as fully as if particularly described.

1.3.19 MATERIAL(S) PROVIDED BY THE OWNER

In the event that the Owner desires or agrees to furnish any materials or supplies, they shall become the custody of the Contractor as soon as delivered to the site of the project and the Contractor shall be responsible for, and shall make good at his own expense, any loss or damage to such materials or supplies from the time of delivery until the final acceptance of the work.

1.3.20 SALVAGE

All materials removed during the construction of this project shall remain the property of the City unless expressly released to the Contractor in writing. All material, equipment, castings, culverts or pipe, etc., claimed by the City as salvage shall be removed by the Contractor and transported to the City storage yards.

1.3.21 WATER AND ELECTRIC POWER

If the Contractor uses City water in the work under this Contract, he shall purchase the water from Marshfield Utilities from one of their distribution locations as determined by

the Utility. At no time will the Contractor be allowed to connect to a utility hydrant. The Contractor shall pay all fees required to obtain this water.

Should temporary electric light or power be required for the execution of the work, the Contractor shall provide and pay for same.

1.3.22 STORAGE OF MATERIALS ON STREETS

When it is necessary to place or store materials in streets open to traffic, the Contractor must secure a permit therefore from the Owner and pay any fee connected therewith. Such permit shall be revocable by the Owner at any time.

1.3.23 LOCAL CONDITIONS

It is understood that the Contractor has, by careful examination, satisfied himself as to the nature, location, and extent of the work, formation of the ground, quantity and quality of the materials to be encountered, character of the equipment, and facilities needed for the prosecution of the work, general and local conditions, and all other matters which can in any way affect the work under this Contract.

No official, agent, or employee of the Owner is authorized to make any representations as to the materials or workmanship involved or the conditions to be encountered, and the Contractor agrees that no such statement or the evidence of any document or plan not a part of this Contract shall constitute any grounds for claims as to conditions encountered. No verbal agreement or conversation with any officer, official, agent, or employee of the Owner, either before or after the execution of this Contract, shall affect or modify any terms or obligations herein contained.

1.3.24 DRAINAGE THROUGHOUT CONSTRUCTION

Wherever water collects on the work under construction or adjacent thereto on account of rain, melting snow, or other natural causes, or on account of broken water or sewer mains or pipes, or from any other causes, such water shall be drained at the earliest possible moment to a manhole, inlet, or natural drain and if no such place is available, the water shall be pumped or bailed out in order to advance the drying out of the subgrade and to prevent damage to building or other foundations and the seeping of water into cellars or basements of adjacent buildings. No storm or surface water shall be directed into a sanitary sewer.

The Contractor is required to provide and maintain drainage during all phases of construction. The use of inlet protection typically at low points or sumps, as described and shown on plan details, is intended to aid site drainage after pavement/surfaces are removed until said surfaces are restored.

Temporary drainage can be accomplished by use of a temporary pipe, channel or ditch. Earthen channels or ditches shall include erosion controls to prevent sediment and debris from entering the storm sewer system. The Contractor shall be responsible for all damages resulting from improper or undersized temporary drainage provisions.

Installation, maintenance and removal of temporary drainage provisions shall be considered incidental to construction.

1.3.25 RULES AND REGULATIONS

The Bidder's attention is called to all the conditions entering into the performance of this work including the delivery points of materials and supplies, the haulage of materials,

employment of labor, location of streets, traffic conditions on these streets, and all laws of the State of Wisconsin and the United States, Ordinances and Regulations of the City of Marshfield insofar as they may affect his operations. The Contractor shall be held responsible for using such safety measures as will protect the interests of the Owner in the fulfillment of any part or all of this Contract.

1.3.26 PUBLIC MEETINGS

The Contractor is required to attend two public meetings to address residents concerns and to present his/her schedule for construction and paving. These meetings will be held in the Common Council Chambers in the basement of City Hall, 630 South Central Avenue, at 7:00 PM. The date of the meetings will be announced upon award of the contract. The City of Marshfield will notify affected residents/property owners.

1.3.27 TRUCK ROUTES

All truck traffic involved with construction under this contract shall use only the official City of Marshfield designated truck routes. (See the attached truck route map) The use of streets not identified as truck routes may be allowed upon written permission by the City Engineer. A written request shall be required one week prior to the date of anticipated use.

1.3.28 SANITARY FACILITIES

Sanitary facilities (porta-potty) shall be provided by the contractor at each project site for the duration of construction operations. Said sanitary facilities shall meet state and local health requirements, be provided and maintained in clean and good working condition, and shall be stocked with sanitary supplies at all times.

1.3.29 PROJECT SIGN

The Contractor shall provide, erect, maintain and thereafter remove a project sign for each project covered by a state or federal (prevailing) wage rate determination or regulatory permit. The sign shall be comprised of, as a minimum, painted 4' x 4' x ¾" plywood with a weatherproof transparent covering securely mounted on 4" x 4" posts or to the Contractor's job trailer. The project sign shall be utilized by the Contractor and Owner to display pertinent project information including but not limited to:

Contact information for: Emergency services
Owner
Engineer
Contractor
Utilities
Project name/identification
Wage Rate Data Sheets
Regulatory Permits/Certificates

1.3.30 CLAIMS BETWEEN CONTRACTORS

Should Contractor cause damage to the work or property of any separate Contractor at or adjacent to the site, or should any claim arising out of Contractor's performance of the work at the site be made by any separate Contractor against Contractor, Owner, Engineer, Engineer's consultants, or any other person, Contractor shall promptly attempt to settle with such other Contractor by agreement, or to otherwise resolve the dispute by arbitration or at law.

Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, and Engineer's Consultants and the officers, directors, partners, employees, agents and other consultants and SubContractors of each and any of them from and against all claims, damages, losses and expenses (including, but not limited to, fees of Engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate Contractor against Owner, Engineer, or Engineer's Consultants to the extent said claim is based on or arises out of Contractor's performance of the Contractor or should the performance of work by any separate Contractor at the site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or Engineer's Consultants or permit any action against them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or Engineer's Consultants on account of any such damage or claim.

If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate Contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a claim for an extension of time. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and Engineer's Consultants for any delay, disruption, interference, or hindrance caused by any separate Contractor. This paragraph does not prevent recovery from Owner, Engineer, or Engineer's Consultants for activities that are their respective responsibilities.

SECTION 1.4 INTERPRETATION AND ADMINISTRATION

1.4.1 ENGINEER'S AUTHORITY

The Engineer shall have general supervision and direct all work. He has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract. He shall also have authority to reject any or all work and materials which do not conform to the Contract, to direct the application of force to any portion of the work as may be required in his judgment, or to order the force increased or diminished, and to decide questions which arise in the execution of the work. It is further agreed by all parties hereto that the Engineer shall in all cases determine the amount, quantities, and classification of the several kinds of work or materials which are to be paid for under this Contract. The Engineer shall decide all questions which may arise relative to the performance of this Contract. All decisions of the Engineer shall, when so requested, be rendered in writing with memos to file and a copy to the Contractor. Such decisions shall be final and conclusive in all matters except the financial consideration involved. They shall be final also as to the financial conditions unless within 10 days following such decision the Contractor applies in writing to the Owner, with duplicate copy to the Engineer, for a review of such decision.

a. Disagreements

Should any disagreements or differences arise as to the true meaning or correct interpretation of the drawings or Specifications, the Engineer shall decide the true meaning or correct interpretation, the decision of which shall be final, conclusive, and binding on all parties to the Contract.

Should any conflict between such Plans and Specifications be in evidence, the Detail Specifications shall take precedence over the Plans unless otherwise stated by the Engineer, in writing, prior to the execution of the work, either in addenda, special provisions, letter, or specific reference to such conflict on the Plans.

b. Suspension of Work

The Engineer shall have the authority to suspend work on The project wholly or in part for such period as he may deem necessary, due to unsuitable weather or such other conditions as are unfavorable for the prosecution of satisfactory work, or for such time as he deems necessary due to the failure of the Contractor or his employees to perform any or all provisions of the Contract or due to the failure of the Contractor or his employees to carry out orders given to them under the terms of this Contract. Order or authorization to suspend work shall be in writing. Except as otherwise provided, no additional compensation or Contract time will be allowed due to such suspension of work.

In the event it should become necessary to suspend operations for an extended or definite period, the Contractor shall store all materials in such a manner that they will not obstruct or impede traffic unnecessarily, nor become damaged in any way; and he shall take every precaution to prevent damage to the work performed. As required by conditions, he shall provide suitable drainage of the roadway by opening ditches, sewers, etc.; and he shall erect any temporary structures necessary to prevent such damage.

1.4.2 **DUTIES AND AUTHORITY OF INSPECTORS**

Inspectors and the Engineer shall have access to the work at all times, wherever it is in preparation or progress, and the Contractor shall provide facilities for such access and for inspection, including the preparation, fabrication, or manufacture of materials to be incorporated in the project. Any Inspector employed by the Owner shall be authorized to inspect any or all portions of the work or the materials and shall report the results of such inspections to the Engineer. An Inspector is not authorized to revoke, alter, or waive any requirements of the Specifications or drawings nor is he or she authorized to approve or accept completed work or any portion thereof. An Inspector is authorized to call to the attention of the Contractor any deviation from the drawings or Specifications of the work workmanship, or materials.

In no instance is the Inspector to act as foreman or to perform any other duties for the Contractor nor shall the Inspector interfere in the management of the work by the Contractor. Any advice which the Inspector may give the Contractor shall not be construed as binding the Owner or the Engineer in any way or releasing the Contractor from fulfilling any of the terms of the Contract.

If the Contractor refuses to suspend operations on the project, the Inspector shall issue a written order giving the reason for suspending work. The Inspector shall then deliver said notice to the Contractor or his employee in charge at the site of work and shall leave the site immediately. Work done during such absence of the Inspector shall not be considered as work done under this Contract and no payment shall be made therefore under this Contract.

1.4.3 **CONSTRUCTION STAKES**

The Owner will provide and set construction ‘stakes’ including hubs, wedges, lath, whiskers, nails and/or paint marks as pertinent to the proposed work and described herein. Stakes will include appropriate notes.

Stakes will be in accordance with the following guidelines or other as agreed upon by the Owner/Contractor:

a. Removals

Pavement removal limits will be indicated by paint markings.

b. Pipelines (sanitary/storm sewers, water main, culverts, conduits, etc.)

Stakes will mark the center of structures and appurtenances. Offset stakes will also be provided. Stakes shall be noted to indicate structure/appurtenance identification/ number, station, distance from reference/centerline, and elevation of the stake as set.

c. Grading (streets, parking lots, ditching, ponds, etc.)

Stakes will mark slope intercept offset, approximately two feet beyond the actual slope intercept (plan distance from reference/centerline rounded up or down to the nearest whole foot plus two feet). Stakes will be provided at 50-foot intervals, minimum. Radius and curves will be staked as appropriate. All stakes will be noted to indicate the station, distance from reference/centerline, right or left, and elevation of the stakes as set.

A grade sheet will be provided to the Contractor which lists station, distance from reference/centerline, right or left, elevation of the stake as set along with the distance from reference/centerline and elevation for proposed break points (such as changes of slope, materials, etc.). The Contractor is expected to provide and utilize accurate direct read survey equipment such as a rotating laser level and Lenker rod for laying out and verifying break points as indicated on the grade sheet.

d. Concrete (pavements, curb and gutter, curb ramps and special sidewalk or driveways)

Stakes will be provided at 25-foot intervals, minimum and offset from the proposed work as requested by the Contractor. Stakes will be noted to indicate the station, offset from the outside edge of the proposed work item, and dimension of cut or fill from the stake as set to the finished edge of the surface of the proposed work item.

e. Asphalt (pavement, parking lots, tracks, driveways, etc.)

For proposed areas which are wider/larger than 50-feet, stakes will be provided at 50-foot intervals along the centerline, and will be set to the finished grade less the thickness of the proposed asphalt.

The Contractor shall furnish at his expense, such additional stakes or other materials required to maintain and mark the point and lines given. The Contractor shall be responsible for the preservation of all stakes and marks; and if, in the opinion of the Engineer, any of the survey stakes, marks, points, or elevation benchmarks have been carelessly or willfully disturbed or destroyed, the cost of replacing them shall be charged to the Contractor by the Owner and shall be deducted from the payment for the work.

At no time shall the Contractor proceed with the work until he has made timely request(s) upon the Engineer for such stakes, points, and instructions as may be necessary and has provided reasonable opportunities and facilities for setting such points and making measurements. The Contractor shall provide advanced notice of said request for stakes of at least three (3) working days.

1.4.4 SURVEY MONUMENT PERPETUATION

Lot and block property pipes will be disturbed by construction activities under this project. The Engineer will perpetuate these property pipes as necessary. Any property pipes disturbed by the Contractor prior to perpetuation by the Engineer shall be restored by a registered land surveyor at the Contractor's expense. Similarly, any survey stakes or temporary markers established for the sake of perpetuation which are subsequently disturbed by the Contractor shall be restored at the Contractor's expense as discussed above. The Contractor shall notify the Engineer a minimum of one week prior to beginning construction activities which may disturb property pipes.

1.4.5 **PROTECTION OF ABUTTING PROPERTY**

It shall be the Contractor's responsibility to take the necessary precautions and to use construction methods that insure no damage is done to anything that abuts this project on private property.

If any damage should occur, the damaged item shall be repaired and restored to its original condition by the contractor.

1.4.6 **DAMAGE TO EXISTING SIDEWALKS**

Existing sidewalk adjacent to the project site shall be inventoried prior to the commencement of any work. The Contractor shall be responsible for protecting the sidewalk and will be held liable for any damage. Damaged sidewalk shall be replaced at the Contractor's expense.

1.4.7 **UNAUTHORIZED WORK**

Work done without lines or grade or instructions from the Engineer or any work done beyond the limits of this Contract as designated by the Plans and Specifications or extra work done without written authority will be considered unauthorized work and will be done at the expense of the Contractor and shall not be paid for by the Owner. Work so done may be ordered removed or replaced at the Contractor's expense, and the cost thereof may be deducted by the Owner from any payment otherwise due the Contractor.

1.4.8 **CLAIMS**

Before the final settlement will be made the Contractor must furnish to the City satisfactory evidence that all persons who have been employed upon the work, or who have furnished materials for the work under his Contract and according to these Specifications or have furnished insurance or contributions for unemployment compensation, and may have been entitled to a lien have been fully settled with and are no longer entitled to a lien. In case such evidence is not furnished, then the City may retain from all monies due the Contractor and in possession of the City such an amount as they may deem necessary to meet all lawful claims due to the above mentioned parties until such claims are fully discharged, and evidence thereof furnished to the City. The Contractor or his Surety shall pay all sums necessary to meet all such lawful claims if sufficient sums are not retained by the City.

1.4.9 **DAMAGES TO THE WORK**

The Contractor will be responsible for all damages to the work including but not limited to damages due to failure of barricades, signs, lights, flagmen, and watchmen to protect it and, when evidence of such damage is found prior to acceptance, the Engineer may order the damaged portion immediately removed and replaced or otherwise repaired by the Contractor at the Contractor's expense.

1.4.10 **PARTIAL PAYMENTS AND RETAINAGE**

Partial payments shall be prepared and submitted by the Contractor during the first week of each month by individual request per project. This submittal shall include an estimate containing a detailed breakdown of the value of the work performed and copies of invoices for materials delivered to the site. Not later than ten (10) days following the next meeting of the Owner's governing body at which the payment of bills is approved, the Owner shall pay to the Contractor the amount of such estimate as approved by the Engineer with the exception of ten percent (10%), which shall be retained until 75

percent of the Contract Price is paid, then five (5%) percent shall be withheld until final completion and acceptance of all work covered by this Contract.

A portion of the amount due to the Contractor at the time of final completion will be retained by the Owner throughout the warranty period. The amount retained shall not exceed two percent (2%) of the final contract amount. Payment of the 'warranty retainage' will become due upon a satisfactory warranty inspection or satisfactory resolution of issues noted by the warranty inspection.

1.4.11 **OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS**

In addition to the percentage of each monthly estimate to be retained by the Owner under a preceding provision of these General Conditions, the Owner may withhold a sufficient amount of any payment otherwise due the Contractor to cover: (a) payments that may be past due and payable for just claims for labor and materials furnished in and about the performance of the work under this Contract; (b) for defective work not remedied; (c) for Fulfillment of guarantee work; and (d) for failure of the Contractor to make proper payments to his Subcontractor. The Owner shall disburse and shall have the right to act as agent for the Contractor in disbursing such funds as have been withheld pursuant to this paragraph to the party or parties entitled to payment therefrom. The Owner shall render to the Contractor a proper accounting of all such funds disbursed in behalf of the Contractor.

1.4.12 **TERMINATION FOR BREACH**

In the event that any of the provisions of this Contract are violated by the Contractor or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and his Surety of the Owner's intention to terminate the Contract, such notice to state the reasons for such intention; and, unless within ten (10) calendar days after the serving of such notice upon the Contractor such violation or violations shall have ceased and satisfactory arrangements for correction have been made, the Contract shall, upon expiration of said ten (10) days, cease and terminate. In the event of such termination, the Owner shall immediately serve notice thereof upon Contractor and his Surety and the Surety shall have the right to take over and perform the Contract, provided, however, that if the Surety does not commence performance thereof within 30 days from the date of mailing to said Surety the notice of termination, the Owner may take over the project and prosecute the same to completion by Contract or by his own forces for the account and at the expense of the Contractor, and the Contractor and his Surety shall be liable to the Owner for any excess cost, over and above the Contract amount, occasioned the Owner thereby. No plant, equipment, materials, or supplies located at the site of the project, and useful in the prosecution of the work, on the date of the before mentioned notice to termination of Contract shall be removed without the written consent of the Owner; and, in the event the Owner takes over the work and prosecutes same to completion under the terms of this Section, the Owner may take possession of and utilize in completing the project any or all of such plant, equipment, materials, and supplies as may be on the site of the project and useful therefore. Upon the completion of the project, all such nonexpendable plant, equipment, materials, and supplies as may remain unused shall be returned to the Contractor at the site of the project and shall be promptly removed by him or by his Surety.

1.4.13 **SCHEDULE OF LIQUIDATED DAMAGES**

If the Contractor does not complete the work as described elsewhere within the specified time (calendar days, working days and/or completion date) the Owner will assess liquidated damages. The specified amount(s) will be deducted from payments due the Contractor for every calendar day that the work remains uncompleted. The fixed, agreed, and liquidated damages shall be assessed in accordance with the schedule listed below. The deducted amounts are not a penalty but are actual damages due the Owner

from the Contractor. The daily liquidated damage amount(s) are in addition to and do not include inspection charges incurring after the specified time has expired.

Original Contract Amount		**Daily Charge**	
From More Than	**To and Including**	**Calendar Day**	**Working Day**
$.00	$50,000	$100.00	$200.00
$50,000	$100,000	$250.00	$450.00
$100,000	$300,000	$450.00	$950.00
$300,000	$500,000	$650.00	$1,300.00
$500,000	$1,000,000	$850.00	$1,700.00
$1,000,000	--	$1,150.00	$2,300.00

If the Contract involves more than one project, the specified completion date/period shall apply to all projects in the Contract, however the terms of this Section shall also apply to each individual project completion date(s)/period(s) separately (including interim project completion, milestone dates, etc.), based upon the original value of said individual project(s).

Any item not specifically covered by this Section of the Specifications shall be covered by Section 108, Prosecution and Progress, 'Highway Specifications'.

1.4.14 INSPECTION CHARGES AFTER COMPLETION DATE HAS EXPIRED

The Contractor or its Surety shall pay for each and every day inspection is required on all construction projects after the time allowed for completion has expired. This per diem rate for inspection will include the cost of inspection, construction supervision, clerical and administrative costs, vacations, pensions, holidays, overtime, and other similar overhead charges. The amount of the per diem charge will be $250.00 per Inspector per day. The City may deduct such charges from any money then due or to become due the Contractor.

An Inspector will be assigned to the project upon notice from the City Engineer to the Contractor to start work. If more than one crew is utilized by the Contractor, as many additional Inspectors will be assigned to the project as the City Engineer deems necessary. An additional charge per day after the time allowed for completion shall be made for each such additional Inspector. Inspection will be continuous until in the judgment of the City Engineer, the project is complete.

When the official notice requires completion of the Contract by a specific calendar day, all work, including clean up of the work site must be completed by that date. The decision of the City Engineer shall be considered final in all matters pertaining to the necessity for inspection and the number of Inspectors required on construction projects.

The foregoing charges will be made in addition to the charges of liquidated damages.

1.4.15 PAYMENT FOR INCORRECT WORK

If the Owner deems it expedient to accept damaged work or work not done in accordance with the Contract, the difference in value together with a fair allowance for the damages shall be deducted from the Contract price for such items.

1.4.16 CORRECTION OF WORK AFTER FINAL PAYMENT

Neither the final payment nor any provision in the Contract Documents shall relieve the Contractor of the responsibility for negligence, faulty materials, or faulty workmanship within the period specified or provided by law; and upon written notice, he shall remove forthwith any defects due thereto and pay for any damage to other work resulting therefrom. Nothing in this paragraph shall be construed as limiting the period during

which the Owner may make a legal claim for said negligence, faulty materials, or poor workmanship.

SECTION 1.5 PROTECTION AND ACCOMMODATION OF THE PUBLIC

1.5.1 PUBLIC ACCOMMODATIONS

During the progress of the work, the convenience and accommodation of the public and the residents along the work must be provided for as far as is practicable. Convenient and safe access to driveways, houses, and buildings among the work must be maintained whenever possible. The Contractor shall not obstruct the drainage of any street contiguous to the work, nor prevent in any manner the normal flow of the water.

When not intended for immediate use in the work, materials delivered on the work shall be neatly and compactly piled in such manner as to cause the least inconvenience to the abutting property owners and the general public, and not within six (6) feet of any fire hydrant or police or fire alarm boxes, as such utilities must be readily accessible at all times. Shade trees and other public or private improvements shall be protected from damage.

Should it become necessary to halt the prosecution of the work in order to provide any public accommodations, no claim for damage will be allowed on account of such delay.

1.5.2 NOTICE TO UTILITIES

The Contractor shall give notice in writing to all persons in charge of streets, gas and water pipes, electrical and other conducts, railroads, poles, manholes, catch basins, and all other property that may be affected by his operations at least 48 hours before breaking ground, and the Contractor shall not interfere with such utilities until the expiration of the time specified in such notice and then only by order to the Engineer, nor shall the Contractor hinder or interfere with any person in the protection of such utilities at any time except with the permission of the Engineer. Copies of such notice shall be furnished to the Engineer in duplicate at the same time that the original is served or mailed.

1.5.3 PROTECTION OF UTILITIES

The Contractor shall use care in excavating to avoid damage to any public or private utility wire, pipe, main, box, lateral, pole, track, or other equipment. The Contractor shall be responsible for any such damage caused by his operations and he, and his Surety, shall save the Owner harmless from any suit or claim for damages.

1.5.4 NOTICE TO FIRE AND POLICE DEPARTMENT

Not less than 24 hours prior to the blocking of any street to any extent whatsoever, the Contractor shall notify the Fire Department and the Police Department in writing. Duplicate copies of such notice shall be furnished the Engineer at the same time.

1.5.5 STREET BARRICADES AND DETOUR SIGNS

When working on a street or highway that is open to traffic or when closing a street or highway to traffic to perform work under this Contract the work shall be signed and protected in accordance with Part V 'Traffic Controls for Highway Construction and Maintenance Operations' of the 'New Manual of Traffic Control Devices' prepared by the State Highway Commission of Wisconsin.

The Contractor shall also be liable for all damages caused by negligent digging up of streets, alleys, or other public grounds or which may result from carelessness in the protection of this work (Wisconsin Statutes 62.15-11).

1.5.6 USE OF EQUIPMENT AND SEQUENCE OF OPERATIONS

The Owner may regulate the time and type of equipment which the Contractor uses so as to minimize objectionable odors, noises, smoke, dust, etc.

The sequence of operations or the place of commencement of work may be determined by the Engineer as he shall deem fit to best serve the needs of the Owner, the abutting property holders, and the public.

1.5.7 SAFETY FENCE

The Contractor shall provide, erect, maintain and thereafter remove safety fence as indicated on the plans, by the special Provisions or directed by the City Engineer. Safety fence shall also be used to delineate accessible and nonaccessible areas. Provide reflective barricades in addition to safety fence as warranted and/or required for traffic control.

Safety fence shall be an orange plastic web fabric at least 4-feet in height and supported by steel fence posts spaced less than 10-feet apart. The intent of safety fence is to protect the public, existing trees, landscaping or other existing features. All work associated with the Safety Fence shall be considered incidental to construction.

1.5.8 NOISE AND VIBRATION

The Contractor shall comply with the City's noise and vibration ordinance, Municipal Code Chapter 10, Section 10-33 (Construction and tool use/operation noise disturbance not allowed between 9:00 PM and 7:00 AM the following day, except for emergency work). Violations will be investigated and enforced by the Marshfield Police Department.

All construction equipment and tools shall include mufflers or noise attenuation devices as originally equipped, and shall be maintained and operated in a manner which does not constitute a disturbance.

The City Engineer may grant an exception to these requirements, with acknowledgement by the Police Chief, for certain construction operations which cannot be done during normal work days or hours (such as but not limited to sawing joints in concrete pavements, etc.). The Contractor shall request permission from the City Engineer at least three working days prior to the proposed occurrence.

SECTION 1.6 ACCEPTANCE, MEASUREMENT, AND COMPLETION

1.6.1 USE OF COMPLETED PORTIONS

The Owner shall have the right to take possession of and use any completed or partially completed portion of the project whenever it shall be deemed in the public interest to do. Such occupation or use prior to the time of acceptance of the complete project shall not relieve the Contractor of any obligation under any other Sections of these Contract Documents nor shall it constitute a waiver on the part of the Owner of any right stipulated or inferred elsewhere in these Contract Documents. However, if such prior occupation and use increases the cost or delays the work, the Contractor shall be entitled to extra compensation or an extension of time, or both, as may be determined by the Engineer.

1.6.2 FINAL INSPECTION

As soon as is practicable after notification by the Contractor and confirmation by the Inspector that all of the work contemplated under this Contract has been completed, the Engineer shall make a final inspection of the project. Whenever the Contractor shall have been notified by the Engineer that the project is ready for acceptance, the Contractor shall prepare and present to the Engineer the final estimate of quantities and the final completed prices for work performed and materials furnished. Payment of such final estimate shall not relieve the Contractor of responsibility for faulty materials or workmanship.

1.6.3 WARRANTY INSPECTION

Near the end of the warranty period, the City Engineer shall inspect the project and document all defects, including but not limited to materials, workmanship, and damaged or incomplete items. Damaged items shall include new and existing facilities which were damaged through construction of the project.

The Engineer will prepare a list or drawing indicating said defects and inform the Contractor of the defects to be repaired prior to final payment. Note: The Contractor may not be allowed to repair or replace all defects. Costs for defects not repaired or replaced shall be deducted as described elsewhere.

1.6.4 INCIDENTAL ABSORBED

All of the work, equipment, and materials covered by these Specifications, or the drawings, or any work, equipment, or materials that may be reasonable from the information given on the Plans or in the Specifications and which may be necessary to complete the project in a workmanlike manner, or the tools, appliances, or structures that may be used by the Contractor and the cost of all such materials, equipment, tools, and work shall be considered to be included in the prices and amount mentioned in the Contractor's Proposal or Bid.

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

1.6.5 NO WAIVER OF LEGAL RIGHTS

The Owner shall not be stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work and payment therefore, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is inaccurate, untrue, or incorrectly made, or that the work or materials do not conform in fact to the Contract. Notwithstanding any such estimate, measurement, or certificate and payment in accordance therewith, the Owner shall not be stopped or precluded from recovering from the Contractor and his Surety such damages as it may sustain by reason of the Contractor's failure to comply with the terms of this Contract. Neither the acceptance by the Owner, the Engineer, or any representative of either, nor any payment for or acceptance of the complete project or any part thereof, nor any possession taken by the Owner or extension of time, shall operate as a waiver of any portion of the Contract, or any power herein reserved, or any right to damages herein provided. A waiver of any breach of the Contract shall not be construed to be a waiver of any other breach or any prior or subsequent breach.

1.6.6 CONTRACT TIME/COMPLETION DATE

The number of calendar or working days to complete the Contract or the completion date is noted on the Proposal Form. The time will start when the Notice to Start Work has been received as evidenced by the return receipt of Certified Mail delivery. The time will end when all items of the Contract have been completed and the project is accepted by the City Engineer. If the Contract involves more than one project the specified time shall apply to all projects in the Contract.

1.6.7 CONTRACT CLOSEOUT

Upon final completion of the project and prior to the final payment, the Contractor shall submit the documents listed below:

a. Evidence of Payment/Release of Liens from subcontractors and suppliers.

b. Affidavit of Compliance with Prevailing Wage Rate Determination.

c. Warranty for materials requiring a special guarantee/warranty.

d. Completion Statement (on Contractor's letterhead with the project(s) specifically referenced; statement indicating all lienable items, labor, equipment, materials and wages have been paid in full and all permits/licenses/approvals were complied with; signed, dated and notarized).

1.6.8 FINAL CLEANING

Prior to final acceptance of the project, the Contractor shall completely clean all new facilities and existing facilities affected by construction. Facilities to be cleaned shall include but are not limited to: surfaces such as streets, gutters, sidewalks, driveways, ditches; storm sewer mains, manholes, outfalls, treatment devices and catch basins/inlets/area drains including grates, structures and sumps; sanitary sewer mains and manholes; and other facilities pertinent to construction of the project including haul roads, temporary/access roads, storage/staging areas, etc.

Final cleaning includes clean-up for work completed by others concurrently with the project, such as but not limited to asphaltic pavement (placed under City or private contract), private plumbers, utility companies, etc.

If Final Cleaning (along with miscellaneous adjustments and repairs) resulting from private work is determined by the City Engineer to be excessive, the Contractor will be compensated for said work via Contract Change Order (negotiated prior to completion of said work).

Cleaning methods, materials and equipment shall not create hazards or nuisances to property owners and the general public.

Remove all waste, debris, rubbish, etc. from the project site and legally dispose of said materials as necessary.

Final Cleaning shall occur after all surface construction has been completed. Clean and remove concrete and/or asphalt materials (such as debris, waste, splatter, overspray, etc.) from manholes, steps, castings (frame seat, covers, pick holes, etc.), electrical appurtenances, walls, fences, buildings, etc.

SECTION 2

CLEARING AND GRUBBING

SECTION 2.1 DESCRIPTION

Clearing and grubbing shall consist of cutting and disposing of trees, shrubs, and brush and removing and disposing of roots and stumps as shown on the Plans or where directed by the Engineer. All work shall be in accordance with Section 201 of WisDOT Standard Specifications and this specification.

SECTION 2.2 MATERIALS

Not used.

SECTION 2.3 CONSTRUCTION METHODS

No trees are to be removed without the approval of the Engineer.

Where feasible, trees shall be felled toward the center of the area to be cleared. Where trees cannot be felled without danger to traffic or injury to other trees, structures, or property, they shall be cut in sections from the top down.

All timber salvaged from the required clearing of right of way shall be owned by the Contractor unless specifically addressed elsewhere. Disposal of clearing and grubbing debris by open burning is not allowed within the City of Marshfield. All debris shall be disposed of off site.

Care shall be taken not to harm or injure any trees or shrubs on or off the right of way which are not to be removed under this Contract.

SECTION 2.4 MEASUREMENT AND PAYMENT

2.4.1 MEASUREMENT

The quantity of clearing or of grubbing will be measured per inch diameter of trees or stumps approximately four (4') feet above the existing ground level and the diameter of the trees or stumps shall be 1/3 of the measured circumference. The measurement for circumference and determination of diameter will be to the nearest full inch. Only trees or stumps in place, and the diameter of which is six (6") inches or more, will be measured for payment. The removal of any tree, stump, or shrub less than six (6") inches in diameter shall be considered as being included in the Contract price for other pertinent items on the Contract.

Where the item ‘Grubbing’ is not specifically listed in the Contract, the stump shall be measured to the nearest full inch across the top of the stump however payment shall be made at 50% of the unit price for clearing and grubbing per inch diameter.

Where indicated on the plans, clearing and/or grubbing shall be measured per station in accordance with Section 201 of WisDOT Specifications. The width of clearing and/or grubbing measured per station may vary. Clearing and/or grubbing limit shall be as indicated on the plans and staked by the Engineer (5-feet beyond the slope intercept, typical).

2.4.2 **PAYMENT**

The Contract Price for clearing and/or grubbing shall include all cutting, removing, and disposing of trees, shrubs, roots, and stumps and any compacted backfilling required because of stump removal. The Contract Price shall also include any damages to structures, whether public or private, occasioned by the removal of said trees or stumps.

Payment shall be considered full compensation for all materials, labor, tools and equipment necessary to complete thee work.

SECTION 3

REMOVING ASPHALT OR CONCRETE SURFACES

SECTION 3.1 GENERAL

This work shall consist of sawing and/or removing existing asphalt and/or concrete pavement, driveways, curb, curb and gutter, and/or sidewalk as shown on the Plans or as directed by the Engineer and disposing of the resulting materials.

SECTION 3.2 MATERIALS (NOT USED)

SECTION 3.3 CONSTRUCTION

3.3.1 REMOVALS

Care shall be taken when removing items covered by this section such that said removals will not damage any portion of surfaces to remain, including the preservation of existing edges and/or reinforcement/bars to remain. The practice of making a second sacrificial/relief saw cut within close proximity to the saw cut at the removal limits is recommended.

The Contractor shall be responsible for damage to underground utilities and adjacent surfaces resulting from all removals. The Engineer reserves the right to withhold payment (as damages for future repair by the City) or to require the contractor to make repairs to the satisfaction of the City Engineer. Repairs to adjacent surfaces may include resawing, replacement of additional surface/areas up to the full panel, partial depth repair or application of crack/chip repair materials, all at the discretion of the City Engineer.

Asphalt and/or concrete materials designated to be removed shall be carefully removed by the Contractor such that the asphalt and/or concrete materials are segregated and clean, and substantially free of clay, mud, steel reinforcement, etc. Asphalt materials shall be essentially free of concrete matter, and concrete materials shall be essentially free of asphalt matter. Asphalt and/or clean concrete waste materials shall be deposited at a City material yard stockpile, per contract requirements. Asphalt and/or concrete materials not designated for deposition at a City yard shall be hauled and disposed of by the Contractor (off site). Concrete, rubble and similar waste materials shall not be reused on the project (as riprap, fill, etc.) unless approved by the City Engineer.

During break-up and removal operations, the Contractor shall mark and protect existing utility appurtenances such as manholes, inlets, valve boxes, etc. Any debris accumulating within said utility appurtenances shall be removed immediately.

3.3.2 SAWING

Use appropriate equipment capable of sawing through the designated surface entirely and producing a smooth true cut edge. All saw cuts shall be straight in alignment. Do not oversaw unless approved by the City engineer (will require drilling a ¾-inch hole at end of saw cut, sealed). Protect the sawed edge/joint throughout all following operations. Making a second saw cut inside of the removal limits is highly encouraged. Repair damaged sawed edges and/or chipped joints in accordance with City of Marshfield Street Repair Standards.

The Contractor shall remove concrete sawing sludge after completing each saw cut, including but not limited to road surfaces to remain, gutters, drainage facilities, hydrants, signs, traffic control devices, etc. Sawing sludge or residue shall not flow or be blown across lanes used by public traffic, nor enter any storm sewer, ditch, greenway, stream or any drainage facility. Sawing residue and sludge (including water) shall be hauled and disposed of by the contractor at an acceptable material disposal site.

3.3.3 SAWING EXISTING CURB HEAD

Where required on the Plans or by the City Engineer, existing concrete curb head(s) shall be sawed and removed to provide a curb opening for driveways/entrances and/or curb ramps. The curb head shall be professionally sawed using proper jigs and equipment to provide a consistent, true, shaped opening. Do not oversaw and do not damage adjacent pavement or curb and gutter. The sawed curb head shall be shaped similar to a proposed driveway or curb ramp opening (see plan details). Grind/rub/repair rough areas and sharp edges.

SECTION 3.4 MEASUREMENT AND PAYMENT

3.4.1 MEASUREMENT

3.4.1.1 General

All work associated with Removal items listed below shall be considered incidental to construction unless specifically listed for payment in the unit price schedule/contract.

Where work items are specifically listed for payment, the Engineer reserves the right to pay for said work based upon the estimated quantity(s) as listed on the unit price schedule/bid form/contract, without measurement thereof unless significant deviations from the plan occur during construction.

3.4.1.2 Remove Concrete Pavement

Removing Concrete Pavement shall be measured per square yard of existing pavement removed, from sawed joint to sawed joint. Integral curb and gutter pavements (wider than 36-inches from flag to back-of-curb) to be removed, shall be measured as concrete pavement (only) to the back of the curb.

3.4.1.3 Remove Concrete Curb & Gutter

Removing concrete curb and gutter shall be measured per lineal foot of existing curb and gutter (less than 36-inches wide, flag to back of curb) along the face of the curb. Removing concrete curb and gutter along the lateral edges of driveways and approaches shall be incidental to removing concrete driveway and/or removing asphalt surface.

3.4.1.4 Remove Concrete Driveways and Sidewalk

Removing concrete driveways and sidewalk shall be measured per square yard of existing concrete driveway and/or sidewalk removed. Integral or free-standing concrete curb and/or curb and gutter along the lateral edges of driveways and approaches, to be removed shall be measured as ‘Remove Concrete Driveway’ to the back of the curb.

3.4.1.5 Remove Asphalt Surface

Removing existing asphalt surface, including pavements, overlays, driveways, curbs, sidewalks, slopes and other asphaltic surfaces (excluding millings) shall be measured per square yard of existing surface removed.

The Engineer reserves the right to delete the item Remove Asphalt Surface, in part or whole, from the Contract. If deleted from the Contract, (before or after award of the Contract), this work will be done by others (typically the City's Public Works Department – Street Division forces). The contractor will be responsible for coordination regarding said removals and shall provide access for trucks and equipment necessary for others to complete this work. Asphalt surfaces which are not removed by others shall be removed by the Contractor.

3.4.1.6 Saw Concrete Pavement (Full Depth)

Sawing existing concrete pavement, full depth, shall be measured per lineal feet at the final saw location and said measurement will not include over-sawing beyond limits, sacrificial/relief cuts as necessary for ease of removal, resawing due to damaged edges or unsatisfactory cuts.

3.4.1.7 Saw Concrete Driveways and/or Sidewalks

Sawing existing concrete driveways and/or sidewalks as the case may be, will be considered incidental to construction unless specifically listed for payment in the unit price schedule/Contract. Where sawing existing concrete driveways and/or sidewalks is to be measured for payment, said measurement shall be made in accordance with parameters for Saw Concrete Pavement, Full Depth.

3.4.1.8 Saw Existing Curb Head

Saw Existing Curb Head (for driveway or curb ramp opening) shall be measured per lineal foot, horizontally along the curb head between each end of the cut.

3.4.1.9 Saw Asphalt Surface

Sawing existing asphalt surface will be considered incidental to construction unless specifically listed for payment in the unit price schedule/Contract. Where sawing existing asphalt surface is to be measured for payment, said measurement shall be made in accordance with parameters for Saw Concrete Pavement, Full Depth. Sawing through asphalt overlaid concrete pavement shall be measured and paid for as Saw Concrete Pavement, (Full Depth).

3.4.2 PAYMENT

Payment for removal and/or sawing items as discussed herein shall be made at the Contract Unit Price, measured as described above regardless of the thickness, depth or number of courses encountered and acceptably completed. Payment shall constitute full compensation for all mobilizations, coordination, sawing, grinding/repair, breaking down, removing, segregating, hauling, disposal and clean-up, along with all labor, material, equipment, tools and incidentals necessary to complete the work.

SECTION 4

EXCAVATION AND TRENCHES

SECTION 4.1 GENERAL

4.1.1 EXCAVATION

Excavation for roadways, structures or drainage shall consist of removal and satisfactory disposal of all materials taken from within the right of way for the construction of the roadway including preparation of roadway foundation, roadbed embankments, subgrade, shoulders, intersections, private entrances, private approaches, and sidewalk foundation in accordance with these Specifications and to lines, grades, and cross sections shown on the Plans. This work shall also include the removal and satisfactory disposal of surface and base courses, stone piles, fences and unsuitable materials; the replacement of unsuitable materials with satisfactory materials, the trimming and finishing of the roadway; maintaining the work in a finished condition until acceptance. Excavation shall consist of removal and satisfactory disposal of all materials of every description except rock. It shall also include the removal and disposal of all trees, shrubs, and brush less than six (6) inches in diameter including their roots and stumps. Excavation shall not include the removal of any Portland cement concrete pavement, concrete curb and gutter, concrete driveways or concrete sidewalks.

Where required on the plans, adjacent asphalt surfaces to remain shall be sawed full depth as necessary to provide smooth butt joint transition to the new work.

4.1.2 TRENCHES

Trenches or excavation necessary to install underground utilities such as storm sewer, sanitary sewer, water mains or other facilities and their appurtenances along with backfilling and compaction thereof shall be the Contractor's responsibility. All costs for trenching, backfilling, compacting, etc. shall be incidental to the utility/facility being installed.

All Contractors must comply with the requirements of "29 CFR, Part 1926, OSHA, Sub-Part P, Excavations and Trenches". It is hereby recognized that excavation safety is the Contractor's responsibility. Adequate sloping, shoring or shielding (trench boxes) shall be used to protect workers and existing utilities and to maintain construction activities within right of ways or easements. The cost for providing this protection will be included in the unit prices for the various items of work being performed and no separate payment will be made for providing such protection.

The Contractor shall also provide, at each work site and at all times when work is progressing, a competent person to comply with OSHA trenching and excavation requirements. The competent person shall be one who is capable of identifying existing and predictable hazards in the surroundings, including working conditions which are unsanitary, hazardous or dangerous to employees. The competent person shall have the Contractor's authorization to take prompt corrective measures to eliminate existing or predictable hazards.

All trenches shall be backfilled and compacted (per these Specifications) by the end of the work day and/or prior to adverse weather conditions (rain, snow, freezing, etc.).

4.1.3 REMOVAL OF TOPSOIL

All topsoil shall be removed and segregated prior to any excavation or trenching. Topsoil may be stockpiled or stored on site if conditions allow, or hauled to an approved

temporary storage site. Surplus topsoil shall be salvaged and remain the property of the City.

4.1.4 SALVAGE EXISTING BASE MATERIALS

Existing roadway base materials such as gravel, crushed aggregate, granite, sand, etc. shall be salvaged by the Contractor for use on the project(s) under contract. Locations, dimensions, thicknesses, etc. of these materials may be shown on the plans or typical sections, however, the Contractor shall field verify material quantity and quality, and not rely upon the plan information. Salvaged base materials shall be stored on site, adjacent to the project site or hauled to an approved site upon approval by the Engineer. The salvaged base material shall be used as pipe bedding/cover (must meet pertinent specifications/gradation requirements) or for temporary surfaces (construction access) but shall not be allowed for use as base aggregates. The salvaging, storing, hauling, placing and compacting of salvaged base materials shall be considered incidental to Excavation. The Contractor shall be responsible for removal, hauling and disposal of excess stockpiled material that is not used on the project(s).

4.1.5 MAINTAINING THE GRADE, SUBGRADE, WORKSITE, HAUL ROADS, ETC.

The Contractor shall maintain the surface of the grade, subgrade, worksite, haul roads, and other areas as necessary to provide proper drainage, prevent damage to said surfaces and underlying soils, and protect against erosion. At the end of each work day and/or prior to adverse weather conditions such as rain, snow, freezing temperatures, etc., the Contractor shall blade, trim and consolidate (using a smooth-drum roller) said areas if disturbed, rutted, operated over or constructed during that workday to produce a tight, smooth, well-drained surface. This work shall be considered incidental to construction of the project.

4.1.6 SOIL COMPACTION TESTING

The Contractor shall arrange and pay for testing of soils and base course to the extent directed by the Owner, if included in the Contract.

a. Testing shall be by a qualified testing agency, acceptable to the Owner and the Contractor.
b. Contractor shall include soil and base course testing as shown on the bid form as part of the bid.
c. During construction the Owner will indicate the desired type, amount and location of testing for each portion of work. The Contractor shall arrange for and coordinate the required testing. The testing agency's invoices shall be attached to the Contractor's pay requests and included in the amount requested during each pay period.
d. Final amount for payment will equal the testing agency's invoices. The Contractor's cost to coordinate testing shall be incidental to the contract.
e. The final amount paid by the Owner may be more or less than the allowance amount, depending on the amount of testing that is requested.

4.1.7 UTILITY LINE OPENING {ULO}

Perform the necessary excavation to uncover utilities for the purpose of determining elevation and potential conflicts with proposed sanitary and/or storm sewer, as shown on the plans, listed in the Special Provisions or as directed by the Engineer.

Do the excavation in such a manner that the utility in question is not damaged and the safety of the workers is not compromised.

Perform the utility line openings as soon as possible and at least 10 days in advance of proposed utility construction to allow any conflicts to be resolved with minimal disruption. Prior to ordering structures, perform ULO's. Where utilities are within 6 feet of each

other at a potential conflict location, only one utility line opening shall be called for. In these cases, a single utility line opening will be considered full payment to locate multiple utilities. Utility line openings include a trench up to 10 feet long as measured at the trench bottom, and of any depth required to locate the intended utility.

Obtain prior approval for all utility line openings from the Engineer and coordinate all ULO's with the Engineer. Notify the utility field engineers or their agents of this work a minimum of three days prior to the work so they may be present when the work is completed. Verify the need for performing ULO's as shown on the plans, since some of the utilities may have been or will be relocated prior to the start of construction.

SECTION 4.2 MATERIALS

4.2.1 EXCAVATION

Suitable native materials removed in excavation on any project within the Contract, which are approved by the Engineer, may be used for backfill on any project within the Contract, where required by the Plans or directed by the Engineer.

The disposal of excess excavation shall be the responsibility of the Contractor. Such excess excavated material shall not be disposed of on any site without the written permission of the owner of such site.

4.2.2 BORROW

The Contractor shall supply and install Engineer approved materials with suitable engineering properties obtained from outside the limits of construction for the project to be used as borrow. Borrow materials shall be free from sod, stumps, logs, debris, waste, contamination and perishable/deleterious matter.

SECTION 4.3 CONSTRUCTION

4.3.1 PROTECTING BACKFILL/FILL MATERIAL

The Contractor shall maintain adequate drainage from the work site, including trenches, grading and spoil piles. Suitable materials that become unusable due to excess moisture will be removed and replaced with an approved suitable material at the Contractor's expense.

4.3.2 EXCAVATION - CUT

When the work is in cut, the Contractor shall be expected to remove material to the true surface of the subgrade. No payment will be made for excavation below the true surface of the subgrade except where such excavation is ordered by the Engineer or called for in these Specifications.

4.3.3 EXCAVATION BELOW SUBGRADE

When approved by the Engineer, the Contractor shall remove unsuitable soils to the depth as directed by the Engineer. Soils resulting from Excavation Below Subgrade (EBS) shall not be reused on the project but shall be removed and disposed of as excess excavation.

4.3.4 PLACING OF FILL MATERIAL

Fill, borrow and/or backfill materials shall be placed and compacted in layers not exceeding 12-inches when loose (uncompacted). Layers shall be bladed prior to compacting such that the compaction equipment to be utilized will perform properly. Material shall not be placed when the moisture content is such as to cause excessive rutting by hauling or equipment, or excessive displacement or distortion under the compacting equipment. Where such conditions exist, the materials shall be allowed to dry prior to compacting. When necessary, drying of such materials shall be accelerated by aeration or manipulation by means of blade graders, harrows, discs, or other appropriate equipment.

When the fill material does not contain sufficient moisture to compact property, water shall be added in quantities deemed necessary to aid and accelerate and to secure effective compaction.

When placing fill for sidewalk grade the Contractor shall fill six (6) inches (minimum) outside of form line and taper outside sideslope at a minimum of 2:1 from the edge of slope to meet natural ground. The fill between the inside of the sidewalk shall be placed at a uniform slope between the inside edge of sidewalk and the back of curb, unless otherwise specified by the Engineer.

4.3.5 COMPACTION

The Contractor shall use vibratory compaction equipment of size and type as necessary to obtain the compaction requirements as specified herein or as described elsewhere, whichever provides greater compaction. Compaction of backfill material shall be accomplished through the use of equipment specifically designed to compact the soils encountered/utilized. Tamping or pounding backfill material with the backhoe bucket does not satisfy this requirement.

All excavations shall be backfilled with maximum 12-inch lifts (when loose) and compacted to a minimum of 95% standard proctor density based upon the maximum dry density as determined for the materials in accordance with AASHTO T99/ASTM D698.

Special compaction shall constitute the use of special vibratory compaction equipment for compacting materials around manholes, catch basins, inlets, valve boxes, hydrants, curb stops, and other structures.

All trenches shall be backfilled and compacted by the end of the day.

Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be attained for each layer before any material for a succeeding layer is placed thereon.

Hauling and leveling equipment shall be routed and distributed over each layer of roadway fills in such a manner as to make use of the compaction afforded thereby, and in addition to the compaction so attained, the compaction shall be performed by means of tamping rollers, pneumatic tired rollers, vibratory rollers, or other types of equipment which will produce the required results in the materials encountered and be subject to the approval of the Engineer.

Tamping rollers, when used for compaction, shall exert a weight of not less than 150 pounds per square inch of tamping surface on each tamping foot in a transverse row.

Placing and compaction of fill materials shall be accomplished using suitable on-site excavation materials or imported borrow materials if approved by the Engineer such that the finished subgrade is stable and will not deform (rut, flex, pump, etc.) when subjected

to proof rolling and/or equipment as needed to construct the base or surface.

4.3.6 COMPACTION TESTING

The City reserves the right to perform random compaction testing. All areas not meeting compaction requirements shall be re-excavated or replaced, and compacted until said compaction requirements are satisfied.

4.3.7 GRADING

Undercut or under fill at excavated or fill slopes designated to receive topsoil to the specified thickness of proposed topsoil. Grade all subgrades, roadways, approaches, driveways, sidewalks, ditches, etc. including blading, smooth rolling and finishing to the proper alignment, grade, and cross section after rough grading. Subgrades shall be staked by the Contractor (on centerline and each edge, typical).

4.3.8 ROCK

If rock is encountered in any excavation, work shall not proceed until the Engineer and Contractor have investigated the extent of the rock, have agreed to the method of removal, material to replace rock and how this work shall be measured and paid for.

SECTION 4.4 MEASUREMENT AND PAYMENT

4.4.1 EXCAVATION

The quantity of excavation shall be paid for at the contract unit price for excavation per cubic yard. The quantity to be paid for will be the estimated quantity as listed on the cross sections, earthwork table and/or bid form without measurement thereof unless significant deviations from the plan occur during construction. Volumes of asphalt and/or concrete pavement (including driveways), concrete curb and gutter, and sidewalk, to be removed, have been deducted from the excavation quantity. Payment shall be considered full compensation for all removal of topsoil, salvage of existing base materials, excavation, furnishing, placing, hauling, disposal, compaction and grading along with all materials, labor, equipment and incidentals necessary to complete the work.

4.4.2 EXCAVATION BELOW SUBGRADE

Excavation below subgrade (EBS) shall be paid for at the contract unit price for EBS per cubic yard. EBS shall be measured by the cubic yard in place, measured after completion of the excavation but before placing of the replacement material, based upon the depth and area of the approved EBS location. EBS that is performed after grading operations are complete and which require that the Contractor return to perform the EBS will be paid for at the (same) contract unit price for EBS for all material removed. EBS will not be paid for unless approved and measured by the Engineer. Payment shall be considered full compensation for all mobilization, delay, excavation, hauling and disposal along with all labor, equipment and incidentals necessary to complete the work.

4.4.3 BORROW

The quantity of borrow shall be paid for at the contract unit price for borrow per cubic yard. Borrow will be measured per cubic yard in place, based upon the depth and area designated or approved to receive borrow. The use of borrow material will not be permitted or paid for until all suitable excavation or salvaged materials from the project(s) within the contract are exhausted. Payment shall be considered full

compensation for furnishing, placing, hauling, compacting and grading borrow material along with labor, equipment and incidentals necessary to complete the work.

4.4.4 **UTILITY LINE OPENING {ULO}**

Utility Line Opening's will be measured per each ULO, acceptably completed. Payment for measured quantities will be made at the contract unit price which shall be considered full compensation for the excavation required to expose the utility line; backfilling with existing material removed from the excavation; compacting the backfill material; restoring the site; cleanup; and for furnishing all labor, tools, equipment, transportation, and incidentals to perform the work.

Existing pavement, concrete curb, gutter, and sidewalk removals necessary to facilitate utility line openings shall not be considered part of or paid for under Utility Line Openings, but shall be considered separate and measured and paid for separately as removal items within the limits of the project. Replacement pavement, concrete curb, gutter, and sidewalk items shall also be considered separate from Utility Line Openings and will be measured and paid for separately, within the limits of the project.

SECTION 5

BASE AGGREGATES, GEOTEXTILE FABRICS AND GEOGRID

SECTION 5.1 GENERAL

5.1.1 DESCRIPTION

Work under this section shall consist of constructing a dense and/or open graded aggregate base and/or subbase, with or without fabrics and/or geogrid, on the prepared subgrade in accordance with the plans and specifications.

Geotextile fabrics if required for the project are intended to be used for subgrade/subbase separation and stabilization of roadways.

Geogrid if required or approved shall be utilized for subgrade stabilization.

SECTION 5.2 MATERIALS

5.2.1 GENERAL REQUIREMENTS FOR ALL BASE AGGREGATES

All materials shall be in accordance with Section 301 of the State of Wisconsin, Department of Transportation Standard Specifications for Highway and Structure Construction.

5.2.2 BASE AGGREGATES (WISDOT)

Base aggregate materials as listed below shall comply with the pertinent WisDOT specifications referenced below. Fracture requirements shall be supplemented such that at least 80 percent, by count, of the number of particles of aggregate retained on the No. 4 and larger sieves, shall have at least one fractured face.

MATERIAL	WISDOT SPECIFICATIONS
Granular Backfill	Section 209
Dense Graded Base, ¾ – Inch	Section 305
Dense Graded Base, 1-1/4 – Inch	Section 305
Salvaged Asphaltic Pavement Base	Section 306
Open Graded Base	Section 310
Select Crushed Material	Section 312
Subbase (Granular)	Section 350

5.2.3 SCREENED BREAKER-RUN STONE

Screened Breaker-Run Stone shall be processed crushed rock material to be used as a drained subbase. Crushed concrete, disintegrated granite, shale or other substitute materials will not be allowed. Screened Breaker-Run Stone material as provided shall pass soundness and wear testing (per Section 5.2.4 and WisDOT requirements), and shall conform to the following gradation:

SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
5 – Inch	100%
1-1/2 – Inch	5% - 50%
¾ - Inch	0 - -5%

At least 50% of the material retained on the ¾-Inch sieve shall have at least two fractured faces.

Acceptability of Screened Breaker-Rum-Stone shall be based upon testing (soundness, wear and gradation, as discussed herein and Section 5.2.4) and the City Engineer's visual observation/inspection on the job site.

5.2.4 SAMPLING AND TESTING OF BASE AGGREGATES

A soundness and percentage of wear test of the base aggregate material(s) shall be performed by an independent testing firm or a consulting firm. A report documenting test results, requirements and pass/fail with remarks shall be delivered to the Engineer. The material tested shall be a representative sample reviewed by an Engineer from the City of Marshfield, and if the location or source of material changes, another test shall be done and the results given to the Engineer. The cost of all such testing shall be at the expense of the Supplier or General Contractor. All tests must be current and submitted prior to beginning work on the projects.

Gradation analysis and testing (including fracture counts) shall be performed on all materials. Sampling and testing shall be done by a certified tester with results reported on approved test analysis forms. There shall be two (2) sample gradations taken within the past 30 days from each potential source, delivered to the Engineer at least 10 days prior to placement on the project. The Engineer shall approve the use of these materials in writing prior to placement.

The Engineer reserves the right to sample and test aggregates (at the source or project site) at any time throughout construction of the project. If these test results show materials do not meet the specified requirements the Engineer shall determine the extent of the deficient materials incorporated into the project and it shall be the Engineer's sole discretion whether to accept deficient material with a pertinent cost deduction or require removal and replacement of said deficient material, all at the Contractor's cost. Costs for sampling and testing of deficient materials shall also become the Contractor's responsibility.

For all materials to be paid for by the ton, the Contractor shall be required to determine actual parameters including the dry unit weight and moisture content based upon an average of at least three nuclear density tests of the material in place at the pit or compacted on site (per the Engineer's discretion) conducted in the presence of the Engineer. The Engineer shall perform moisture content tests at his discretion and cost; however costs associated with moisture content testing revealing excessive moisture (above 7%) shall be the Contractor's responsibility.

5.2.5 ASPHALT MILLINGS

Asphalt millings, used as temporary or finished surfaces, shall contain not less than 90 percent asphaltic material and shall be processed such that 100% passes a ¾-inch sieve.

5.2.6 DISINTEGRATED GRANITE

Disintegrated Granite aggregate material shall be screened or crushed to a maximum ½-inch size and substantially free of fines and deleterious matter.

5.2.7 GEOTEXTILE FABRICS

All materials shall be in accordance with Section 645 of the State of Wisconsin, Department of Transportation Standard Specifications for Highway and Structure Construction. The nonwoven fabrics include Type 'SAS' (typically a seven ounce fabric placed between the earthen subgrade and the lower base aggregate material) and Type 'DF' Schedule 'A' (typically a four ounce fabric).

5.2.8 GEOGRID

The geogrid material shall be a polypropylene grid with triangular apertures and rectangular ribs, as manufactured by Tensar International Corp., type TriAx TX140.

Geogrid materials shall maintain dimensional stability during handling, placement, installation and covering; and shall not degrade due to UV/sun/weather exposure, chemical exposure, insects, rodents, mildew, rot, etc.

The Contractor shall submit manufacturer's literature, test data and a sample to the Engineer for approval prior to delivery or installation of geogrid.

SECTION 5.3 CONSTRUCTION

5.3.1 BASE AGGREGATES

All work for base aggregates shall be in accordance with Section 301 of the State of Wisconsin, Department of Transportation Standard Specifications for Highway and Structure Construction and these Specifications. This work shall include but not be limited to preparing the foundation, compacting and rolling with smooth vibratory equipment, maintaining adequate moisture for compaction, shaping, controlling dust and maintaining the base.

Do not place base aggregates upon the earthen subgrade until the subgrade has been inspected and approved by the Engineer. Do not haul over the earthen subgrade unless specifically approved by the Engineer.

Screened Breaker-Run Stone and Select Crushed Material shall be placed upon the prepared subgrade (per 5.3.1) however this material shall be end-dumped and spread to at least the full depth/thickness of the proposed section (or twice the depth/thickness if hauling over this layer). Compact by at least two passes of a 5-ton vibratory roller (minimum). Screened Breaker-Run Stone and Select Crushed Material shall be covered with the specified base aggregate material within three calendar days.

5.3.2 AGGREGATE SURFACES

Construct aggregate surfaces such as private driveways and/or paths, using Asphalt Millings, Disintegrated Granite, or Dense Graded Base ¾-inch, in-kind and matching the thickness of the existing surface. Placement, compaction, grading and shaping shall comply with all pertinent requirements for Base Aggregates.

5.3.3 AGGREGATE SHOULDERS

Construct Aggregate Shoulders using materials as specified by the contract or required by the Engineer. Place, compact, grade, shape and roll in accordance with WisDOT Standard Specifications (Section 305) and these requirements. Finished shoulders shall provide a firm and consistent surface adjacent to the roadway pavement and ditch inslope, properly sloped for drainage and free of ridges, depressions, deleterious material, etc.

Aggregate Shoulders shall be placed utilizing a shouldering machine or equipment specifically designed for shouldering and approved by the Engineer, for continuous lengths (one side of road) which are 75 feet or longer.

5.3.4 GEOTEXTILE FABRICS

All work for Geotextile Fabrics shall be in accordance with Section 645 of the State of

Wisconsin, Department of Transportation Standard Specifications for Highway and Structure Construction. Fabrics shall be installed on a compacted/shaped/smooth foundation, pulled taught and secured to eliminate wrinkles. Minimum overlay (any direction) shall be 18 inches. Repair torn or damaged areas with a patch overlapped 3 feet in all directions. Sew all factory and field seams (per WisDOT requirements). Pin or staple the fabric to the subgrade to maintain tautness and prevent movement. All fabrics placed shall be covered with compacted base aggregate by the end of the working day. No equipment shall be allowed on the fabric until the entire thickness of base aggregate above it is placed.

5.3.5 GEOGRID

The Geogrid shall be protected from ultraviolet radiation and from damage due to shipping and handling. The geogrid shall be kept dry until it is installed. The geogrid rolls shall be clearly marked to identify the material contained.

Prior to placement of the geogrid, the indicated placement surface shall be brought to the required lines, grades and dimensions as shown on the plans. The surface shall be smoothed and shaped to eliminate any ruts, ridges, rocks, clods, roots or other items which may cause damage to the geogrid during placement of covering. The geogrid shall be placed on the prepared surface at the locations and to the limits as shown on the plans. After placement, the geogrid shall be pulled taut and shall be secured with pins, clips, staples or other devices to prevent movement or displacement. Parallel strips of geogrid shall be placed with a minimum overlap of 24-inches. Butt joints between roll ends shall be lapped a minimum 24-inches. All lapped sections shall be fastened together by the use of ties, straps, clips or other devices to develop a secure joint which meets the approval of the Engineer. No vehicles or construction equipment shall be permitted to operate directly on the geogrid.

Small rips, tears or defects in the geogrid shall be covered with an additional section of geogrid which shall be secured in place so as to overlap the damaged area by at least 3-feet in all directions. Geogrid sections with large rips, tears, defects or other damage shall be removed and replaced at the direction of the Engineer. All costs to repair or replace damaged or defective geogrid shall be the responsibility of the Contractor. After placement, the geogrid shall be covered with the full thickness of the (lower) subbase material as indicated on the plans, typical sections and cross sections. Placement, spreading and compaction operations shall not damage or displace the geogrid.

The actual limits for placement of geogrid shall be as determined in the field by the Engineer, based upon soil condition, moisture/ groundwater conditions and the results of proof roll testing.

Geogrid may be required to stabilize utility trenches if warranted and approved by the Engineer. The length, width and limits shall be as determined by the Engineer. All costs for geogrid and installation for said purposes shall be borne by the agency/entity responsible for the trench and shall not be measured for payment.

SECTION 5.4 MEASUREMENT AND PAYMENT

5.4.1 BASE AGGREGATES (INCLUDING AGGREGATE SURFACES AND SHOULDERS)

Base aggregates shall be measured in accordance with the units listed on the contract, per ton or per cubic yard in place.

For aggregates measured by the ton the quantity will be determined by the weight(s) of each load based upon Contractor provided tickets from a certified scale. The Contractor shall provide tickets for each load delivered to the project showing the net weight of the load, type of material, date and project number/ID. Tickets shall be given to the Engineer/Inspector on the same day the loads were delivered to the project. If load tickets are not given to the Engineer/Inspector on the same day the loads were delivered to the project, those loads/quantities may not be included or paid for.

For aggregates measured by the ton, if delivered to the project site with a moisture content greater than seven percent (7%), the Engineer will reduce the net weight of the load by the weight of water exceeding seven percent (7%). The Engineer will determine the aggregates moisture content based upon and expressed as a percentage of the materials dry unit weight.

For aggregates measured by the cubic yard – in place, the volume will be calculated based upon plan thickness, width and placement limits. This in-place (calculated) quantity will not be adjusted to compensate for potential losses of aggregate materials resulting from its penetration into underlying layers/materials or its placement/ displacement beyond the intended limits. The in-place (compacted) calculated volume is typically based upon the typical section, plans and cross-sections. The in-place quantity will be adjusted if the limits of construction (begin/end locations) are modified by the Engineer during construction of the project.

Payment for Base Aggregates shall be made a the pertinent contract unit price for each material, and shall be considered full compensation for preparing the foundation, hauling, stockpiling, placing, compacting, shaping and maintaining the base/aggregate surface/ shoulder, along with all labor, equipment and incidentals necessary to complete the work.

5.4.2 **GEOTEXTILE FABRIC AND GEOGRID**

Fabric/geogrid shall be measured per square yard, suitably placed and accepted, without additional measurements for overlapped areas. Payment shall constitute full compensation for furnishing, hauling and installing all devices necessary to joint or secure the fabric/geogrid in place, and for furnishing all materials, labor, equipment and incidentals necessary to complete the work.

SECTION 6

STORM SEWER, CULVERTS AND PIPE UNDERDRAINS

SECTION 6.1 GENERAL

6.1.1 DESCRIPTION

This work shall consist of excavating the required trenches, laying therein the specified pipe, backfilling the trenches, and restoring the site of the work as provided by the Plans and Contract.

6.1.2 DRIVEWAY CULVERTS

Pipe and end treatments for culverts on private, commercial or field entrances or driveways are owned by the property owner. If required by the project, the Contractor shall protect, remove and/or salvage existing materials; clean or reinstall existing pipe; install new pipe and/or install new apron endwalls.

6.1.3 ROADWAY CULVERTS

Pipe and end treatments for culverts or streets, alleys or municipality owned lands are the property of the City of Marshfield. If required by the project, the Contractor shall protect, remove, salvage and/or transport existing materials; clean or reinstall existing pipe; install new pipe and /or install new end treatments with or without markers.

SECTION 6.2 MATERIALS

6.2.1 CORRUGATED ALUMINUM PIPE

Corrugated aluminum pipe shall conform to the requirements of the Specification for Corrugated Aluminum Alloy Culverts and Underdrains, AASHTO Designation: M196, and the dimensions shown on the Plans.

6.2.2 CORRUGATED METAL PIPE (CMP) AND PIPE ARCH (CMPA)

Corrugated steel pipe and pipe arch shall conform to the requirements of the Specification for Metallic Coated (Galvanized or Aluminized) Corrugated Iron or Steel Culverts and Underdrains, AASHTO Designation: M36 and the dimensions shown on the Plans.

6.2.3 CORRUGATED POLYETHYLENE PIPE

Corrugated polyethylene drainage pipe intended for underdrains shall be comprised of virgin materials (no recycled materials or resin) and conform to the requirements of the Specification for Corrugated Polyethylene Drainage Tubing, AASHTO Designation: M252, Type CP, with or without sock.

6.2.4 PVC STORM SEWER PIPE

PVC Sewer Pipe shall conform to ASTM D3034 and SDR 35 in sizes 15” and smaller. PVC pipe and fittings in sizes 18” and larger shall conform to ASTM F679. Joints shall push-on with elastomeric gaskets.

6.2.5 **PVC STORM LATERAL PIPE**

PVC pipe and fittings shall be either SDR 35 conforming to ASTM D-3034 requirements with push-on type joints and elastomeric gaskets; or Schedule 40 conforming to ASTM D-1785 and D-2665, with solvent cemented joints conforming to ASTM D-2564.

6.2.6 **REINFORCED CONCRETE PIPE (RCP)**

Reinforced concrete pipe intended for storm sewers and culverts shall conform to the requirements of AASHTO Designation: M170, or AASHTO Designation: M207 Class III unless shown otherwise. Regardless of the basis of acceptance of the pipe, the placement of the reinforcement shall comply in all respects with the provisions of AASHTO Designation: M170, or AASHTO Designation: M207.

6.2.7 **REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE (RCHEP)**

Reinforced Concrete Horizontal Elliptical Pipe (RCHEP) shall conform to the requirements of AASHTO Designation M207, Class HE-III unless shown otherwise.

6.2.8 **REINFORCED CONCRETE PIPE WITH WRAPPED PIPE JOINTS**

Where required on the Plans, structure table or as directed by the Engineer, RCP and/or RCHEP storm sewers shall be installed with geotextile fabric wrapped around the exterior at each joint and without gaskets, and is thereby designated as RCP-W or RCHEP-W. Fabric shall be WisDOT Type DF Schedule A.

6.2.9 **REINFORCED CONCRETE BOX CULVERT/PIPE**

Reinforced Concrete Box Culvert/Pipe shall be precast and meet requirements for ASTM C1433 or ASTM C1577 (pipe with less than 2-feet of cover subjected to highway loadings).

6.2.10 **SMOOTH INTERIOR CORRUGATED HIGH-DENSITY POLYETHYLENE PIPE (SICPP)**

Corrugated polyethylene pipe shall be comprised of virgin materials (no recycled materials or resin), shall have a smooth interior and annular corrugated exterior and shall comply with the requirements for materials, test methods, dimensions, and marking in accordance with AASHTO M-252 (Type S) for pipe diameters 4" – 10” and AASHTO M-294 (Type S) for pipe diameters 12" - 48".

For storm sewer applications (including pipe underdrain), the pipe lengths shall be connected using a gasketed, bell and spigot joint. This shall consist of either a factory installed, gasketed double bell polyethylene coupling, a factory-welded bell or integral bell. The spigot end of the pipe shall be furnished with a factory installed elastomeric profile "O-Ring" gasket which meets ASTM F477. The pipe shall be shipped with removable wrap to protect the gasket. Joint lubrication shall be provided prior to pushing joints together. At least two (2) corrugations of the spigot end must insert into the bell end.

For culverts and ditch lead applications, pipe lengths shall be connected by utilizing an external band/collar type connection.

Only SICPP (double wall) pipe fittings shall be used and shall also meet the AASHTO requirements for each pipe size as described above. Upon request, the manufacturer shall furnish product certification of compliance to these specifications.

6.2.11 **PERFORATED PIPE**

Where required on the plans, the specified pipe material shall be manufactured with perforations meeting WisDOT or industry standards for size, shape, placement, etc.

6.2.12 **GEOTEXTILE FABRIC**

Geotextile fabric shall be utilized for wrapping pipe joints and/or enveloping storm sewers or pipe underdrain. Where it is called for on the plans or structures table for "Wrapped Joints" the Contractor shall wrap the joints of the required storm sewer pipe material and omit the gasket at the wrapped joint. The wrapped joint shall follow the detail of wrapped pipe joint. The fabric to be used shall be Geotextile Fabric, Type "DF", Schedule A and shall conform to Section 645 of WisDOT specifications.

6.2.13 **APRON ENDWALLS**

When required on the plans, apron endwalls shall be installed at culvert or storm sewer pipe openings. Apron endwalls shall be of a standard design unless plan details require special 6:1 endwalls with safety bars. The apron endwall material shall be of the same material as the adjacent culvert/storm sewer pipe except that galvanized steel apron endwalls shall be installed on SICPP (Note: Steel apron endwalls shall be designed/sized to fit the pertinent size of SICPP as required on the plans). Polyethylene or other such materials shall not be used for apron Endwalls.

6.2.14 **JOINT TIES**

Where required on the plans, professionally manufactured joint ties shall be installed to secure successive pipe joints. Joint ties shall be specifically manufactured to restrain the pertinent pipe material(s) specified.

6.2.15 **FLEXIBLE MARKER POSTS**

Flexible Marker Posts shall be designed and specifically manufactured for the use as a roadside marker, with galvanized metal soil anchors (and hardware). Posts shall be white except the top 6" to 9" shall be black. Flexible Marker Posts shall comply with WisDOT requirements and shall be submitted/approved by the City Engineer prior to installation.

6.2.16 **TRASH GRATES**

Where required on the plans, professionally manufactured galvanized steel trash grates shall be installed on apron endwalls (AEW). Grates shall have connector plates bolted to the endwall at three points. Bars shall be spaced 6-inches and sized (diameter) as follows: ¾" for AEW's 12" through 21", 1" for AEW's 24" through 36" and 1-1/4" for AEW's 42" and larger. Grates shall be galvanized after fabrication.

6.2.17 **PIPE GASKETS**

Rubber and plastic gaskets intended for flexible, watertight joints in sewer pipe shall conform to the requirements of AASHTO Designation: M198.

6.2.18 **JOINT SEALER**

Pipe joints which cannot be sealed with pipe gaskets shall be sealed with mastic, butyl rope or exterior joint wrap. Mastic joint sealer shall be an approved cold-applied bituminous material of such consistency that it can be applied to joints with a trowel when air temperatures range from 20 degrees F to 100 degrees F. Butyl rope sealant shall be preformed and meet ASTM C-990 and AASHTO M-198. Exterior joint wrap shall

be a butyl adhesive with backing, with or without bands, sized to cover the joint and extend at least 3" over each pipe.

6.2.19 LATERAL OR BRANCH PIPE CONNECTIONS, TAPS, ETC.

Where required on the plans, lateral or branch pipes shall be connected to storm sewers as blind connections utilizing manufactured fittings, cored and sealed connections or tapped connections. Fittings shall meet all requirements for the specified pipe material and joints. Cored and sealed connections shall utilize a manufactured seal as made by 'Insert-a-Tee'. Tapped connections shall be sealed and protected with a ready mix concrete collar.

6.2.20 RODENT SCREEN

Underdrain connections at structures shall be protected through the use of rodent screen devices such as 'Agri-Drain Rat Guard' or other approved equal devices.

6.2.21 PIPE BEDDING AND COVER

Bedding and cover materials shall conform to the gradation requirements shown on the details for each pipe material.

SECTION 6.3 CONSTRUCTION

6.3.1 LAYING PIPE

Pipe shall be installed to the line and grade shown on the plan with an automatic grade and line laser of the 'in the pipe' type beam with the appropriate size pipe target. Blowers shall be provided to prevent laser beam distortion in the pipe as necessary.

Pipe shall be laid upon a compacted bedding material in accordance with plan details, beginning at the lowest point and proceeding towards the upper end with spigot or tongue ends discharging in the direction of flow.

Pipe joints shall be sealed with gaskets or approved sealant. All pipe joints shall be soil and groundwater tight except that wrapped joint and perforated pipe joints shall be soil tight only.

Holes in pipe and appurtenances as needed for lifting or installation of joint ties, grates, etc. shall be sealed with approved materials.

Pipe shall be covered with an approved cover material in accordance with plan details. Cover material shall be carefully compacted (including under pipe haunches) in lifts not exceeding 12-inches thick when loose.

Pipes with wrapped pipe joints shall utilize geotextile fabric 3-feet wide centered on the joint with an overlap of fabric no less than half the pipe's (vertical) diameter. Lift holes shall be plugged but are not required to be sealed if protected/covered with fabric (3' x 3' minimum).

Where RCP-W and RCHEP-W pipe are designated, the cover material thickness shall be increased and shall extend up to the subgrade and intersect the subbase material (this elevation is typically 1-foot below the top of structure elevation (TSE)).

6.3.2 LAYING PIPE UNDERDRAIN

The trenches for Pipe Underdrain (including roadway edge drains, ditch drain tile and storm/sanitary trench underdrain) shall be constructed as nearly as practicable at the locations and to the lines and grades indicated on the Plans. Said trench shall be excavated to produce the cross section as shown on the detail, with smooth vertical sides and a smooth flat bottom. The trench shall be excavated using a mini-excavator or other equipment which the Contractor successfully demonstrates is capable of complying with cross sectional requirements and is approved by the Engineer. When necessary, locations, lines, and grades may be altered by the Engineer to fit existing conditions.

Trench excavation shall begin at the outlet end of underdrain and proceed towards the upper end. Trenches shall be of sufficient width to provide free working space on each side of the pipe and also to permit compacting the backfill around the pipe. Any areas excavated below the established grade shall be restored by means of a layer of suitable material adequately compacted and shaped.

The laying of pipe in the trench shall, in general, be started at the outlet end and proceed toward the upper end, true to line and grade. The joints between sections shall be made by fitting the ends as tightly as practicable.

Sections of corrugated polyethylene pipe shall be securely connected with fittings meeting the requirements of AASHTO M252.

Unless otherwise directed, perforated drainage pipe shall be laid with the perforations on the underside of the pipe.

For projects where rigid pipe is specified (including SICPPP), the Contractor shall substitute flexible tubing (CPPP) at street intersection/corner radii or other locations where the rigid pipe cannot be utilized. Unless specifically listed for payment on the unit price schedule, the CPPP underdrain at the substituted locations shall be measured and paid for as the specified rigid pipe underdrain.

Dead ends of pipe shall be tightly closed by means of concrete plugs or approved caps or plugs fabricated from the same material used in the corresponding pipe and securely held in place.

Discharge ends of pipes shall be protected with approved rodent screen securely fastened in place and shall not extend into a structure more than 2-inches.

6.3.3 BACKFILLING AND COMPACTION

Suitable native/excavated material shall be used as trench backfill unless plans and details indicate otherwise. Backfill material must be compacted to a minimum of 95% standard proctor density. This material shall be installed in lifts not to exceed 12” thick when loose. Compaction of backfill material shall be accomplished through the use of equipment specifically designed to compact the soils encountered/utilized. Tamping or pounding backfill material with the backhoe bucket does not satisfy this requirement. Special compaction measures and equipment (vibratory rammer or hoe-mounted vibratory plate) are required at structures, cleanouts, and other vertical appurtenances, and where standard compaction equipment cannot be utilized. The City reserves the right to perform random compaction testing. All areas not meeting compaction requirements shall be re-excavated or replaced, and compacted until said compaction requirements are satisfied. Flooding of backfill shall not be allowed. All trenches shall be backfilled and compacted by the end of the day. Also see Specification Section 4 – Excavation and Trenches as these requirements shall apply in addition to those discussed above.

6.3.4 DRIVEWAY CULVERTS

Existing culverts within construction limits shall be removed and may be reused if allowed on the plans and approved by the Engineer.

Existing end treatments shall be salvaged (metal apron endwalls, etc.). Existing end treatments such as but not limited to timbers, concrete, block retaining walls, etc. shall be removed (do not damage pipe) and disposed of by the Contractor, and shall be incidental to construction.

All existing culverts shall be carefully removed to avoid damage. The Contractor shall take appropriate actions (such as removing sand, sediment, debris and otherwise cleaning culverts) prior to removal to prevent damaging the pipe. If damaged by the Contractor or construction operations, the Contractor may be responsible for replacement with a new culvert.

Removed culverts shall be placed on the property/terrace of the property owner. The Engineer shall contact the property owner regarding reuse/disposal of the removed culvert pipe.

If the removed driveway culvert pipe is in acceptable condition as determined by the Engineer, it may be reinstalled if said pipe is equal to or larger than the proposed pipe diameter as shown on the plans. The property owner shall be responsible for providing materials (bands, pipe, etc.) and assembly of said materials such that the length of the culvert is adequate for the width of the driveway required.

If the removed driveway culvert is <u>not</u> in acceptable condition as determined by the Engineer, the property owner shall provide a new culvert (diameter per plan requirements, length adequate for the width of the driveway required). The Engineer shall notify the property owner as necessary. If, after ten days notice by the Engineer, the property owner does not claim the removed/salvaged pipe materials, the material shall be disposed of by the Contractor. New driveway culverts shall be either corrugated metal pipe (CMP) or smooth interior corrugated plastic pipe (SICPP, double wall polyethylene).

6.3.5 ROADWAY CULVERTS

Existing roadway culverts are the property of the City of Marshfield. These culverts shall be removed and salvaged by the Contractor as required herein and delivered to the City Garage (407 West Second Street).

Materials and installation of new culverts shall comply with storm sewer pipe requirements.

6.3.6 STORM SEWERS WITH MULTIPLE LATERALS, (TYPICAL FOR ALLEY RECONSTRUCTION)

Furnish and install SICPP storm sewer trunkline, and SICPP fittings and laterals as shown on the plans and details, in accordance to the standard specifications, and these special provisions. Submit shop drawings on all materials.

The location and size of existing storm sewer laterals and proposed lengths of new/replacement laterals as shown on the plans are approximate and may vary in the field. The City of Marshfield has attempted to investigate lateral issues such as the location and service source; however, many of these determinations can only be completed during construction. The City will assist the Contractor during construction (by lateral televising, entering buildings, dye testing, etc.); however, it is ultimately the

Contractor's responsibility to locate each existing storm lateral (both at the main and the point of connection to the existing lateral pipe) and assure continuation of sewer service.

The City Engineer reserves the right to televise existing storm sewer laterals from within the excavation to determine pipe condition or status (live vs. abandoned). The City Engineer will perform this televising with assistance by the Contractor using equipment supplied (stored and transported) by the City. The Contractor shall provide safe access to the lateral within the trench for televising/investigation. This work and any down time or delay shall be incidental to construction.

The status of the existing storm lateral shall be confirmed prior to installation of the main/trunkline. Service tees shall only be installed for live storm sewer laterals.

If an existing lateral scheduled for replacement is found to be either PVC or any existing pipe material sliplined with PVC and in good condition (proper slope, alignment, joints, etc.), the lateral shall remain in place per discretion of the City Engineer.

Laterals that are confirmed to be 'Not Live' shall be removed (per Section 10 of the standard specifications), from the main/trunkline to the Right-Of-Way. The end of the existing storm sewer lateral pipe to remain shall be structurally sound and clear of foreign materials, and shall be bulkheaded in accordance with plan details and Section 10 of the standard specifications.

SICPP storm sewer (mains and laterals) pipe and fittings, shall conform to Section 6 of these Standard Specifications, however joints shall conform to ASTM D3212. All fittings shall be SICPP (double wall). All joints and connections shall be watertight.

Connect to existing storm sewer lateral pipes (sizes and materials are unknown/vary) using a SICPP (dual wall) adapter with a bell at the downstream end (or bell-bell coupler) and a plain/smooth wall cylinder (typically sized for PVC pipe) at the upstream end, which shall be connected to the outside of the existing lateral pipe using a flexible plumbing adaptor as manufactured by Fernco. The inside diameter of the new storm sewer lateral (including fittings) shall not be less than the existing lateral pipe inside diameter and shall not be decreased in the downstream progression.

Install trunkline storm sewers in accordance with the plans and standard specifications. Install storm laterals in accordance with the storm sewer details, trench section, plans and standard specifications (such as laid on a prepared bed of stone and covered with stone, compacted, etc.) except that a pipe laser is not required (maintain positive and consistent slope by frequent checks using a level).

When requested by the property owner or their plumber, expose or leave exposed the existing storm sewer lateral, at a point near or within the limits or replacement, for access and use by others intending to replace or rehabilitate (including, but not limited to, slip-lining, pipe-bursting, and cured-in-place lining) the existing lateral to remain. Protect the excavation as necessary for safety and provide safe access for others/private contractors as appropriate. This work and any down time or delay shall be incidental to construction.

New and replacement storm sewer laterals to be installed as part of this project shall be field surveyed via GPS by the City engineer concurrent with construction. The intent of this GPS data acquisition is to comply with Section 182 of the Wisconsin State Statutes, without installation of an actual tracer wire. Provide adequate notice to the City Engineer (at least three working days prior to commencing lateral work), allow reasonable time for the City Engineer to acquire said GPS survey data, provide safe trench conditions and access for the City Engineer, and assist the City Engineer with acquisition of this survey data if necessary. This work and any downtime or delay shall be considered incidental to construction.

6.3.7 PIPE MATERIALS TO BE USED FOR REPAIRS OR SPECIAL CONNECTIONS

Where required by the Plans or approved by the City Engineer, existing/to remain storm sewer branch/lead pipes which are damaged, defective or to be connected to proposed structures shall be repaired/connected to by carefully exposing the existing pipe and connecting new pipe materials as follows:

- Existing SICPP pipe shall be repaired with new SICPP pipe, utilizing an external band coupler.
- Existing PVC pipe shall be repaired with new PVC pipe, utilizing a gasketed repair sleeve.
- Existing Vitrified Clay pipe shall be repaired with new PVC pipe, utilizing a Fernco connection.
- Existing Concrete pipe shall be repaired with new RCP pipe, utilizing an Engineer approved concrete collar.

6.3.8 CONCRETE COLLARS

Construct concrete collars in accordance with the plans and details, utilizing Grade A ready-mix concrete (specified elsewhere). Minimum thickness shall be 6-inches with 12-inches of overlap. Collars shall be formed and/or troweled to eliminate honeycombing. Protect fresh concrete from moisture, freezing, vibration, etc. as specified elsewhere. Reinforcement may be required for larger pipe collars.

6.3.9 TESTING STORM SEWER

All storm sewer shall be tested for excessive infiltration and sand leakage. All sand leaks shall be repaired by the Contractor at his expense. If in the judgment of the Engineer the infiltration will cause a continued maintenance problem, the sewer shall be repaired by the Contractor at his expense.

Alignment and Grade shall be checked by the lamping method to detect poor alignment, offset joints, sags, kinks, or open joints; defects shall be corrected by the Contractor before final acceptance. If closer inspection is warranted, the Owner may arrange for a televised inspection. The Owner will assume the cost of televised inspection if no serious defect is found. If defects are found which the Engineer attributes to the failure of proper installation or sound materials, the Contractor shall pay for the televising. Defects shall be promptly corrected by the Contractor.

Deflections in flexible pipe shall be limited to 5 percent of the nominal pipe diameter. If visual inspection indicated a greater deflection, the Contractor shall supply and pull a rigid ball or mandrel with a diameter 5 percent less than the nominal pipe size through the sewer. Failure of the ball to freely pass through shall be cause for rejection of the sewer.

6.3.10 INSTALLING APRON ENDWALLS

Where required on the plans, the Contractor shall install apron endwalls of the appropriate material installed in accordance with the requirements for said pipe material. Apron endwalls for roadway culverts or connections to storm sewer shall include joint ties or restrained joints within 25 feet of the end of the endwall and flexible marker posts. Apron endwalls for connections to storm sewer shall include trash grates on pipe sizes of 21-inch and larger.

Apron endwalls shall be encompassed with sod consisting of a minimum width of 54-inches completely surrounding each apron endwall unless plans require erosion mat, riprap or the apron endwall is located in an asphalt or concrete surface. Sod, if so required, shall be considered incidental to construction of said apron endwalls. In lieu of

sod the Contractor may utilize Erosion Mat, Type Urban with seed applied at twice the standard rate, upon approval of the Engineer.

6.3.11 NEW STORM SEWER PIPE CONNECTIONS TO EXISTING OR NEW STORM SEWER FACILITIES

Where indicated on the plans, new storm sewer pipe(s) shall be directly connected to existing or new storm sewer facilities in accordance with plan details and the standard specifications. All connections shall be water-tight and shall not damage or adversely impact the storm sewer or structures. Branch connections/taps shall not protrude into sewers (must be flush with inside wall of trunkline storm sewer pipe). The use of anchor bolts to secure a coring machine shall be minimized. When allowed, anchor bolts shall be cut flush with the outside wall of the pipe and sealed/coated to prevent rust or corrosion. The annular space around the outside of the connection shall be filled with approved mortar material or ready mix concrete, trowel finished. The annular space around the connection inside the trunkline storm sewer pipe or structure shall be filled/tuckpointed using approved mortar.

New storm sewer pipes/laterals shall be connected to existing or proposed trunkline storm sewer pipes {Connect to Storm Sewer (Inserta-Tee)} utilizing a hole-sawed/cored hole and an Inserta-Tee type seal (or approved alternate).

New storm sewer pipes/laterals shall be connected to existing trunkline storm sewer pipes utilizing an existing tap hole {Connect to Existing Storm Sewer (Tap)} and shall include careful removal of the existing lateral pipe, resizing/repair of the tap hole as necessary, cutting/fitting of the new lateral pipe, and filling of the annular space (inside and outside) as discussed above.

New storm sewer pipes shall be connected to existing storm sewer structures (manhole, catch basin, etc.) which do not have an existing hole for this connection, utilizing a hole-sawed/cored hole with a mortar seal.

New storm sewer pipes shall be connected to existing structures which have an existing hole (from a previous removal or a previously sealed hole (brick/mortar, collar, etc.)), shall be constructed similar to a new pipe to new structure (brick/mortar, concrete collar, etc.). This work and the modification of the existing hole and/or removal of the plug/seal shall be considered incidental to construction.

New PVC storm sewer mains shall be connected to existing PVC storm sewer mains using a gasketed PVC repair sleeve and bends as necessary to accomplish said connection.

New storm sewer laterals: shall be connected to existing storm sewer lateral pipe using an appropriately sized flexible plumbing adaptor as manufactured by Fernco Inc. If the new lateral is for future use (not connected to an existing lateral) then install a water tight cap and mark the end. Capping and/or connecting storm sewer laterals as described herein shall be considered incidental to construction.

SECTION 6.4 MEASUREMENT AND PAYMENT

6.4.1 MEASUREMENT OF PIPE

Pipe for storm sewers, culverts and/or underdrains shall be measured per lineal foot, along the centerline of the pipe, to the inside wall of each structure (manhole, catch basin, etc.) and shall not include the length of apron endwalls.

6.4.2 PAYMENT FOR PIPE

Payment for pipe items including storm sewers, laterals, culverts and/or pipe underdrains shall be considered full compensation for all removals, excavation; preparing the foundation; providing, hauling, placing and compacting bedding and cover materials; providing, hauling, placing and connecting the pipe including gaskets, joint seal and geotextile fabric; backfilling and compacting; along with all materials, labor, equipment and incidentals necessary to complete the work.

6.4.3 MEASUREMENT AND PAYMENT FOR STORM SEWER WITH MULTIPLE LATERALS

SICPP storm sewers (trunklines) for storm sewers with multiple laterals shall be measured in accordance with Section 6 of the Standard Specifications.

SICPP tees will be measured per each, per size.

SICPP storm sewer laterals shall be measured in length by the linear foot of pipe installed, measured from the end of the (upstream) bell of the lateral tee branch connection to the (downstream) end of the bell of the adaptor (connection to existing storm lateral pipe), measured along the centerline of the laterals, through bends if provided (bends will not be measured/paid for separately).

Connect to existing storm lateral shall be considered incidental to construction.

Payment shall be made at the pertinent contract unit prices and said payment shall be considered full compensation for furnishing all materials such as pipe, fittings, adaptors, bedding and cover; excavation, downtime and delay; forming foundation; installing pipe, cutting and fitting, and making all connections including temporary connections; backfilling, compaction (standard and special); testing; removing and disposing of surplus material; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

6.4.4 PAYMENT FOR PIPE CONNECTIONS

New storm sewer connections to existing or new storm sewer facilities, as described above, shall be measured and paid for at the contract unit price per each, per size of new storm sewer or lateral pipe; per type of connection; and per type of existing storm sewer facility or proposed pipe. Said payment shall be considered full compensation for locating the existing storm facility, providing the proper hole and seal, connecting the new pipe, and for all work implied herein, along with all materials, labor equipment, mobilization, disposal of waste and all incidentals necessary to complete the work.

Note: New storm sewer pipes connected to new storm sewer structures shall be considered incidental to construction.

6.4.5 PAYMENT FOR APRON ENDWALLS

Payment for Apron Endwalls shall be made at the Contract Unit Price per Each per size and material as indicated and shall be considered full compensation for all excavation; preparing the foundation; providing, hauling, placing and compacting bedding and cover materials; providing, hauling, placing and connecting the apron endwall including gaskets, joint seal, geotextile fabric, joint ties, flexible marker posts and trash grates if required; backfilling and compacting; sod if so required, along with all materials, labor, equipment and incidentals necessary to complete the work.

6.4.6 **INCIDENTALS**

All work and materials not specifically listed in the contract/proposal for payment shall be considered incidental to construction. Incidental items include but are not limited to removal and/or salvage of existing materials, pipe connections, joint ties, rodent screen, disposal of waste, etc.

SECTION 7

STORM STRUCTURES

SECTION 7.1 GENERAL

7.1.1 DESCRIPTION

Work under this Section shall include construction of storm sewer structures such as but not limited to manholes, catch basins, inlets, area drains, pond outlet/control structures and concrete endwalls/headwalls. Structures shall be precast, prefabricated or cast-in-place; with or without sumps or flowlines; and shall include embedded items as required by the plans and details. Block and brick materials are not allowed for structures and adjustment/modifications of structures.

7.1.2 SUBSTITUTIONS

Storm structures consisting of alternate construction (type, materials, size, etc.) may be substituted for planned/as-designed storm structures if approved by the City Engineer prior to construction or fabrication. The Engineer reserves the right to deny any or all requested substitutions, and to request compensation or a decrease in cost for accepting a substitution.

SECTION 7.2 MATERIALS

7.2.1 PRECAST CONCRETE

The manhole manufacturer shall prepare shop drawings for precast concrete structures and provide them to the Contractor. Shop drawings must be labeled with the project name and ID number, the manufacturer's name and the Contractor's name. Structures must be identified using plan ID numbers. The Contractor shall review the submittals and stamp his approval on them which is evidence that he has checked them for accuracy and compliance with the plans and specifications. The Contractor shall then submit the shop drawings to the City Engineer for approval (prior to manufacturing). City Engineer's review will be for general conformance to the design concept.

All structures and components such as bases, tops and adjusting rings shall be comprised of precast reinforced concrete unless plans indicate otherwise. Precast concrete materials shall be supplied by a manufacturer approved by the City Engineer.

Sections of precast concrete structure shall be made with 'keyed' type joints whenever possible. Keyed joints may be sealed with mortar or butyl gaskets. Butt joints shall be sealed with mortar. Mortar at structure joints shall be at least 1-inch thick and as wide as the structure wall.

7.2.2 CONCRETE

Concrete for cast-in-place structures, flowlines, collars, etc. shall be Grade 'A' per WisDOT specifications, from an approved ready mix concrete supplier.

7.2.3 MORTAR

Mortar used for storm sewer structure and pipe connections and for adjusting storm manholes/ structures shall be a high quality, preblended, air entrained mixture. The mortar mix to be used shall be Underground Utility Mortar Mix as manufactured by Spec Mix, Mendota Heights, MN, 888.773.2649, or equal if approved by the City Engineer.

7.2.4 INLET, TYPE 13

Where required on the plans, PVC inlets denoted as Inlet, Type 13 shall be as manufactured by Nyloplast, USA or approved equal. PVC inlets shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. PVC surface drainage products shall meet the mechanical property requirements for fabricated fittings as described in ASTM F794, F979 and F1336.

7.2.5 INLET, TYPE 12, 15 and 18

Where required on the plans, smooth interior corrugated polyethylene pipe (SICPP) inlets denoted as Inlet, Type 12, 15 or 18 (per inside diameter of the pipe) shall include a riser and tee (vertical run/horizontal branch) with cap on the bottom/lower run. The branch connection shall be sized to accommodate the size and material of the discharge pipe. Pipe and joints for these Inlets shall meet all requirements for SICPP pipe (see Section 6). Length of riser will vary.

7.2.6 BEDDING AND COVER

Bedding and cover materials shall conform to the gradation requirements shown on the details for the pertinent type of structure or the connecting pipe (if not specifically shown for said structure).

7.2.7 REINFORCEMENT

Bar steel reinforcement shall utilize new, deformed bars, uncoated, grade 60 unless plans indicate otherwise, in accordance with Section 505 of WisDOT Specifications.

7.2.8 STEPS

Steps shall be professionally manufactured, plastic coated steel with non-slip tread and reflectorized end lugs.

SECTION 7.3 CONSTRUCTION

7.3.1 CONCRETE STRUCTURES

All concrete structures shall include concrete flowlines, benches and pipe connections. Flowlines shall be smooth and continuous between all connecting pipes. Benches shall rise to the springline of each connecting pipe. Pipe connection collars shall be hand formed and trowelled smooth on the inside and outside of the structure.

7.3.2 PRECAST CONCRETE STRUCTURES

Joints for precast concrete structures shall be soil and water tight and made with full beds of mortar. Offsets between risers and/or tops shall not be allowed.

7.3.3 CAST-IN-PLACE CONCRETE STRUCTURES

All components of cast-in-place (CIP) structures shall be suitably formed to obtain the specified dimensions. All forms shall be completely removed after concrete has cured. Bar steel reinforcement shall be properly placed and supported, with no clearances less than 2-inches (from rebar to formed faces or edges) and shall be tied in accordance with WisDOT requirements. Minimum inside height and/or width shall be 48-inches or at least 6-inches beyond the largest pipe outside diameter. All honeycomb areas on the inside and outside faces of all walls and the top shall be rubbed and filled with an approved

grout material immediately following removal of the forms. CIP structures shall be constructed as follows unless plan details indicate otherwise.

Base: Minimum thickness of the base shall be 9-inches. Pipes shall be installed on top of the base and shall not be cast integral with the base. Bar steel reinforcement shall be #5 bars spaced 6-inches on center within 2-feet of the perimeter and 12-inches on center inside, placed 2-inches clear above the bottom face of the concrete base/top surface of the subbase. The footprint of the concrete base shall be 6-inches wider than the walls for each side of the structure.

Walls: Minimum thickness of each wall shall be 8-inches. Pipes shall be cast integral to each wall. Bar steel reinforcement shall be #5 bars spaced 12-inches on center placed 2" clear from inside wall face. Wall forms shall be secured with form ties, with the remaining tabs on the inside and outside removed and grouted/sealed.

Tops: Minimum thickness of tops shall be 10-inches. Bar steel reinforcement shall be #5 bars spaced 6-inches on center placed 2-inches clear above the bottom face of the concrete top. Place additional bent bars to reinforce corners and openings (such as for manhole covers). The top shall be set on a full bed of mortar (top/wall joint), 1-inch minimum thickness.

7.3.4 FABRICATED STRUCTURES

Fabricated structures such as PVC inlets shall be installed in accordance with plan details. Pipe connections shall be made with gasketed push on joints or approved connectors.

7.3.5 FLOWLINES

Storm structures which are not required to have sumps shall be constructed with concrete flowlines including benches. Flowlines shall be smooth with benches extending to the springlines of all connecting pipes. Concrete shall be Grade A from a ready-mix concrete plant, hauled and placed as approved by the City Engineer.

7.3.6 PIPE TO STRUCTURE CONNECTIONS

New structures shall be connected a new or existing pipes utilizing pipe seals constructed of ready-mix concrete, mortar, brick and mortar, in accordance with plan details and/or the Standard Specifications, or other materials if approved by the City Engineer. Pipe Seals shall provide water tight connections, suitable for the intended bury, loadings, freeze/thaw cycles, etc.

Connections of new structures to new or existing pipes will not be measured for payment but will be considered incidental to construction of the structure.

7.3.7 ADJUSTING RINGS AND ADJUSTMENT

Adjustment of storm structures and adjusting rings shall comply with the requirements of Section 9 of these standard specifications. Two-piece rings are allowed for catch basins however the butt joint between the split ring shall also be sealed.

7.3.8 STEPS

Steps are required in all manholes where the depth exceeds 4-feet. Steps shall be embedded during casting or drilled and secured after casting. Steps shall be located in line with the access hatch/cover and spaced 16-inches on center, typical.

7.3.9 STORM STRUCTURES – UNPAVED AREAS

Storm structures such as area drains, inlets, catch basins, etc. shall be encompassed with sod consisting of a minimum width of 54-inches completely surrounding each structure unless plans require erosion mat, riprap or the structure is located in an asphalt or concrete surface. Sod shall be considered incidental to construction of said storm structures. In lieu of sod, the Contractor may utilize Erosion Mat, Type Urban with seed applied at twice the standard rate, upon approval of the Engineer.

7.3.10 CLEANING

All structures shall be maintained in a clean condition during construction. Said storm structures shall be thoroughly cleaned to the satisfaction of the City Engineer just prior to final acceptance of the project.

SECTION 7.4 MEASUREMENT AND PAYMENT

7.4.1 MEASUREMENT

Storm sewer structures shall be measured and paid per the units indicated in the contract, typically per each or per vertical foot, per Type of Structure.

When structures are paid per vertical foot, measurement shall be from the bottom of the cover frame/casting to the floor of the sump or outside diameter of the lowest pipe (not including the bell). No additional measurement shall be made for additional depth beyond the required sump or floor elevation (such as necessary for precasting/ transporting).

7.4.2 PAYMENT

Payment for storm sewer structures shall be considered full compensation for all removals; excavation; preparing the foundation; providing, hauling and placing all materials such as concrete, reinforcement, bedding and cover materials; for forming or precasting; backfilling and compacting; disposal of waste/surplus materials along with all materials, labor, equipment and incidentals necessary to complete the work.

SECTION 8

MANHOLE, CATCH BASIN, AREA DRAIN AND INLET COVERS

SECTION 8.1 GENERAL

8.1.1 DESCRIPTION

The work under this Section shall consist of the furnishing and installation of a new cover, including frame, grate, or lid on either new or existing structures in accordance with details shown on the Plans.

SECTION 8.2 MATERIALS

8.2.1 MASTER LIST OF ITEMS

CITY ID	DESCRIPTION	NEENAH NO'S
B	Area Drain – Round, Beehive w/4" Frame	R-2560-D1
C	Manhole, Catch Basin (or Area Drain) – Round, Flat w/9" Frame	R-2050, Machined Bearing w/Type D Grate
C-LP	Manhole, Catch Basin (or Area Drain) – Round, Flat w/4" Frame	R-1689, Non Rocking w/Type D Grate
D	Catch Basin – Rectangular, Driveways	R-3290-A, W/Type C Grate
E	Catch Basin – Rectangular, No Curb Box	R3067-C W/Type L Grate
E-S	Catch Basin – Rectangular, No Curb Box, Low Point	R3067-C W/Type C Grate
H	Catch Basin – Rectangular, Barrier Curbs	R-3067 W/Type L Grate, "Drains to Fresh Water"
H-S	Catch Basin – Rectangular, Barrier Curbs, Low Point	R-3067 W/Type R Grate "Drains to Fresh Water"
HM	Catch Basin, - Rectangular, Mountable Curb	HM (WisDOT) w/Type L Grate,
HM-S	Catch Basin – Rectangular, Mountable Curb, Low Point	HM (WisDOT) W/Type R Grate.
J	Manhole (Storm) – 9" Frame	J (WisDOT), R1550-A, Machined Bearing W/Type C Lid (1040), Labeled "STORM"
J-LP	Manhole (Storm) – 4" Frame	R-1689, Non Rocking, W/Type C Lid, Labeled "STORM"
JM	Manhole (Sanitary) – 9" Frame	R-1550-A, Machined Bearing W/Type B Self Sealing Lid W/T-Seal Gasket, Labeled "SANITARY"
JM-LP	Manhole (Sanitary) – 4" Frame	R-1689, Non Rocking, W/Type B Self Sealing Lid W/T-Seal Gasket, Labeled "SANITARY"
K	Inlet – Round, Flat	See Section 8.2.2
L	Inlet – Square, Flat	See Section 8.2.3
MS	Area Drain – Flat	MS (WisDOT) (R-4882)
MS-A	Area Drain – Flat	MS-A (WisDOT) (R-4882-A)
N	Area Drain – Round, Stool	R-4341-A
U	Catch Basin (or Area Drain) – Rectangular, Flat	R-3577 W/ Type D Grate
Note: Catch basins noted as "Drains to Fresh Water" shall include a logo consisting of raised lettering cast into the curb box stating "Dump No Waste Drains to Fresh Water" along with fish and loon objects.		
Note: Self Sealing Lids shall include two concealed pick holes and T-Seal style gaskets (pre-installed by the manufacturer).		

Note: Lids for Storm Manholes (Type J, J-LP) shall be labeled “STORM” with 2-inch raised lettering cast into the lid.
Note: Lids for Sanitary Manholes (Type JM, JM-LP) shall be labeled “SANITARY” with 2-inch raised lettering cast into the lid.

8.2.2 INLET COVER – TYPE K

Inlet Cover, Type K shall be a round, flat pipe grate designed for use on Type 12, 15 and 18 Inlets, with a top lip not extending beyond the host pipe outer diameter. The grate shall be anchored/secured to the host structure. Grates shall be cast iron or painted/ galvanized steel and designed to withstand loadings reasonably expected per installed location. Inlet Covers Type K shall be submitted to the Engineer for approval prior to installation.

8.2.3 INLET COVER – TYPE L

The inlet cover furnished for all PVC surface drainage inlets shall be cast iron and shall be made specifically for each fitting. Grates for 12” and larger drain basins and inline drains shall be capable of supporting H-20 wheel loading. Metal used in the manufacture of the castings shall conform to ASTM A-48-83 Class 30B for gray iron. The castings shall be furnished with a black paint. The cover shall be secured to the inlet. The grate shall be removable or hinged and shall include a hold-down/locking device.

8.2.4 MORTAR

Mortar used for adjusting manholes, catch basins and area drains shall be a high quality, preblended, air entrained mixture. The mortar mix to be used shall be Underground Utility Mortar Mix as manufactured by Spec Mix, Mendota Heights, MN, 888.773.2649, or equal if approved by the City Engineer.

SECTION 8.3 CONSTRUCTION

Manhole, catch basin, area drain and inlet covers shall be installed in accordance with plan details and specifications. Frames shall be set on a full bed of mortar and shall be sealed to the structure (watertight). Adjustment, adjusting rings and chimney seals (typically required on sanitary manholes) are described elsewhere in these specifications.

SECTION 8.4 MEASUREMENT AND PAYMENT

The payment under this Section shall be the Contract Price for each manhole, catch basin, or inlet area drain cover and shall be full compensation for furnishing all materials, including all masonry, frames, grates, and lids, and for all excavation, backfilling, and restoring the site of the work, and for all labor, tools, equipment, and incidentals necessary to complete the work.

SECTION 9

ADJUSTMENT AND RECONSTRUCTION OF MANHOLES, CATCH BASINS, AREA DRAINS AND INLETS

SECTION 9.1 GENERAL

9.1.1 DESCRIPTION – ADJUSTMENT OF COVERS

This work shall include the adjustment of existing, salvaged or new covers on existing or proposed structures such as manholes, catch basins, area drains or inlets, to the finished grade (including longitudinal and transverse slopes) as required by the plans.

9.1.2 DESCRIPTION – RECONSTRUCTION

Reconstruction of manholes, catch basins or inlets is hereby defined as a vertical change in elevation of a cover requiring removal or installation of structure which cannot be accomplished (per plan/detail requirements) through removal or installation of masonry adjusting rings or grade adjusting devices.

SECTION 9.2 MATERIALS

9.2.1 MANHOLE, CATCH BASIN, AREA DRAIN AND INLET COVERS

See Section 8

9.2.2 STORM MANHOLE, CATCH BASIN, AREA DRAIN AND INLET STRUCTURES

See Section 7

9.2.3 SANITARY MANHOLES AND CHIMNEY SEALS

See Section 20

9.2.4 MORTAR

Mortar used for storm sewer pipe connections and for adjusting manholes/structures shall be a high quality, preblended, air entrained mixture. The mortar mix to be used shall be Underground Utility Mortar Mix as manufactured by Spec Mix, Mendota Heights, MN, 888.773.2649, or equal if approved by the City Engineer.

9.2.5 ADJUSTING RINGS

9.2.5.1 PRECAST REINFORCED CONCRETE

Adjusting rings shall be precast reinforced concrete rings (one piece) of 2-inch, 4-inch or 6-inch thickness. Rings must have true/flat horizontal surfaces and be free of cracks or other surface defects. Split/2-piece rings are allowed for rectangular catch basins. Precast reinforced concrete adjusting rings shall be produced by a certified precast concrete manufacturer.

9.2.5.2 PLASTIC

Plastic adjusting rings shall be HDPE as manufactured by Ladtech Inc. and shall meet AASHTO requirements.

SECTION 9.3 CONSTRUCTION

9.3.1 ADJUSTMENT OF COVERS

9.3.1.1 REMOVALS

Unless the contract provides otherwise, remove and salvage the existing manhole, catch basin, area drain or inlet cover frame and grate or lid as a set. Excavate as necessary to provide an adequate area for working and compaction equipment. Remove all existing masonry rings, brick, shims and/or grade adjusting devices. The top of the structure shall be cleaned or prepared as necessary to provide a true, level surface.

9.3.1.2 INSTALLING ADJUSTING RINGS

All concrete adjusting ring joints shall utilize full beds of mortar, typically ½-inch thick. The total height of concrete adjusting rings shall be limited per plan details, and as such the number of concrete adjusting rings and mortar joints is also limited. Use combinations of 6-inch, 4-inch and at least one 2-inch concrete adjusting ring. Do not use more than three total concrete adjusting rings without prior approval from the Engineer.

Plastic adjusting rings shall be installed in accordance with the manufacturer's requirements. Plastic adjusting rings shall not be used where horizontal/lateral adjustment is required (only use where plastic rings can be stacked and centered upon the underlying manhole opening or adjusting ring). Plastic adjusting rings installations shall be reviewed/approved by the Engineer prior to construction. On storm structures (manholes and catch basins), plastic adjusting rings are not required to be sealed but must be wrapped with Geotextile Fabric, Type DF Schedule A, overlapped 12 inches minimum and extending 6 inches (minimum) below the bottom ring and 2 inches (minimum) above the top ring.

9.3.1.3 SETTING COVERS

Set covers/frames accurately so that the complete installation is at the correct elevation including longitudinal and transverse slopes as required to fit the adjoining surfaces. Casting frames shall be fully supported and chimneys shall be load bearing. When using concrete adjusting rings set the casting frame on a full bed of mortar, typically ½-inch thick. When using a chimney seal and concrete adjusting rings, set the internal-external chimney seal directly onto a concrete adjusting ring (and add casting directly onto the seal). When using plastic adjusting rings follow the manufacturer's requirements.

9.3.1.4 SETTING COVERS IN CONCRETE SURFACES

Set covers prior to placing concrete pavement, patches or incidental concrete flat work. Set covers in conjunction with concrete paving operations using permanent or removable shims and use an approved non-shrinking grout applied under pressure to fill all remaining voids. Covers set in concrete pavement shall comply with surface testing and correction requirements (i.e. ten-foot straightedge).

9.3.1.5 SETTING COVERS IN ASPHALT SURFACES

Set covers in asphalt surfaces after placement of the lower layer and prior to placement of the upper/surface layer. Prior to placing the lower layer of asphalt, install temporary plates over structures and record their location and elevation. Grade, shape and pave the lower layer of asphalt over said plated structures. Saw and remove the asphalt from the area of the structure (do not disturb or lift the asphalt surface to remain). The area of asphalt removal shall be at least 7-foot by 7-foot. Special compaction of disturbed

road base is required. Patch and compact asphalt in the removal area at least 48 hours prior to placing the next layer of asphalt.

Covers set in asphalt pavement shall not vary (surface of asphalt vs surface of cover) by more than 5/8 inch nor less than 3/8 inch when checked with a 6-foot straightedge laid upon the adjacent asphalt surface and across the cover, in any direction (longitudinal or transverse).

9.3.1.6 **FINISHING AND CLEAN-UP**

Concrete adjusting ring chimneys shall be back plastered (after removal of temporary shims/wedges) and brushed for a smooth finish inside and outside. On plastic adjusting ring chimneys remove excess material protruding inside the chimney. Clean and remove dropped or splattered materials from manhole steps, benches and flowlines immediately.

9.3.2 **RECONSTRUCTION OF STRUCTURES**

In addition to removals for adjustment, section(s) of existing structures shall be removed, in addition to removal of cones or tops, as necessary for the required reconstruction.

After removal of the existing section(s) the remaining existing structure/joint will be examined for damage. If the Engineer determines that this remaining structure/joint is satisfactory, the Contractor shall prepare said joint for installation of the proposed structure reconstruction. The existing joint shall be cleaned and all old sealant (mortar, butyl, mastic, etc.) removed. The joint between the existing structure and the new structure section shall be constructed in accordance with plan details or a method recommended by the Contractor, however, whatever method is selected by the Contractor, the method and materials must be preapproved by the Engineer. As a minimum, this joint when completed shall be structurally sound, provide vertical and horizontal stability and be watertight. External joint seal is required when reconstructing sanitary manholes and shall be MacWrap Exterior Joint Sealer as manufactured by Mar-Mac Manufacturing Co., with 12-inch width and built in straps to secure the seal.

Following the removal of the existing manhole section(s), if the remaining structure/joint is damaged or not suitable for reuse then the Contractor shall excavate to below said existing joint and prepare a new joint for installation of the proposed reconstruction, in accordance with plan details. The existing structure shall be sawed below the damaged/ defective portion. Sawing of the manhole shall utilize special sawing equipment (not hand/power saws) and shall result in a smooth, flat, clean, true and level surface (1/4-inch tolerance). The joint between the existing, sawed structure and the new section shall be constructed in accordance with plan details modified to conform to the sawed surface, or a method recommended by the Contractor, however, whatever method is selected by the Contractor, the method and materials must be preapproved by the Engineer. As a minimum, this joint when completed shall be structurally sound, provide vertical and horizontal stability and be watertight. External joint seal is required when reconstructing sanitary manholes and shall be MacWrap Exterior Joint Sealer as manufactured by Mar-Mac Manufacturing Co., with 12-inch width and built-in straps to secure the seal.

Where required by the plans, the Contractor shall remove, salvage and reinstall pertinent sections of structures such as cones or tops. Joints shall be cleaned and prepared in accordance with these specifications. Lift holes, if required to be reopened shall be sealed watertight by grouting the holes and applying bitumastic sealer on the exterior at least 6-inches beyond said lift hole.

New sections shall be installed in accordance with plan details for new structures.

Joints between new sections and salvaged cones or tops shall be cleaned and sealed in accordance with these specifications.

Reconstructed manhole, catch basin, area drain and inlet covers shall be adjusted in accordance with these specifications.

SECTION 9.4 MEASUREMENT AND PAYMENT

9.4.1 GENERAL

Adjusting or reconstructing manholes, catch basins, area drains and inlets (and their covers) shall be measured and paid per the units indicated in the contract.

9.4.2 ADJUSTMENT

Measurement of adjusting manhole, catch basin, area drain or inlet covers shall be per each existing structure/cover successfully adjusted. If the adjustment item(s) vary per height of adjustment (i.e. adjust manhole, ≤ 12-inches vs. adjust manhole, > 12-inches), the adjustment shall be the actual height of the adjustment made by the Contractor measured from the bottom of the cover frame to the top of the structure (TSE).

Adjustment of covers for proposed structures or reconstructed structures will not be measured for payment but will be considered incidental to construction.

9.4.3 RECONSTRUCTION

When the contract requires measurement and payment for reconstruction of pertinent structures per each, the measurement shall be for each structure successfully reconstructed and adjusted.

Where the contract requires measurement and payment for reconstruction of pertinent structures per vertical foot, the work shall be measured from the remaining existing structure (lowest surface/lip) to the top of the reconstructed structure (TSE). If new flat top section is required (such as replacing a 48-inch diameter cone with a 48-inch diameter flat top) and said top is measured/paid for separately, the height of said top shall not be included in the vertical foot measurement for said reconstruction.

9.4.4 PAYMENT

Payment for adjusting or reconstructing manholes, catch basins, area drains or inlets and their covers, measured as discussed above shall be paid for at the contract unit price per each pertinent contract item. Payment shall constitute full compensation for all work including but not limited to removals, salvaging, excavation, hauling, preparation of joints, providing and installing structure materials, joint seals, backfilling and compacting along with all mobilization, materials, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 10

REMOVING AND ABANDONING STRUCTURES AND PIPES

SECTION 10.1 GENERAL

10.1.1 DESCRIPTION

This work shall consist of removing or abandoning structures such as manholes, catch basins, area drains and inlets; and pipes such as sewers, water mains, force mains and laterals at locations shown on the plans or as directed by the Engineer.

Where removal of an item is required said item shall be completely removed.

Where abandonment of an item is required the work may require partial removal with the remainder of the item to be filled and/or the opening(s) sealed.

SECTION 10.2 MATERIALS

Not used.

SECTION 10.3 CONSTRUCTION

10.3.1 REMOVING STRUCTURES

Structures designated to be removed shall be completely removed and disposed of by the Contractor. The resulting excavation shall be backfilled and compacted using suitable fill materials (unless plans/details require borrow, granular or other materials) in accordance with these specifications. Pipes previously connected to the structure which are to remain shall be sealed through construction of concrete bulk heads.

10.3.2 REMOVING PIPES

Pipes designated to be removed shall be completely removed including pipe bedding, cover and encasement materials and appurtenances, and disposed of by the Contractor. The resulting excavation shall be backfilled and compacted using suitable fill materials (unless plans/details require borrow, granular or other materials) in accordance with these specifications. Pipes previously connected to the structure which are to remain shall be sealed through construction of concrete bulk heads.

10.3.3 ABANDONING STRUCTURES

Structures designated to be abandoned shall be done so in accordance to plan details, which may include removal of the upper portion of the structure, sealing connected pipes to remain in place and backfilling and compacting the excavation and remaining structure using suitable fill materials (unless plans/ details require borrow, granular or other materials) in accordance with these specifications. As a minimum, walls of structures shall be removed to a point at least 2-feet below subgrade at roads, driveways, sidewalks, etc., 2-feet below finished grade for turf areas and in all cases to the extent required to avoid interfering with the work.

10.3.4 **ABANDONING PIPES**

Pipes to be abandoned in-place (without filling) shall be structurally sound with ends sealed through construction of concrete bulkheads.

10.3.5 **ABANDONING PIPES VIA FILL-IN-PLACE**

Existing pipes to be abandoned via the fill-in-place method shall be completely filled with approved low strength non-shrinking cement grout/slurry materials. These materials shall be pumped directly into the pipeline or placed via tremmie pipe. The Contractor shall provide adequate bulkheading and venting of the existing line such that the chosen method of filling the existing pipe will completely fill the pipe (no voids).

10.3.6 **BULKHEADS**

Bulkheads shall be constructed in accordance with plan details, on clean, sound pipes and shall be suitably formed.

10.3.7 **SPECIAL REQUIREMENTS FOR SANITARY PIPES**

The end of a sanitary sewer, lateral or force main pipe to remain which is connected to a live sanitary sewer facility shall be suitably capped and sealed water tight using approved gasketed caps or plugs instead of a bulkhead. The end of said sanitary sewer, lateral or force main at the live sanitary sewer facility shall also be sealed with an appropriate bulkhead, if accessible.

SECTION 10.4 MEASUREMENT AND PAYMENT

10.4.1 **MEASUREMENT OF REMOVING STRUCTURES**

Removal of structures shall be measured for payment per pertinent structure type or size per each, at locations where the center of the structure to be removed is more than 10 feet from the center of a proposed structure or pipe.

Removal of structures shall be considered incidental to construction when the center of the structure to be removed is within 10-feet of the center of a proposed structure or pipe.

Bulkheads required for sealing pipes to remain at removed structures shall be measured for payment in accordance with Section 10.4.5 Measurement of Bulkheads.

10.4.2 **MEASUREMENT OF REMOVING PIPES**

Removal of pipes shall be measured for payment per pertinent type or size of pipe per lineal foot, at locations where the center of the pipe to be removed is more than 5-feet from the center of a proposed structure or pipe.

Removal of pipes shall be considered incidental to construction when the center of the center of the pipe to be removed is within 5-feet of the center of a proposed pipe or structure.

For either case, bulkheads required for sealing pipes to remain in place shall be measured for payment in accordance with Section 10.4.5 Measurement of Bulkheads.

10.4.3 **MEASUREMENT OF ABANDONING STRUCTURES**

Abandonment of structures shall be measured for payment per pertinent structure type or size per each. Bulkheads required for sealing pipes within the portion of the structure to remain shall be incidental to abandoning structures and will not be measured for payment.

10.4.4 **MEASUREMENT OF ABANDONING PIPES**

The quantity for abandoning pipes via fill-in-place shall be measured per pertinent size or type of pipe per lineal foot successfully completed. Bulkheads and filling or venting appurtenances as necessary to completely fill the pipe shall be considered incidental to construction.

Bulkheads required for sealing pipes to remain in place (pipes abandoned in-place without filling) shall be measured for payment in accordance with Section 10.4.5 Measurement of Bulkheads.

10.4.5 **MEASUREMENT OF BULKHEADS**

Sealing existing pipes (to remain or abandoned) accomplished through installation of bulkheads shall be measured and paid for per pertinent size or type, per each in accordance with the Contract Unit Price schedule. If not specifically listed in the Contract Unit Price schedule, bulkheads shall be considered incidental to construction.

10.4.6 **PAYMENT**

Payment for removing structures or pipes, or abandoning structures or pipes, defined and measured as described herein, shall be considered full compensation for all excavation; removals; disposal of waste/debris; providing, placing and compacting fill or backfill materials as specified, along with all mobilization, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 11

CONCRETE PAVEMENT AND DRIVEWAYS

The following documents are hereby incorporated into this section and together shall constitute the specifications of this Section 11, Concrete Pavement and Driveways.

- Modifications to Concrete Pavement Specification (Section 11-A)
- Concrete Pavement Specification, 2009 (Section 11-B)
- Concrete Pavement Joint Sealing Specification (Section 11-C)

The intent and description of these documents is as follows:

Modifications to Concrete Pavement Specification – Drafted by the City of Marshfield, this document is intended to alter, change and/or modify the Concrete Pavement Specifications (described below) as desired by the City of Marshfield. These 'modifications' shall govern over other documents within this section.

Concrete Pavement Specification, 2009 – Drafted and published by the Wisconsin Concrete Pavement Association (WCPA), this 'guide' specification is hereby adopted by the City of Marshfield and incorporated into the City's standard specifications. WCPA's document provides a baseline specification which is familiar to concrete pavement contractors and can be utilized by a variety of contracting agencies.

Concrete Pavement Joint Sealing Specification – This supplemental specification is hereby attached to the concrete pavement specifications and further describes the requirements for sealing concrete pavement joints.

The general intent of this section of the City's Standard Specifications describes construction of concrete pavements. Typical street pavement designs within City limits are intended to comply with requirements for urban pavements with design speeds less than 45 MPH, unless indicated or noted otherwise.

Concrete Driveways, including the approach (located between the street/curb and sidewalk) and beyond the sidewalk, but excluding the sidewalk; shall be constructed to comply with pertinent requirements for concrete pavements. Driveways shall be constructed as manual fixed-formed pavements unless noted otherwise. Joint reinforcement is not required; however, all concrete driveways shall be reinforced with wire mesh or synthetic fiber mesh as specified in Section 15 (Concrete Sidewalks) of these standard specifications. Concrete Driveway construction shall also comply with pertinent sections of Section 15 such as but not limited to reinforcement, expansion joints, surface requirements and surface testing and correction.

SECTION 11-A

MODIFICATIONS TO CONCRETE PAVEMENT SPECIFICATION

a. The 'Contracting Agency', Engineer and Owner is the City of Marshfield.

b. The City Engineer reserves the right to test or require the Contractor to test Air Content (see (WCPA) Section 3.8.5), using alternate methods/equipment (including unit weight) and to sample or require that samples be taken from the grade (including behind the paver/slip-form machine and/or within formwork).

c. The content of air entrainment, as specified in (WCPA) Sections 3.8.5.1 and 5.5.2 is hereby modified such that concrete placed via slip-form machine shall have a target air content (after applying the aggregate correction factor) of 7%, with a lower control limit of 5.5% and an upper control limit of 8.5%. All fixed-form concrete placement methods shall have an air content as specified (6% plus/minus 1.5%).

d. Concrete surfaces shall be cured by the Impervious Coating Method unless other methods are approved by the Engineer. The curing agent shall be Tri-Kote 26 for all concrete pours except for Concrete Base Pavement Surfaces (to be overlaid with asphalt), which shall be cured by the Impervious Sheeting Method. Manufacturer and lot must be approved for use by WisDOT (appear on the WisDOT Approved Products list) and manufactured/dated within one year of the date it is to be applied on.

e. The mix design as submitted by the Contractor to the Owner shall clearly indicate the type/classification of aggregate. Note: Per (WCPA) Section 5.2.1, Type II cement is required when using igneous/metamorphic materials.

f. (WCPA) Section 6.2 Paving Equipment is modified as follows:
Use a slip-form paving machine for placement of all mainline pavements with the exception of side street intersections, paving gaps or other irregular-shaped areas, as approved by the Engineer. Note: Use of a slip-form paver also requires that the base be trimmed using automatic sensored equipment per (WCPA) Section 6.3.2.

g. (WCPA) Section 6.4 Setting Forms is modified (add) as follows:
Set forms using stakes as provided by the City Engineer, Contractor and/or others. Contractor is responsible to verify that stakes and forms conform to the plans (alignment and grade), adjacent new work/construction and adjacent existing surfaces to remain. Notify the City Engineer of any/all discrepancies, adjustments, corrections, etc. before making changes and prior to ordering concrete.

h. All concrete to be utilized on the project shall conform to the mixing and delivery requirements (see (WCPA) Section 6.7). The Contractor's paving foreman shall collect and provide batch tickets to the Engineer (in accordance with (WCPA) Section 6.7.1) for each load upon its arrival at the work site. Computer generated daily batch records shall be submitted in addition to the load batch tickets. The Engineer and Contractor shall review load batch tickets, monitoring the water to cementitious ratio and other pertinent parameters.

   The Engineer will closely monitor elapsed time per (WCPA) Sections 6.7.3 and 6.7.4. Concrete which is not mixed or retempered in accordance with the specifications shall be rejected. Concrete (ready-mix or from a mobile batch plant) which is not unloaded ('off the truck') within the limits as specified in (WCPA) Section 6.7.4 shall be rejected. Concrete which is rejected shall be disposed of by the Contractor, off site.

i. Consistency of concrete (see (WCPA) Section 6.8) is modified such that slump tests may be required by the Engineer. Slump tests shall be in accordance with AASHTO T-119. Slumps shall be 2.5-inches or less for slip-formed work and 4-inches or less for formed/non-slip-formed work.

j. The City Engineer reserves the right to verify or require the Contractor to verify the placement of reinforcement (including tie and/or dowel bars, placed per (WCPA) Section 6.10) in the as-placed wet concrete (behind the paver/slip-form machine and/or within formwork).

k. Evaporation Reducers/Retardants may be allowed if approved by the City Engineer, however these shall only be used for emergency conditions, to extend plasticity/finishability of unfinished concrete and applied within five (5) minutes of placement and after vibration and screeding; and in accordance with the manufacturer's recommendations.

l. Joints (see (WCPA) Section 6.11) shall be located in accordance with the Jointing Plan, if provided as part of the design/plan set, however the Contractor shall review and recommend changes/adjustments as necessary for proper construction of concrete pavement(s).

   If the plans do not include a jointing plan then the Contractor shall create one and present it to the City Engineer for approval.

   The Contractor shall be responsible for layout of the approved jointing plan in the field.

m. Transverse joint (see (WCPA) Section 6.11.3) locations shall be marked in a manner acceptable to the City Engineer, such as with a metal rod or wood lath placed in-line with the joint (and beyond the string line if present). Joint markers shall be placed prior to the start of paving operations and shall remain in place until the City Engineer inspects all finished joints.

n. Apply the curing compound at a rate that meets or exceeds the minimum specified rate (see (WCPA) Section 6.13.2). Complete coverage is expected per application with uniform/even coverage and will be visually inspected by the City Engineer. Application/coverage of white curing compound as spray applied to the concrete surface shall be as opaque as a white sheet of paper, with no gray areas visible. Coat all exposed surfaces, including sides and edges of both slip-formed and fixed-formed work (within 30 minutes of removing fixed forms).

   Curing Compounds shall be mixed to produce a consistent appearance, prior to commencing application and frequently throughout application. Compounds in large tanks or drums shall be thoroughly agitated and mixed (white pigment materials tend to settle out in larger containers).

   Curing concrete during all weather conditions requires timely application of the curing compound. Apply the cure when surface moisture is no longer present (in accordance with (WCPA) Section 6.13.2). Determine the concrete surface moisture conditions via the 'dab' test (lay a paper towel on the surface – not ready for curing if it soaks up moisture).

   Cool or cold weather requires more time for curing – for the concrete to 'set-up', and also for the curing compound to 'set-up' (so that it does not track or get picked up by sawing equipment).

   Curing concrete surfaces (normal or cold-weather) shall be considered incidental to the concrete item of work.

   Note: The City Engineer reserves the right to reduce the unit price of concrete items of work which were not sufficiently cured or cured in a timely manner.

o. Cold Weather Concreting requirements shall be as specified in (WCPA) Section 6.14, however this work shall be considered incidental to construction unless specifically listed for payment in the Unit Price Schedule. Where specifically listed, this work shall be measured and paid for separately, based upon the level of protection required, and measured in accordance with the measurement of the concrete item(s) to be protected (i.e., per SY of SF for area measurements of concrete pavement, driveways, sidewalks, etc.; per LF for curb and gutter). The level of protection is classified as listed below:
    - Type 'A' includes a single layer of polyethylene.
    - Type 'B' includes two layers of polyethylene.
    - Type 'C' includes insulation such as loose straw/hay between two layers of polyethylene, insulated blankets or other devices approved by the City Engineer.

p. A Pre-Pour Meeting shall be held approximately one week prior to the beginning of mainline paving. Items to be discussed shall be in accordance to WisDOT/industry standards, per the Engineer's discretion.

q. The edges of all construction joints, including but not limited to transverse joints and longitudinal locations at the centerline, flangeline, etc. shall be edged/rounded to provide a ¼-inch radius on both sides of the joint.

r. Concrete pavements shall be maintained in a clean condition by the Contractor until the project is accepted by the Owner and open to traffic. Regular sweeping is required, including removal of sawing debris at first loading, when completing remaining work, immediately prior to joint sealing, immediately prior to pavement marking, and other times as required by the Engineer.

s. All concrete pavement joints (contraction, expansion and construction) shall be sealed, in accordance with the Concrete Pavement Joint Sealing Specification (attached to Section 11). Sealing joints shall be incidental to the concrete surface/item of work.

t. Joints and/or edges of concrete surfaces which are chipped/damaged shall be remedied in accordance with the City of Marshfield's Standards for Repair of Street Pavements to the satisfaction of the Engineer.

u. Defective concrete surfaces, including but not limited to cracking, faulting, spalling, raveling, pop-outs, roughness, rough ride, substandard thickness, etc.; resulting from improper materials, workmanship, or unknown reasons; shall be remedied in accordance with Section 1 of the Standard Specifications and shall be at the discretion of the City Engineer.

Section 11-B

Concrete Pavement Specification

2009

WISCONSIN CONCRETE PAVEMENT ASSOCIATION

Moving forward with concrete results

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Portland Cement Concrete Pavement Specification

1 Description

This section describes constructing a Portland cement concrete pavement, with or without reinforcement, on a prepared foundation.

2 Approval of Materials

2.1 General

Provide materials conforming to the contract. Use materials the contract specifies unless the engineer authorizes substitutions. Monitor construction operations to identify potential nonconforming materials and prevent their incorporation into the work.

All materials are subject to the engineer's approval before incorporation into the work. The engineer may inspect or test all materials at any time during their preparation, storage, and use. Notify the engineer of the proposed source of materials before delivering those materials to the project site.

Materials or components demonstrated to conform to the contract will be approved. Approval will be based on conformance with the contract as close as it is practical to the point of incorporation into the work. Material approval is based primarily on the engineer's tests, contractor's tests, or tests the manufacturer performs and certifies.

Conform to manufacturer recommended procedures for products incorporated into the work unless the contract specifies otherwise. Provide copies of those procedures if the engineer requests. The contractor may request approval of alternate procedures.

Approval of materials or components does not constitute acceptance of the work incorporating those materials or components.

2.2 Approved Products Lists

The WisDOT maintains product acceptability lists and other lists of approved products and approved manufacturers or suppliers. The WisDOT includes products on these lists based on the results of prior testing and a satisfactory performance history on WisDOT projects. The WisDOT approved products list can be viewed at:

http://www.dot.wisconsin.gov/business/engrserv/approvedprod.htm

Retesting or re-inspection of products located on the WisDOT approved products list may occur after delivery to the project site to verify that they conform to the contract. A product is nonconforming if verification test results indicate the product does not meet the requirements.

2.3 Approval by Certification

2.3.1 General

For manufactured products or assemblies, approval may be based on a product certification.

2.3.2 **Product Certifications**

For manufactured products or assemblies, the engineer may accept a certified report of test or analysis, or a certificate of compliance instead of performing tests on samples. Provide a copy of the manufacturers certified report of test or analysis to the engineer upon request.

For testing documented by certificate, all sampling and testing procedures and testing facilities are subject to review and approval. Products may be sampled and tested to verify the certified test results.

2.4 **Approval by Sampling and Testing**

Approval of materials will be based on a combination of the results of the following:

1. Contractor quality control testing required under the contract.
2. Optional contractor assurance testing.
3. Engineer verification testing.
4. Inspections of the materials production, storage, handling, and construction processes.
5. Dispute resolution procedures.

2.4.1 **Certified Technician**

All personnel engaged in sampling and testing of materials to be incorporated into the work must be certified under the WisDOT highway technician certification program, or a national recognized certification agency, for the specific tasks they are performing.

2.4.2 **Qualified Laboratory**

All laboratory facilities used in sampling and testing of materials to be incorporated into the work must be qualified by the WisDOT laboratory qualification program, AASHTO accreditation program, or other nationally recognized agency, for the specific tests they are performing.

2.5 **Nonconforming Materials**

For nonconforming materials identified before incorporation into the work, the engineer will do one of the following:

1. Reject those materials. Unless the engineer allows otherwise, the contractor shall remove rejected materials from the project site. The engineer may allow the contractor to correct rejected materials. The contractor shall obtain the engineer's approval for previously rejected, but subsequently corrected, materials before incorporating those materials into the work.
2. Approve those materials subject to potential reduced payment. The engineer will determine the circumstances under which those nonconforming materials may be approved and allowed to remain in place. The engineer will document the basis of approval and may execute a contract change order to adjust the contract unit prices for the nonconforming materials.

For materials incorporated in the work and subsequently found to be nonconforming, the engineer will do one of the following:

1. Reject those materials and issue a written order to remove and replace or otherwise correct nonconforming work.
2. Approve those materials and determine the circumstances under which the nonconforming work may be accepted and allowed to remain in place. The engineer will document the basis of acceptance and may execute a contract change order to adjust the contract unit prices for the nonconforming work.

2.6 Dispute Prevention

Both the contracting agency and the contractor have a common interest in preventing any misunderstandings or differences that may arise between them from becoming claims against one another. With the intent of avoiding this both parties will make good faith efforts to identify in advance and discuss the potential causes of disputes. The progress of the work will be reviewed on a weekly basis. Any miscommunications or dissatisfactions that may arise will be promptly brought to the attention of the other party to jointly review and resolve the issue.

3 Contractor Quality Control

3.1 General

Provide and maintain a quality control program, defined as all activities and documentation of the following:

1. Mix design.
2. Production control, placement control, and inspection.
3. Sampling, testing, measurement, and correction of materials and in-place concrete pavement.

3.2 Quality Control Plan

Submit a comprehensive written quality control plan to the engineer no later than 10 business days before placing concrete pavement. Update the plan with changes as they become effective. Ensure that the plan provides the following elements:

1. An organizational chart including names, telephone numbers, current certifications and/or titles, and roles and responsibilities of all quality control personnel.
2. Preliminary concrete pavement mix information including anticipated producers, manufacturers, and sources of mix materials, and the name, title, and phone number of the person responsible for developing the mix design.
3. The locations and qualifications of the Quality Control laboratories for mix design, aggregate testing, cylinder curing, concrete testing, and compressive strength testing.
4. Anticipated concrete mix aggregate gradations and limits.
5. The initial and routine equipment checks and documentation performed on scales, and water meters.
6. The methods for monitoring and recording the materials used in each batch.
7. Sampling and testing data documentation
8. The format for sampling and testing data documentation.

3.3 Personnel

Perform the material sampling, testing, and documentation required using a certified technician. Have the technician at the project site, prepared and equipped to perform the required sampling and testing, whenever placing concrete.

3.4 Laboratory

Perform the concrete mix design, aggregate testing, cylinder curing, and compressive strength testing at a qualified laboratory.

3.5 Equipment

Furnish the necessary equipment and supplies for performing quality control testing. Calibrate all testing equipment and maintain a calibration record at the laboratory.

3.6 Concrete Mixes

Determine concrete pavement mixes for the project conforming to section 5. Test concrete during mix development at a qualified laboratory.

Submit a concrete pavement mix report at least 3 days before producing concrete in accordance with section 5.3 or section 5.4. On the mix report clearly indicate the type/classification of aggregates per section 5.2.1.

3.7 Documentation

Submit test results to the engineer upon request. Assure that all properties are within the limits specified.

3.8 Testing

3.8.1 General

Perform all quality control tests necessary to control the production and construction processes. Use the test methods identified below to perform the following tests:

Aggregate gradations	AASHTO T 11 & T 27
Aggregate materials finer than the No. 200 sieve	AASHTO T 11
Aggregate moisture	AASHTO T 255
Air content	AASHTO T 152
Slump	AASHTO T 119
Temperature	AASHTO T 309
Compressive Strength	AASHTO T 22, T 23, T 141, M 201

3.8.2 Aggregate Gradation

3.8.2.1 Sampling and Testing

The engineer may accept aggregate gradation based upon satisfactory records of previous testing.

Randomly sample and test the individual aggregate gradations according to AASHTO T 11 and AASHTO T 27. Have a certified technician sample and test the aggregate and document the results.

Test aggregates during production at a minimum frequency of 1 test per 1000 tons of aggregate produced up to a maximum of 3 tests per day. Production tests may be performed during aggregate production or during load out from aggregate source stockpile to plant site stockpile.

If aggregate production test records are not available or not acceptable to the engineer, sample and test aggregates during concrete production at a minimum frequency of 1 test per 500 cubic yards of concrete produced up to a maximum of 3 tests per day.

3.8.2.2 Documentation

Maintain control charts or tables at the laboratory for each aggregate stockpile. Maintain a chart or table for each control sieve for each material. Record contractor test results the same day tests are conducted.

Notify the engineer whenever an individual test value exceeds a control limit. Material is nonconforming when an individual test exceeds the control limit. The quantity of nonconforming material includes the material of the first test exceeding the control limit, continuing to but not including, the material from the first subsequent test that is within the control limits.

3.8.3 **Aggregate Percent Passing the No. 200 Sieve**

3.8.3.1 Sampling and Testing

Have a certified technician sample and test the aggregate and document the results.

Measure and record the percent passing the No. 200 sieve of both the fine and coarse aggregates when producing concrete pavement. Conduct tests according to AASHTO T 11.

Sample and test at least one combined aggregate gradation prior to producing concrete for the project. Sample and test aggregates during concrete production at a minimum frequency as follows:

1. One test per 5 days of concrete production when the previous p200 test result is less than or equal to 2.0.
2. One test per day of concrete production when the previous p200 test is greater than 2.0.

Ensure that the combined aggregate gradation, expressed as weight percentages of the total aggregate, for the percent passing the No. 200 sieve is less than or equal to 2.3 percent.

3.8.3.2 Documentation

Document testing using a combined gradation control chart or table for the percent passing the No. 200 sieve.

Notify the engineer whenever an individual test value exceeds a control limit. Material is nonconforming when an individual test exceeds the control limit. The quantity of nonconforming material includes the material of the first test exceeding the control limit, continuing to but not including, the material from the first subsequent test that is within the control limits

3.8.4 **Compressive Strength**

Acceptance of concrete will be based on compressive strength of concrete cylinders.

3.8.4.1 Sampling and Curing

Have a certified technician sample, test, and document results during concrete production and placement.

Randomly select and cast one set of 3 standard 6X12 inch cylinders for each mix grade and placement type at a minimum frequency of one test per 500 CY of concrete, and in any event, not less than one test for each ½ day of placement. Sample according to AASHTO T 141. Cast and initially cure the cylinders according AASHTO T 23.

Do not cast more than one set of cylinders from a single truckload of concrete.

Provide facilities for initial curing. Transport the specimens to a qualified laboratory for standard curing according to AASHTO M 201 for 28 days.

3.8.4.2 Compressive Strength Testing

Have a certified technician, in a qualified laboratory, perform compressive strength testing and document the results. Randomly select 2 cylinders to test at 28 days.

Determine the 28-day compressive strength in psi of each cylinder according to AASHTO T 22. Test each cylinder to failure. Use a compression machine that automatically records the date, time, rate of loading, and maximum load of each cylinder. Include a printout of this information with the compressive strength documentation for each cylinder tested.

Compare the strengths of the 2 randomly selected cylinders and determine the 28-day average strength as follows:

- If the lower strength divided by the higher strength is 0.9 or more, average the 2 cylinders.
- If the lower strength divided by the higher strength is less than 0.9, break one additional cylinder and average the 2 higher strength cylinders.

3.8.4.3 Compressive Strength Evaluation

The compressive strength testing laboratory shall furnish the engineer with a copy of all tests reports. No less than one test for each 500 cubic yards of concrete for each class of concrete placed will be required, and in any event, not less than one test for each ½ day of placement for each class of concrete.

If the average 28 day compressive strength is less than 3250 psi or if either of the two 28 day cylinders has a compressive strength less than 3000 psi the engineer may direct the contractor to core the subject area of pavement to determine its structural adequacy and whether to direct removal. Cut and test cores according to AASHTO T 24 as and where the engineer directs. Have a certified technician perform or observe the coring. Fill all core holes with an approved grout, and provide traffic control during coring at the contractors expense.

The pavement is conforming if the compressive strengths of all cores from the represented area are 3000 psi or greater or the engineer does not require coring.

The pavement is nonconforming if the compressive strength of any core from the represented area is less than 3000 psi.

3.8.5 Air Content

3.8.5.1 Sampling and Testing

On each day of production, test air content at the point of placement at start-up and as frequently as practicable until the concrete meets the specifications and the production process is under control. Subsequently, test air content for each compressive strength test. Have a certified technician test air content according to AASHTO T 152. Test concrete taken from the same sample used for strength cylinders.

The target air content after applying the aggregate correction factor is 6%. The lower control limit is 4.5% and the upper control limit is 7.5%. Make every attempt to run at or above the target air content.

3.8.5.2 Documentation

Ensure that all test results are recorded and become part of the project records. Submit air content test results to the engineer on the compressive strength test reports.

If an individual air test is outside the control limits, notify the engineer, and perform additional air tests as often as it is practical on subsequent loads until the air content is inside the control limits. The material is nonconforming when an individual test exceeds the control limit. Material from the load with the first test exceeding the control limit, continuing to but not including the load with the first subsequent test within the control limits, is nonconforming.

3.8.6 Concrete Temperature

Have a certified technician measure concrete temperature according to AASHTO T 309 when concrete temperatures at the point of placement are subject to fall below 60 F. Test concrete taken from the same sample used for strength cylinders. Ensure that all test results are recorded and become part of the project records. Submit concrete temperature results on the compressive strength test reports.

3.8.7 **Slump**

Have a certified technician measure slump according to AASHTO T 119 for non slip-formed work. Test slump whenever an air content test is performed or cylinders are made.

Provide material conforming to the slumps specified in section 6.8.1.

4 **Materials**

4.1 **Portland Cement**

Use cement conforming to ASTM specifications as follows:

- Type I Portland cement; ASTM C 150.
- Type II Portland cement; ASTM C 150.
- Type III Portland cement; ASTM C 150, for high early strength.
- Type IS(X) Portland blast-furnace slag cement; ASTM C 595 up to a maximum 20% replacement.
- Type IP(X) Portland-pozzolan cement; ASTM C 595 up to a maximum 20% replacement, except maximum loss on ignition is 2.0 percent.

Use Portland cement included in the current WisDOT approved products list, provided they produce the required properties in the concrete.

The engineer will reject cement that is partially set or that contains lumps.

The engineer may reject cement if the temperature at the time of delivery to the mixer exceeds 165 F.

Submit a certified mill test report for all cement shipments used on the project.

4.2 **Fly Ash**

Provide fly ash conforming to ASTM C 618 Class C, except limit the loss on ignition to a maximum of 2 percent.

Use fly ash in Portland cement concrete manufactured by facilities and processes known to provide satisfactory material.

Submit a certified mill test report for all fly ash shipments used on the project.

4.3 **Ground Granulated Blast Furnace Slag**

Provide ground granulated blast furnace slag conforming to ASTM C 989, grade 100 or 120.

Use ground granulated blast furnace slag in Portland cement concrete manufactured by facilities and processes known to provide satisfactory material.

Submit a certified mill test report for all ground granulated blast furnace slag shipments used on the project.

4.4 **Pozzolans**

The contractor may use pozzolans as a direct and complete replacement for fly ash in concrete mixes. Do not combine pozzolans or use pozzolans with fly ash in the same mix.

Provide pozzolans conforming to the physical, chemical, and performance requirements specified for class C fly ash in ASTM C 618.

Use pozzolans in Portland cement concrete manufactured by facilities and processes known to provide satisfactory material. Obtain material from a manufacturer with an in-place quality management program that includes the following daily uniformity tests:

1. Specific gravity
2. Percent retained on the No. 325 sieve
3. Loss on ignition
4. Moisture content
5. Activity index with Portland cement.

4.5 Admixtures

4.5.1 General

Use admixtures included in the current WisDOT approved products list, provided they produce the required properties in the concrete.

The engineer must approve all admixtures not on the WisDOT approved products list before using them.

The engineer will base approval of admixtures on the evaluation of results of tests made in a qualified laboratory. The manufacturer shall furnish test result data. Provide to the engineer a manufacturer's certification that the materials it is furnishing are essentially identical to those used in the performance testing.

Stir, agitate, or circulate admixtures according to manufacturers' recommendations to insure a uniform and homogeneous mixture.

4.5.2 Air Entraining Admixture

Conform to AASHTO M 154

4.5.3 Retarding Admixtures

Conform to AASHTO M 194, type D.

4.5.4 Water Reducing Admixtures

Conform to AASHTO M 194, type A or type D, except if adding a retarding admixture use type D.

4.5.5 Non-Chloride Accelerating Admixtures

Conform to AASHTO M 194, type C or type E.

4.6 Evaporation Reducer

Provide water-born film forming evaporation reducers manufactured for application to fresh concrete.

4.7 Water

4.7.1 General

Use water with cement in concrete mixing operations conforming to the following:

Water obtained from a municipal supply or approved well to produce concrete may be accepted without testing.

Use water that is not brackish and is clean and free of detrimental amounts of oil, salts, acids, strong alkalis, organic matter, or other deleterious substances detrimental to concrete.

If supply sources are relatively shallow, enclose the suction pipe intake to keep out silt, mud, grass, and other foreign materials. Position the suction pipe to provide at least 2 feet (600 mm) of water beneath the pipe intake.

4.7.2 **Testing of Suspected Water Sources**

In the event the water supply is suspect the engineer may require the contractor to test the water source.

Test suspected water sources according to AASHTO T 26. Water shall comply with the following:

Acidity, maximum amount of 0.1N NaOH to neutralize 200 mL of water	2 mL
Alkalinity, maximum amount of 0.1N HCL to neutralize 200 mL of water	15 mL
Maximum sulphate ($S0_4$)	0.05 percent
Maximum chloride	0.10 percent
Maximum total solids organic	0.04 percent
Maximum total solids inorganic	0.15 percent

Test suspected water sources according to AASHTO T 106. Use water that causes no indication of unsoundness, no significant change in the time of setting, and varies no more than 10 percent in the strength of standard 2-inch mortar cube from strengths obtained with mixtures containing distilled water and the same cement and sand.

4.8 **Aggregates**

4.8.1 **General**

Supply aggregates from WisDOT approved aggregate sources. The WisDOT maintains a list of current aggregate source test results at:

http://www.atwoodsystems.com/materials/view_files.cfm.

Testing of aggregates shall conform to the following:

Sampling aggregates.....AASHTO T 2
Lightweight pieces in aggregate .....AASHTO T 113
Material finer than No. 200 (75 µm) sieve.....AASHTO T 11
Unit weight of aggregate.....AASHTO T 19
Organic impurities in sands .....AASHTO T 21
Sieve analysis of aggregates.....AASHTO T 27
Effect of organic impurities in fine aggregate.....AASHTO T 71
Los Angeles abrasion of coarse aggregate .....AASHTO T 96
Freeze-thaw soundness of coarse aggregate.....AASHTO T 103
Sodium sulfate soundness of aggregates.....AASHTO T 104
Specific gravity and absorption of fine aggregate .....AASHTO T 84
Specific gravity and absorption of coarse aggregate .....AASHTO T 85

Submit a copy of the aggregate source test results for the current year to the engineer and ensure they meet the durability requirements in section 4.8.3.2.

The engineer may prohibit using aggregates from any source, plant, pit, quarry, or deposit if the character of the material or method of operation makes it unlikely to furnish aggregates conforming to specified requirements; or from deposits or formations known to produce unsound materials.

Store aggregates from different sources of supply or with different gradation requirements in separate piles to prevent mixture until proportioned into each batch.

4.8.2 Fine Aggregate

Fine aggregate consists of a combination of sand with fine gravel, crushed gravel, or crushed stone consisting of clean, hard, strong, durable inert particles from natural deposits. Fine aggregates entirely pass the 3/8-inch sieve, almost entirely pass the No. 4 sieve and are predominantly retained on the No. 200 sieve.

4.8.2.1 Deleterious Substances

Do not exceed the following percentages of deleterious substances:

SUBSTANCE	PERCENT BY WEIGHT
Material passing the No. 200 sieve	3.5
Coal	1.0
Clay lumps	1.0
Shale	1.0
Other deleterious substances like alkali, mica, coated grains, soft and flaky particles	1.0

The total percentage of coal, clay lumps, shale, and other deleterious substances shall not exceed 3.0 percent by weight. There is no requirement to wash fine aggregate for Portland cement concrete if produced otherwise to conform to all specified requirements. When used, the fine aggregate shall not contain any of the following: frozen material, and foreign material like wood, hay, burlap, paper, or dirt.

4.8.2.2 Organic Impurities

Fine aggregate shall not contain harmful amounts of organic impurities. The engineer will reject aggregates, subjected to the colorimetric test for organic impurities, producing a darker than standard color, unless they pass the mortar strength test.

4.8.2.3 Mortar Strength

Fine aggregates, if tested for the effects of organic impurities on strength of mortar, using type I cement, must produce a relative strength at 7 days, calculated according to section 8 of AASHTO T 71, of not less than 95 percent.

4.8.2.4 Gradation Requirements

Use well-graded fine aggregate conforming to the following gradation requirements:

FINE AGGREGATE GRADING REQUIREMENTS	
SIEVE SIZE	PERCENT PASSING BY WEIGHT
3/8 Inch	100
No. 4	90 – 100
No. 16	45 – 85
No. 50	5 – 30
No. 100	0 – 10

4.8.3 **Coarse Aggregates**

Coarse aggregate consists of clean, hard, durable gravel, crushed gravel, crushed stone or crushed concrete free of an excess of flat & elongated pieces, frozen lumps, vegetation, deleterious substances or adherent coatings considered injurious. Coarse aggregates are predominantly retained on the No. 4 sieve

4.8.3.1 Deleterious Substances

Do not exceed the following percentages of deleterious substances:

SUBSTANCE	PERCENT BY WEIGHT
Coal	1.0
Shale	1.0
Clay Lumps	0.3
Soft fragments	4.0
Any combination of above	4.0
Materials passing the No. 200 sieve	1.5
Unsound chert retained on 3/8 inch sieve with BSG (SSD basis) less than 2.45	3.0
Flat and elongated pieces based on a 3:1 ratio	15.0

If using 2 sizes of coarse aggregates determine the percentages of harmful substances based on the actual percent of size No. 1 and No. 2 used in the work.

The engineer will not require the contractor to wash coarse aggregate produced within specified gradations, free of coatings considered injurious, and conforming to the above limits for harmful substances.

4.8.3.2 Aggregate Source Durability Requirements

Aggregate Wear (AASHTO T 96): Loss by abrasion and impact shall not exceed 50 percent by mass.

Aggregate Soundness (AASHTO T 104): The weighted average sodium sulfate loss shall not exceed 12 percent by mass.

Freeze-thaw (AASHTO T 103): The weighted average loss shall not exceed 18 percent by mass.

4.8.3.3 Gradation Requirements

Use well graded coarse aggregate conforming to the following gradation requirements:

COARSE AGGREGATE GRADATION REQUIREMENTS		
SIEVE SIZE	PERCENT PASSING BY WEIGHT SIZE No. 1 (AASHTO M 43, Size No. 67)	PERCENT PASSING BY WEIGHT SIZE No. 2 (AASHTO M 43, Size No. 4)
2 inch	---	100
1 1/2 inch	---	90 – 100
1 inch	100	20 – 55
3/4 inch	90 – 100	0 – 15
3/8 inch	20 – 55	0 – 5
No. 4	0 – 10	---
No. 8	0 – 5	---

Proportion the total coarse aggregate quantity between size No. 1 and size No. 2 as necessary to secure suitable workability and ensure that it is within the range of 35 – 65 percent of size No. 1. If the engineer approves the contract may provide coarse aggregate consisting entirely of size No. 1.

In lieu of providing size No. 1 and size No. 2 coarse aggregates provide a single well graded coarse aggregate with suitable workability conforming to the following gradation requirements:

ALTERNATIVE COARSE AGGREGATE GRADATION REQUIREMENT	
SIEVE SIZE	PERCENT PASSING BY WEIGHT
2 inch	100
1 inch	90 – 100
3/4 inch	60 – 80
1/2 inch	35 – 60
3/8 inch	20 – 45
No. 4	0 – 25
No. 8	0 – 15

4.9 Reinforcing Steel

4.9.1 Welded Steel Wire Fabric

Use a fabric of the weight and design the plans show and conform to AASHTO M 55.

4.9.2 Dowel Bars and Tie Bars

4.9.2.1 General

Furnish coated bars conforming to AASHTO M 31, grade 40 or 60. Ensure that the bars are the diameter and length the plans show.

The contractor need not coat or patch sawed ends, sheared ends, cut ends, ends left bare during the coating process, or ends with damaged coating.

4.9.2.2 Dowel Bars

Coat dowel bars with a thermosetting epoxy conforming to AASHTO M 254, type B. The Concrete Reinforcing Steel Institute must certify the coating applicator's plant. Ensure that the bars are straight, round, smooth, and free from burrs or other deformations detrimental to the free movement of the bar in the concrete.

Apply a surface treatment, or furnish manufacturer treated bars, capable of preventing bond between the epoxy-coated bars and the concrete. Apply field surface treatments when loading bars in the dowel bar magazine or after staking the dowel basket to the grade.

4.9.2.3 Tie Bars

Coat tie bars conforming to AASHTO M 284. The Concrete Reinforcing Steel Institute must certify the coating applicator's plant.

4.9.2.3.1 Coating Material

Use a powdered epoxy resin located on the WisDOT approved list.

The epoxy resin manufacturer shall supply to the coating applicator, any information on the resin it considers essential to the resins proper use and performance as a coating. The resin manufacturer shall

also furnish written certification that the material is the same formulation and quality as the material supplied for prequalification tests.

The epoxy resin manufacturer shall provide patching or repair material, compatible with the coating and inert in concrete. This material shall be suitable for repairing areas of the coating damaged during fabrication or handling in the field

4.9.2.3.2 Certification

Furnish a certificate of compliance for the surface preparation, coating material, and process.

4.10 Expansion Joint Filler

Furnish expansion joint filler conforming to AASHTO M 153 or AASHTO M 213.

Furnish the filler in lengths equal to the width of the pavement lanes, and to the thickness and height that the plans show. If dowel bars are required, use filler with clean-cut punched holes, not greater than 1/8 inch larger in diameter than the nominal size of the dowel bar the plans require.

4.11 Curing Agents

In areas as noted on the plans or for urban pavements, curb and gutter and sidewalk furnish liquid membrane-forming curing compounds composed of a blend of boiled linseed oil and high viscosity, heavy bodied linseed oil emulsified in a water solution conforming to AASHTO M 148, type 2. Test material at an application rate of 1 gallon per 200 square feet. The drying time requirements shall be waived. The chemical requirements (volumes are exclusive of added pigments) are as follows:

Oil phase (50+/- 4% by volume) (Percent by Mass)
Boiled Linseed Oil…….. 80
Z-8 Viscosity Linseed Oil……..20
Water phase (50 +/- 4% by volume)……..100

In areas as noted on the plans or for rural mainline pavements furnish poly-alpha-methylstyrene membrane-forming curing compounds, conforming to AASHTO M 148, type 2, class B as modified below. Test material at an application rate of 1 gallon per 200 square feet.

Total Solids (% by weight of compound)……..42 Minimum
% Reflectance in 72 hours (ASTM E1347)……..65 Minimum
Loss of Water, kg/m^2 in 24 hours (ASTM C156)……0.15 Maximum
Loss of Water, kg/m^2 in 24 hours (ASTM C156)……0.40 Maximum
VOC content (g/L)…….350 Maximum
Infrared Spectrum, Vehicle……..100% alpha methylstyrene

Furnish polyethylene sheeting conforming to AASHTO M 171 for clear or white opaque polyethylene film.

Furnish burlap conforming to AASHTO M 182, class 3 or 4. The contractor may use 2 layers of class 1 or class 2 instead of one layer of class 3 or class 4.

Furnish polyethylene-coated burlap conforming to AASHTO M 171 for white burlap-polyethylene sheets.

4.12 Epoxy

Furnish epoxy consisting of a 2-component epoxy material of contrasting colors and conforming to AASHTO M 235, grade 3 - non-sagging consistency, type IV epoxy, except as modified below:

1. Use class B material for mid-depth slab temperatures between 41 F and 61 F (5 C and 16 C).

2. Use class C material for mid-depth slab temperatures between 61 F (16 C) and the highest temperature allowed by the manufacturer of the product.

Bond strength, tensile strength, and elongation testing is not required.

Achieve minimum compressive yield strength of 5000 pounds per square inch at 3 days for grades A and C concrete. Test according to AASHTO M 235 and ASTM D 695, with the following restrictions:

1. Mold and cure compressive test specimens in cylinders with a one-inch nominal diameter.
2. Machine specimen ends square to produce a final specimen length of 2 inches.

Submit to the engineer a manufacturer's certification showing that the product conforms to all above requirements. Clearly identify the temperature classes and compressive strength cure times for which the product is certified.

5 Concrete Mix Requirements

5.1 General

For all concrete provide air entrainment and a water reducing admixture. Prepare air entrained concrete with sufficient air entrainment admixture to produce concrete with the required air content. Do not use chloride based accelerators in mixes for all new construction.

5.2 Grades and Classes

For concrete pavement and incidental construction use grades A, A-FA, A-S, A-T, A-IS, and A-IP air entrained concrete. Prepare air entrained concrete with type I, II, IS(X), or IP(X) cement except as specified in Special Restrictions 5.2.1.

For high early strength concrete pavement, and concrete pavement repair use Grade C, C-FA, C-S, C-IS and C-IP air entrained concrete. Prepare air entrained concrete with type I, II, III, IS(X), or IP(X) cement.

5.2.1 Special Restrictions

If using coarse aggregate composed primarily of igneous or metamorphic materials, provide Grade A, A-FA, A-S, and A-T concrete using type II Portland cement or Grade A-IS and A-IP concrete using type I/II blended Portland cement. Note the type/classification of aggregates on the Mix report.

5.3 Standard Concrete Mix

5.3.1 General

The contractor may elect to use concrete mixes listed under this section. When choosing this alternate, the contractor is responsible for mix performance just as if the contractor provided independent mix designs.

Provide mix documentation ensuring that all materials are conforming unless the engineer waives specific requirements. Ensure that the mix limits, including aggregate gradations in accordance with section 4.8.3.3, are within the standard concrete mix master limits. Include documentation for the original mix designs as follows:

1. Mix: quantities per cubic yard expressed as SSD weights and net water, water to cementitious material ratio, and air content.
2. Materials: type, brand, and source.
3. Aggregates: type/classification, absorption, specific gravities, wear, soundness, freeze thaw, air correction factor, and proposed gradation control limits.

5.3.2 **Standard Concrete Mix Master Limits**

The following table specifies the standard concrete mix master limits for several grades of concrete, and designates the quantities of materials and relative proportions for each grade of concrete.

The quantities of aggregates specified in the tabulations are for oven-dry materials with a bulk specific gravity of 2.65. For aggregates with a different specific gravity, adjust the weights in the ratio so that the specific gravity of the material used relates to 2.65. The tabulated design water and maximum water amounts are for total free water in the mix and do not include the water absorbed in the aggregate.

STANDARD CONCRETE MIX MASTER LIMITS
QUANTITIES FOR A NOMINAL CUBIC YARD [1]

GRADE	CEMENT (lb)	CLASS C FLY ASH (lb)	SLAG (lb)	WEIGHT TOTAL AGG. (lb)	PERCENT FINE AGG. [4] (% Total Agg.)	DESIGN WATER (gals)	MAX. WATER (gals)
A	565	---	---	3120	30 – 40	27	32
A-FA [5]	455	110	---	3080	30 – 40	27	32
A-S [5]	455	---	110	3100	30 – 40	27	32
A-T [6]	455	Fly Ash and Slag = 110		3090	30 – 40	27	32
A-IS [2]	565	---	---	3090	30 – 40	27	32
A-IP [3]	565	---	---	3100	30 – 40	27	32
C	660	---	---	2980	30 – 40	30	36
C-FA	560	100	---	2960	30 – 40	30	36
C-S	560	---	100	2970	30 – 40	30	36
C-IS [2]	660	---	---	2950	30 – 40	30	36
C-IP [3]	660	---	---	2970	30 – 40	30	36

[1] A nominal cubic yard has the tabulated weights of cement and aggregate, design mix water and 6% air.
[2] For Grades A-IS and C-IS use only IS(X) cement up to a maximum of 20% replacement.
[3] For Grades A-IP and C-IP use only type IP(X) cement up to a maximum of 20% replacement.
[4] If using crushed stone the engineer may allow up to 45% fine aggregate.
[5] If using less than the tabulated maximum quantities of fly ash or slag, calculate the cement content by reducing the base cement content for the grade A mix by the weight of fly ash or slag added.
[6] For ternary mixes containing cement, fly ash, and slag, if using less than the tabulated maximum combined quantity of fly ash and slag, calculate the cement content by reducing the base cement content for the grade A mix by the combined weight of fly ash and slag added.

The total coarse aggregate quantity equals the difference between the total aggregate and the fine aggregate.

Provide a mix design based on the master limits, adjusted as necessary for the specific gravities of the aggregate furnished, using the lowest quantity or percentage of fine aggregate within the range shown that, without exceeding the maximum quantity of water allowed, yields a mix of the necessary workability.

The difference between the amount of fine aggregate determined above and the total amount of aggregate equals the coarse aggregate proportioned between the 2 sizes within the limits set, except if only one size is required. If the character of the proposed aggregates prohibits producing a workable mix within the maximum fine aggregate and water limits, then reduce the total quantity of aggregates sufficiently and re-proportion the mix to produce a workable mix without exceeding the maximum water allowed. The amount of water allowed includes the free moisture in the aggregates, minus the absorbed moisture determined according to AASHTO T 84 and T 85. Use just the amount of water needed, without exceeding the maximum that produces a mixture of the consistency, plasticity, and workability required for the work.

These requirements do not guarantee yield.

5.4 Contractor Concrete Mix

5.4.1 General

The contractor may elect to use independent contractor mix designs for concrete. When choosing this alternate, the contractor is responsible for mix performance.

Provide mix design documentation ensuring that all materials are conforming, unless the engineer waives specific requirements. Include documentation for contractor mix designs as follows:

1. Mix development: test dates, the name and location of the laboratory used to develop the mix design.
2. Mix: quantities per cubic yard expressed as SSD weights and net water, water to cementitious material ratio, air content and 28-day or earlier compressive strength.
3. Materials: type, brand, and source.
4. Aggregates: type/classification, absorption, specific gravities, wear, soundness, freeze thaw, air correction factor, and proposed gradation control limits.

5.4.2 Physical Requirements

Use at least 5 pairs of cylinders to demonstrate the compressive strength of a mix design. The contractor may report strengths from either laboratory testing or previous field test data for a similar mix design. Ensure that the average compressive strength achieved, in 28-days or less, by the 5 pairs of cylinders is 4200 psi or greater. The contractor need not provide separate laboratory mix designs and compressive strength tests for high early strength concrete.

Provide a minimum cement content of 565 pounds per cubic yard.

The contractor may partially replace Portland cement with fly ash, slag, or a combination of fly ash and slag at a replacement ratio in pounds of 1:1 up to a maximum Portland cement replacement content of 20% of the total cementitious material.

The target ratio of net water to cementitious material (W/Cm) for the submitted mix design shall not exceed 0.42 by weight. Net water includes free water on the aggregate surface but does not include water absorbed within the aggregate particles.

Provide high early strength concrete, use type III cement or a non-chloride accelerating admixture. Alternatively, the contractor may add a minimum of an additional 95 pounds of Portland cement per cubic yard of concrete to a previously accepted mix.

5.5 Admixtures

5.5.1 General

Dispense admixtures in liquid form only. Incorporate non-liquid admixtures in an aqueous solution according to the manufacturer's instructions before dispensing. Maintain admixtures at uniform concentration. The contractor is responsible for the uniform operation of the admixture and for its compatibility with other mix components and any other admixture used.

5.5.2 Air Entrainment

Add an air entraining admixture to all grades of concrete. Use an admixture with non-air entrained Portland cement to produce air entrainment. Ensure that the concrete air content is 6 percent plus or minus 1.5 percent.

Perform air content tests on freshly produced concrete according to AASHTO T 152.

5.5.3 **Set Retarder**

If the contractor elects to extend delivery time for ready mixed concrete use admixtures to retard concrete setting as follows:

1. Add to the concrete mix if the air temperature when placing the concrete is 60 F or above.
2. Add according to the manufacturer's instructions to obtain at least a one-hour delay in the initial set, as defined in AASHTO T 197, at the temperature during placement.

5.5.4 **Water Reducer**

Add a water reducing admixture to all grades of concrete. Determine the specific type and rate of use based on the atmospheric conditions, the desired properties of the finished concrete and the manufacturer's recommended rate of use. The actual rate of use shall at least equal the manufacturer's recommended rate.

6 Construction

6.1 **Batching and Mixing Equipment**

6.1.1 **Batch Plant**

Use automatic or semi-automatic batching plants conforming to AASHTO M 157

Use either beam, digital or springless dial-type scales for weighing concrete ingredients.

After erection, test each batch plant before use. Fully load aggregate bins, batchers, and scales with aggregate for not less than 5 hours before testing, in order to allow for settlement and adjustment under working conditions.

Have an authorized testing firm test and certify the weighing and metering equipment. Provide a copy of the certificate to the engineer.

6.1.2 **Mixers**

Use a central-mix plant or truck mixers conforming to AASHTO M 157. Operate all equipment within the manufacturer's recommended capacity to produce concrete of a uniform consistency.

Equip stationary mixers with a timing device that automatically locks the discharge mechanism during the full mixing time and releases it at the end of the mixing period.

6.1.3 **Admixture Dispensing Equipment**

Use accurate, volumetric, mechanical measuring dispensers, capable of presetting to deliver a specified amount of admixture for each admixture. Use a dispensing system with a device that either detects and indicates the presence or absence of flow of the admixture, or provides a convenient means of visually observing the admixture during batching or discharging. Ensure that the dispenser piping is free from leaks and properly valved to prevent back flow or siphoning.

Ensure that the system is capable of dispensing the admixture within +/- 3.0 percent of the required volume or weight of admixture, or the minimum dosage rate per 100 pounds (45.4 kg) of cement, whichever is greater.

6.2 Paving Equipment

6.2.1 Slip-form Machine

Use self-propelled slip-form paving machine designed to spread, strike off, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine to produce a dense and homogeneous pavement requiring minimal hand finishing. Slip-form paving machines extrude concrete into a shape using attached molding components consisting of a profile pan and side forms. Equip the slip form paving machine with the following:

1. Automatic controls to control line and grade from either or both sides of the machine.
2. Vibrators to consolidate the concrete for the full width and depth of the course placed in a single pass, and designed and constructed so no spreading or appreciable slumping of the concrete occurs.
3. A positive interlock system to stop all vibration and tamping elements when forward motion of the machine stops.
4. A mechanical device that accurately spaces and positions the required tie bar reinforcement and that allows satisfactory mechanical or manual tie bar insertion.

Use a concrete spreader, ahead of a slip-form paver that cannot otherwise satisfactorily spread, consolidate, or finish the concrete.

The contractor may use finishing machines that do not conform to these requirements but are specifically designed for finishing concrete pavement to finish minor amounts of concrete pavement with the engineer's written permission. These machines must produce equivalent results including adequate consolidation by internal vibration and an acceptable finish.

6.2.2 Paving Vibrators

For full width and depth consolidation of concrete pavement use internal immersed tube or multiple spud gang vibrators. Operate internal type vibrators at frequencies within 5000-8000 impulses/minute.

To consolidate concrete pavement that is adjacent to forms, joints, or fixtures, use single spud type internal vibrators. Operate the vibrator at a minimum frequency of 7000 impulses per minute.

6.2.3 Screeds

Use air vibrated, or mechanically vibrated truss screeds designed for striking off manual fixed-form concrete pavement conforming to the proper cross section.

Roller screeds may be used to strike off hand-form concrete pavement upon approval by the engineer. Consolidate concrete using single spud type internal vibrators ahead of roller screeds.

6.2.4 Saws

Furnish concrete saws that are capable of sawing new concrete. Equip all saws with blade guards and guides or devices to control alignment and depth.

6.2.5 Forms

Provide steel edge forms designed and constructed with proper side and base supports to ensure rigidity and capable of supporting the type of equipment used to finish the concrete. Use straight forms free from warping with sufficient strength to resist concrete pressure without bulging. Use forms that are clean and in acceptable condition.

Steel forms are readily available for various pavement thicknesses in even 2 inch increments. Provide steel forms with a vertical face height greater than or equal to the specified pavement edge thickness minus 1 1/2 inches.

Wood or plastic forms may be used for forming fillets, widening at intersections, curves less than 100-foot radius, and other minor construction.

6.2.6 **Finishing Tools**

Furnish aluminum, magnesium or wooden hand finishing tools. Avoid the use of steel hand finishing tools on air entrained concrete.

6.3 **Foundation**

6.3.1 **General**

Trim and shape the foundation for a width equal to the width of the pavement plus at least one foot on each side to approximately the required lines, grade, and cross-section. After trimming and shaping the foundation uniformly re-compact to not less than the required density for standard compaction of earth subgrade, subbase, or base. Perform compaction with suitable rolling or other types of consolidating equipment.

For areas of the foundation that are impractical to prepare by machine methods, prepare these areas by hand methods satisfactory to the engineer.

Before placing concrete, repair and re-compact rutted or disturbed areas of the foundation resulting from hauling or paving operations.

Ensure that the foundation is in a moist condition during concrete placement. Thoroughly dampen the foundation in advance of the paving operation. If the surface dries before concrete is placed sprinkle additional water ahead of the paving operation to dampen the foundation.

6.3.2 **Slip-form Methods**

If using slip-form methods, after satisfactorily compacting the base, bring the areas that support the slip-form paver to the required grade and the areas where the pavement will be placed to the required grade and cross-section by using a machine designed specifically for trimming foundations. Equip the machine with automatic sensors to trim the foundation to the required grade and cross-section when practical.

6.3.3 **Manual Fixed-Form Methods**

After preparing the foundation set the forms according to the requirements specified for this work. Bring the foundation to true cross-section and elevation. Fill all depressions with suitable material, and remove excess material immediately after cutting. Dispose of excess material beyond the forms in a manner that does not interfere with concrete placing and finishing operations.

Check foundation stability under forms which were placed prior to a rain event.

6.4 **Setting Forms**

Set forms to the required grade and alignment. Firmly support and anchor forms in a manner to prevent movement.

Key-in or firmly support forms to the required grade when using forms with a vertical face height greater than or equal to the specified pavement edge thickness minus 1 1/2 inches. After setting the forms

ensure that the interface between the form face and the pavement is reasonably square and any necessary foundation corrections are compacted.

Check that forms conform to alignment and grade, and make necessary corrections before placing the concrete. If a form has been disturbed, reset and recheck the form.

6.5 Handling Materials

6.5.1 Aggregates

Keep all materials required to manufacture concrete clean and free from contamination. Keep the fine aggregate and the coarse aggregates separate until measuring and placing in the batch. Keep aggregates from different supply sources in separate piles.

If using a composite material from 2 or more sources for any aggregate, proportion material from the respective sources separately into the batch by weight.

Store aggregates in stockpiles. After washing, allow aggregates to drain in stockpiles for periods that ensure reasonable uniformity in the moisture content prior to loading in proportioning bins.

Choose reasonably smooth, firm, and well-drained sites for aggregate stockpiles cleared of vegetable matter and foreign material that might contaminate the aggregates. Separate aggregate stockpiles to prevent aggregates from becoming intermixed.

Construct coarse aggregate stockpiles in a manner that minimizes segregation of the coarse and fine fractions.

Utilize proper load out techniques when transporting aggregates from stockpiles to proportioning bins to avoid segregation and contamination of the aggregates.

6.5.2 Cement

Handle bulk cement in a manner that precludes contamination and avoids loss.

Store cement of different types, brands, and sources separately. Store bulk cement in suitable bins with smooth inner surfaces.

6.5.3 Fly Ash or Slag

Use separate facilities equal to those used for Portland cement for handling, storing, transporting, and conveying the fly ash or slag

6.6 Proportioning and Batching

Proportion and measure aggregates and cement by weight.

Measure water by volume or weight. Use water-measuring equipment capable of accurately measuring to within one percent of the quantity required for each batch. Ensure that the measurement accuracy is uniform under all construction conditions and that variations in pressure in the water supply line do not affect it.

Proportion and measure admixtures by volume or weight. If using more than one admixture, add each admixture in a manner that prevents intermixing the admixtures before incorporating into the mixture.

6.7 **Mixing and Delivery**

6.7.1 **General**

Use central- mixed or truck-mixed to produce ready-mixed concrete defined as follows:

1. Central-mixed concrete: Concrete completely mixed in a stationary mixer and transported to the point of delivery with or without mechanical agitation in the transporting vehicle.
2. Truck-mixed concrete: Concrete completely mixed in a truck mixer

Use stationary mixers, or truck mixers of the revolving drum type or other types specifically designed for mixing. For agitators, use truck mixers or truck agitators. The manufacturer shall attach in a prominent place, to each stationary mixer, truck mixer, or truck agitator a metal plate plainly marked with the various uses of the equipment, the drum or container capacity in volume of mixed concrete, and the rotation speed of the mixing drum or blades.

Do not incorporate water used to clean mixing equipment and accessories into the mix.

Provide a computer-printed batch ticket which includes load and truck identification, the actual batch weights of all materials in that load, the mixing time for central plant mixed concrete or the start of the batch life for truck mixed concrete, and other pertinent data. Submit batch tickets to the engineer upon arrival at the work site.

The engineer may accept concrete used in pavement and associated bid items based on daily production records, if the concrete is proportioned in a computer-controlled plant erected specifically for this purpose. Submit computer printed batch records for a day's production to the engineer in a single group at the end of the work day.

The engineer may accept minor quantities of ready-mixed concrete used in miscellaneous bid items without batch tickets

6.7.2 **Central-Mixed**

If using a stationary mixer to mix concrete, mix at least one minute, provided that plant operating procedures are reasonably stabilized and controlled, and that it achieves visible blending of materials during charging. Increase mixing time if necessary to achieve proper stabilization, control and blending. Do not exceed a mixing time of two minutes.

Blending implies a uniform volume of flow of all batch ingredients throughout the charging time interval, except for the brief introduction of water and coarse aggregate.

For stationary mixers do not exceed the manufacturer's rated maximum mixing capacity, for the type and volume of mixer used.

6.7.3 **Truck-Mixed**

If mixing concrete in a truck mixer, mix each batch for 70 or more revolutions at the manufacturer designated mixing speed. Do not exceed 300 total revolutions per batch, the sum of the revolutions at mixing and agitating speeds including any re-tempering revolutions. Begin mixer revolutions only after all materials, including mixing water are in the mixer.

Add the mixing water at the batching plant. Re-tempering is permitted once per load if obtaining the specified slump requires more water. Re-tempering is the process of adding more water and remixing of concrete which has started to stiffen. When re-tempering, do not exceed the maximum water allowed or maximum water–cementitious ratio allowed for the specific mix.

If re-tempering, perform an additional 30 revolutions of the truck mixer at mixing speed before discharging any concrete. Re-tempering must happen within the following limits, beginning when adding water to the cement, or when adding cement to the aggregates.

1. 45 minutes if the air temperature is 60 F (16 C) or higher at placement, and the contractor does not use an approved retarder.
2. 75 minutes if the air temperature is less than 60 F (16 C) at placement.
3. 75 minutes if the air temperature is 60 F (16 C) or higher at placement, and the contractor uses an approved retarder

Equip truck mixers with an approved revolution counter. Unless equipped to control and count revolutions at mixing speed, perform mixing at the batching plant or job site with the mixer operated at agitating speed while in transit.

For truck mixers do not exceed the manufacturer's rated maximum mixing capacity, for the type and volume of mixer used.

6.7.4 **Delivery**

Deliver ready-mixed concrete at a uniform rate that ensures reasonably continuous progress in the placing and finishing operations with no concrete achieving initial set before placing adjacent concrete. If the time interval between successive loads causes initial set of previously placed concrete provide additional equipment of the kind necessary to preclude these delays. Minimize re-handling of the concrete.

For ready-mixed concrete deliver and completely discharge the concrete within the following limits, beginning when adding water to the cement, or when adding cement to the aggregates.

1. Agitator body with paddles not constantly rotating and Non-agitating body:
   - 45 minutes
2. Agitator body with paddles constantly rotating and truck mixers:
   - 1 hour if the air temperature is 60 F (16 C) or higher at placement, and the contractor does not use an approved retarder.
   - 1.5 hour if the air temperature is less than 60 F (16 C) at placement.
   - 1.5 hour if the air temperature is 60 F (16 C) or higher at placement, and the contractor uses an approved retarder

Except during the mixing revolutions, operate the drum or agitator of the vehicle at agitating speed until discharging the mix. Ensure the concrete’s uniform composition, required consistency, and required air content at time of delivery.

The contractor may deliver central-mixed concrete to the work site by equipment with non-agitating body types. These body types are smooth, mortar-tight, metal containers capable of discharging the concrete at a satisfactorily controlled rate. Do not use aluminum bodies.

Concrete delivered with non-agitating body types should show no appreciable water gain at the surface. The concrete should freely and readily discharge from the vehicle, be free of excessive segregation of the fine and coarse aggregates, and have air content within the required range at the point of discharge.

6.8 **Consistency**

Maintain a uniform consistency in consecutive batches of concrete, with all ingredients uniformly distributed throughout the weight, and so that the mortar clings to the coarse aggregate. Concrete shall not have a consistency sufficiently wet so it flows and segregates, or a mealy, dry consistency.

Use the minimum amount of water that achieves the desired workability.

6.8.1 **Slump**

Perform slump tests according to AASHTO T 119 for non slip-formed work. Slumps for non slip formed work shall be 4 inches or less.

6.9 **Placing, Consolidating and Finishing Concrete**

6.9.1 **General**

Uniformly dampen the prepared foundation before paving. Do not place concrete on frozen subgrade or base.

Deposit concrete on the foundation from the mixer or hauling equipment across the full width of the pavement in a manner that minimizes required spreading and minimizes segregation in the concrete mix.

Adjust and set castings and frames for manholes, catch basins, inlets, and other fixtures to the required alignment and grade while the adjacent concrete is still plastic.

Thoroughly and uniformly vibrate and consolidate the concrete during placement without segregating the material. Use handheld internal vibrators along forms and around embedded objects, including dowel baskets and utility fixtures to prevent the formation of voids and to fill openings between the bases of the fixtures and their support structures.

The contractor may set the castings and frames for manholes, catch basins, and inlets, on a full bed of mortar or concrete and adjust to the required alignment and grade before placing concrete. The contractor may also use an engineer-approved non-shrink pressure grout to fill all remaining voids beneath the base of these fixtures before opening the adjacent pavement to traffic.

Continuously place concrete between transverse joints, do not use intermediate bulkheads. If a temporary shutdown occurs, cover the concrete at the unfinished end of the slab with wet burlap. Install a construction joint if an interruption exceeds 30 minutes or is long enough that the concrete deposited attains its initial set. Do not place sections of pavement less than 10 feet (3 m) in length between joints.

Deposit concrete at joint installations so as not to displace or disarrange the installations. Completely fill joint assemblies with concrete. Simultaneously place concrete on both sides of expansion joints. Deposit the concrete at and in advance of contraction joint assemblies to preclude the formation of segregated or laitance-bearing concrete in the assembly.

When placing concrete adjacent to previously constructed pavement, provide that part of the equipment supported on the previously constructed pavement with protective pads, crawler tracks, or rubber-tire wheels and operate a sufficient distance from the edge of the pavement to avoid breaking the pavement edge. Do not operate this equipment on the pavement surface until opening to service requirements have been met.

Strike off and screed the concrete to the crown and cross section the plans show, as soon as placed. When properly consolidated and finished, the surface of the pavement shall be at the required grade elevation and free from porous areas.

Keep hand finishing efforts on the surface to a minimum to avoid over finishing. Hand-float the surface only as needed to produce a uniform surface, and sharp corners; do not use excess mortar to build up slab edges or round the slab corners. Before the concrete's initial set, work the pavement edges along each side of transverse isolation joints, formed joints, transverse construction joints, and fixed forms to produce a 1/4-inch continuous radius and a smooth, dense mortar finish.

Check the surface of the fresh concrete with a long-handled straightedge that is10 ft or longer. Remove high areas indicated by the straightedge. Overlap each successive pass of the straightedge by about 1/2

the length of the straightedge. Fill any depressions immediately with freshly mixed concrete, and strike off, consolidate, and refinish the concrete. Also, strike off and refinish all projections.

If moving or operating paving equipment on concrete bridge decks, asphaltic pavement, or concrete pavements, employ appropriate means to prevent damage to the bridge decks or pavements.

6.9.2 **Slip-Formed Pavement**

The use of a self propelled slip-form paving machine is required for the placement of all mainline pavements with the exception of paving gaps, small pours, and irregular shaped areas as approved by the engineer.

Operate slip form paving equipment with a continuous forward movement, as practicable, and coordinate mixing, delivering, and spreading concrete to provide uniform progress.

Carry a sufficient amount of concrete forward ahead of the paver. Minimize starting and stopping the paver. Vibrate the concrete, either externally or internally, with sufficient intensity to consolidate it throughout its entire width and depth. If it is necessary to stop the forward movement of the paver, stop vibrating and tamping immediately, and restart when forward motion resumes.

Vibrate concrete adjacent to transverse construction joints with hand vibrators.

When constructing pavement by the slip-form method, the engineer will allow an edge slump tolerance of 3/8 inch at locations with no adjacent concrete construction; and an edge slump tolerance of 1/8 inch at locations with adjacent concrete construction. Correct edge slump in excess of these requirements before the concrete sets.

6.9.3 **Manual Fixed-Formed Pavement**

In irregular areas or areas inaccessible to self-propelled slip-form paving equipment, construct the pavement using fixed forms.

Use single spud hand vibrators to consolidate the concrete along the full length of all transverse joint assemblies. Vibrate to a depth that consolidates the concrete above and below the dowel bars and assembly.

Use single spud hand vibrators on concrete adjacent to all transverse construction joints, forms, and fixtures to prevent voids.

Supplemental vibration with hand held spud vibrators is required when placing concrete thicker than 5-inches when using a vibratory screed and is always required when using a roller screed. Insert vibrators using vertical plunges leaving the vibrator head inserted for 5 – 15 seconds to properly consolidate the concrete. Do not drag spud vibrators through the concrete nor attempt to move the concrete laterally.

Use surface type vibratory screeds for hand strike-off and to supplement internal vibration. Do not over vibrate if using the internal spud vibrator and the vibratory screed. If using vibratory screeds, first spread and partially level the concrete with shovels, a straightedge or other means, allow sufficient material above the forms for consolidation, then operate the vibrator with the screed moving forward, sliding on the forms, with a uniform amount of concrete in front of it for the full width of the pour. Maintain a sufficient amount of concrete, during operations, in front of the screed to fill all voids or low areas. Do not allow excessive amounts of concrete to accumulate in front of the screed, causing the concrete to surge under the screed, or produce ridges or waves in the surface. Do not make more than 2 passes of the vibratory screed on a given area of concrete. Regulate the speed of the forward movement of the screed, and the speed of the vibrator, to produce the best results. Do not vibrate the concrete with the screed in a stationary position.

6.10 **Reinforcement**

Reinforce the concrete if and as the plans specify. Keep reinforcement clean and free from rust scale, straight and free from distortion

When dowel bars are required align dowels vertically and horizontally within the following tolerances:

1. Locate the dowel bars within one inch of the planned transverse location and depth.
2. Locate the dowel bars within 2 inches of the planned longitudinal location.
3. Place dowel bars parallel to the pavement surface and centerline within a tolerance of 1/2 inch in 18 inches.
4. Provide a minimum embedment length of 6 inches on either side of the joint.

If using a mechanical device to install dowel bars when required, conform to the following:

1. Place and consolidate the pavement to full depth before inserting the dowel bars.
2. Insert the dowel bars into the plastic concrete in front of the finishing beam or screed.
3. Ensure that the installing device consolidates the concrete with no voids around the dowel bars.
4. Do not interrupt the forward movement of the finishing beam or screed while inserting the dowel bars.
5. Provide a positive method of marking the locations of the transverse joints.

Place dowel bars for contraction joints if required at the location, depth and spacing shown on the plans. Fasten the dowels to rigid baskets or insert them while the concrete is plastic.

When dowel bar baskets are used to hold dowel bars in the correct position and alignment use an engineer approved rigid basket. The contractor need not cut dowel basket tie wires. Fasten dowel baskets securely to the foundation using stakes or nails.

Place dowel bars for transverse construction joints at the location, depth and spacing shown on the plans. Drill holes and epoxy dowels into position in a sawed joint face, or insert them through holes in a header form taking care to maintain proper alignment.

Place dowel bars in transverse isolation joints at the location, depth and spacing shown on the plans. Fasten the dowels to an expansion basket that remains in the pavement, provides joint closure space and holds each dowel parallel to the surface and center line of the slab. Attach expansion caps to each dowel bar.

Place tie bars reasonably perpendicular to the longitudinal joints with mechanical or manual insertion equipment or rigidly secured chairs without damaging or disrupting the concrete. Do not bend and straighten tie bars into correct position by more than 90°. Repair or replace broken or badly damaged tie bars.

Place mesh reinforcement at the location and orientation shown on the Plans.

6.11 **Jointing**

6.11.1 **General**

Construct transverse and longitudinal joints to the details, dimensions and spacing shown on the plans. Make joints perpendicular to the pavement surface. Use construction-style joints at any longitudinal joint necessary to facilitate construction staging.

Saw the joints, in a single cut, to the width and depth the plans show. Begin sawing as soon as the concrete hardens sufficiently to prevent excessive raveling along the saw cut and finish before conditions induce uncontrolled cracking, regardless of the time or weather. Provide artificial light if joint sawing after

daylight hours. The contractor may saw the joints by the skip method, wherein every third joint is sawed as soon as possible. Following this skip sawing, make the cuts of the remaining intermediate joints.

If covering the pavement for cold weather protection, the contractor may delay sawing to avoid early exposure to freezing conditions.

6.11.2 **Longitudinal Joints**

Do not deviate more than 1/2 inch in 10 feet from the required line. Longitudinal joints may consist of construction joints where new work joins existing work. Saw all other longitudinal joints.

Tie new work to existing concrete pavement using tie bars driven or epoxy into the existing pavement.

Use only cast-in-place tie bars in construction joints of pavement placed under the contract.

6.11.3 **Transverse Joints**

Extend all transverse joints the entire width of paving. When constructing curbs or medians integral with the pavement, construct transverse joints continuous through the curb or median. When the pavement abuts an existing pavement or curb and gutter, construct transverse joints in the pavement at locations matching transverse joints or cracks in the existing pavement.

For expansion joints install a preformed joint filler extending from the foundation to 1/2 inch below the finished pavement surface, with its respective edges conforming to the contour of the subgrade and the pavement surface. Use material with factory-punched holes for and at the exact location of the dowel bars. During installation, protect the upper edge of the filler with a tight-fitting, removable metal channel cap having flanged edges of not less than 1 1/2 inches in depth. Upon completion of the finishing operations and after the concrete has set sufficiently, remove the cap, and round the edges of the joint with an edging tool.

Form a construction joint by setting a header board securely in place at the end of each day's run or when an interruption in the concreting operation of 30 minutes or more occurs. Design and set the header board to accommodate proper placement of the tie bars or dowel bars. If a header board is not used the contractor may construct a header by sawing completely through the concrete and remove excess material to expose solid concrete.

Use only production quality concrete in the header. Protect the steel projecting beyond the header from spilled concrete and all loadings or forces that might displace or bend the steel or weaken the bond with the concrete. Use hand vibrators to consolidate the concrete against the header or concrete face.

6.12 **Final Surface Texture**

6.12.1 **General**

Perform the final finish after straight edging, and after all excess moisture disappears, and while it is still possible to produce a uniform striated surface texture. Texture all concrete surfaces that will be used by traffic.

6.12.2 **Posted Speed Less Than 45 MPH**

Unless otherwise specified, provide an artificial turf drag final finish. Use a seamless strip of artificial turf approximately full pavement width and of sufficient length to provide approximately 2 feet of turf in contact with the pavement surface. Pull the drag with a device that allows control of the time and rate of texturing. Operate the drag in a longitudinal direction parallel with the centerline to produce a straight and acceptable finish. Weight the drag as necessary to maintain contact with the pavement. Keep the drag clean and free of particles of hardened concrete.

Apply a broom finish to small areas of urban pavement and to concrete driveways and other miscellaneous areas.

6.12.3 **Posted Speed 45 MPH and Higher**

6.12.3.1 General

Texture the pavement surface with an artificial turf drag prior to tinning.

Tine the pavement with a self-propelled tinning machine. Where using a tinning machine is not practical, tine by hand. Produce uniformly deep grooves approximately 1/8 to 3/16 inch deep. Provide a finished surface free of tinning defects. Complete before tinning tears or unduly roughens the concrete.

For machine work, use longitudinal tinning. For hand work, use transverse tinning.

6.12.3.2 Transverse Tinning

For hand work, use a rake with individual 1/8 inch tines randomly spaced between 3/8 of an inch and 2 1/4 inches.

6.12.3.3 Longitudinal Tinning

Use a tinning machine with an automated alignment control system to ensure that all tinning runs straight and parallel to the longitudinal axis of the pavement. Use a rake with individual 1/8 inch (3 mm) tines spaced uniformly with a clear spacing between tines of 3/4 inches (19 mm). Within 2-inches of longitudinal sawed joints, turf drag but do not tine surface.

6.13 **Curing**

6.13.1 **General**

Maintain adequate moisture throughout the concrete mass to support hydration until the concrete develops sufficient strength to open it to service. Cure all concrete by the impervious coating or impervious sheeting method or a combination of the two within 45 minuters of finishing pavement.

6.13.2 **Impervious Coating Method**

After texturing, and immediately after bleed water leaves the surface, coat the exposed surfaces with a liquid membrane-forming curing compound as specified in section 4.11. For fixed-form work, coat the sides of the pavement after removing forms.

Provide sufficient agitation prior to and during spraying to ensure uniform consistency and dispersion of pigment within the curing compound during application.

Protect all liquid curing compounds from freezing.

Apply the curing compound with an engineer-approved self-propelled mechanical power sprayer whenever practical. The contractor may use hand-operated spraying equipment for irregular, narrow, or variable width sections.

For tined surfaces, apply the curing compound uniformly at or exceeding a minimum rate of one gallon per 150 square feet. For all other surface finishes, apply the curing compound uniformly at or exceeding a minimum rate of one gallon per 200 square feet.

If removing forms within 72 hours after placing the concrete, coat newly exposed surfaces within 30 minutes after form removal.

6.13.3 **Impervious Sheeting Method**

After finishing the concrete and allowing it to harden enough to prevent excessive marring, immediately cover all exposed concrete surfaces with one or a combination of the following impervious sheeting materials:

1. Polyethylene sheeting.
2. Polyethylene-coated burlap. Pre-wet the polyethylene-coated burlap and place the uncoated side against the concrete.
3. If the engineer approves, insulated curing blankets with an impervious coating.
4. Alternate impervious sheeting materials as the engineer approves.

For sheet curing materials, extend the sheets beyond the edges of the slab to a distance at least twice the thickness of the pavement.

Provide enough sheeting material to cover all exposed edges, with enough excess to enable use of weights or anchors to hold the material securely in place. Provide 12 inches or more overlap between adjacent pieces of sheeting. Place and maintain the sheets in complete contact with the surface until the concrete conforms to the opening criteria.

If temporary removal is required to remove forms or perform other necessary work, re-cover all exposed concrete as quickly as practical, or as the engineer directs.

6.14 **Cold Weather Concreting**

The contractor is responsible for the quality of the concrete placed in cold weather. Take all precautions necessary to prevent freezing of the concrete until it has developed sufficient strength to open it to service. Remove and replace frozen or frost damaged concrete at the contractor’s expense.

Provide a reference high/low thermometer at an engineer approved location to document air temperature during cold weather concreting.

Suspend concreting operations if a descending air temperature falls below 35 F. Do not resume concreting operations until an ascending air temperature in the shade and away from artificial heat reaches 30 F.

Maintain the temperature of the concrete at or above 50 F at the point of placement. If necessary to maintain placement temperature, the contractor may heat the water, aggregates, or both.

Do not place concrete on a frozen base or subgrade.

At any time of the year, if the national weather service forecast for the construction area predicts freezing temperatures within the next 24 hours, or when freezing temperatures actually occur, provide the minimum level of thermal protection specified below for concrete that has yet to conform to the opening criteria.

1. Predicted or actual air temperature 22 to <28 F: single layer of polyethylene
2. Predicted or actual air temperature 17 to <22 F: double layer of polyethylene
3. Predicted or actual air temperature <17 F: 6" of loose, dry straw or hay between 2 layers of polyethylene

Place protective material as soon as the concrete is finished and sets sufficiently to prevent excessive surface marring. If necessary to remove the coverings to saw joints or perform other required work the contractor may remove the covering for the minimum time required to complete that work.

In the event the contractor incurs cold weather concrete expenses due to project delays unforeseen at the time of bidding and outside the contractors control the engineer and contractor shall negotiate a price for cold weather protection.

6.15 **Protection of Concrete**

Erect, maintain, and occupy, if necessary, suitable barricades, warning lights, and signs to keep pedestrian or vehicular traffic off the newly constructed pavement until it is opened for service.

Provide a safe and adequate alternative for pedestrian traffic as deemed necessary.

Protect the unhardened concrete against rain damage. If rain is imminent, cover the unhardened concrete immediately with polyethylene sheeting or other suitable material.

Concrete pavements shall be maintained in a clean condition by the contractor until the project is accepted by the owner an open to public traffic. Regular sweeping is required, including removal of sawing debris prior to opening to traffic, when completing remaining work, immediately prior to joint sealing, immediately prior to pavement marking, and as required by the engineer.

6.16 **Surface Testing and Correction**

6.16.1 **Ten-Foot Straightedge**

The engineer will ride the pavement surface to identify locations of any rough areas. Test the pavement surface at engineer-selected locations with a 10-foot straightedge. The engineer may direct the contractor to mark and grind down those areas showing high spots greater than 1/8 inch but not exceeding 1/2 inch in 10 feet until the area or spot's elevation no longer shows surface deviations greater than 1/8 inch when retested with the straightedge. If the departure from correct cross section or profile exceeds 1/2 inch in 10 feet, the engineer may direct the contractor to remove and replace the pavement at the contractor's expense.

6.16.2 **Pavement Grinding**

Perform grinding with a device specifically designed for pavement grinding having diamond blades uniformly spaced with at least 50 blades per linear foot. Perform additional light grinding as necessary to provide a neat rectangular area of uniform appearance. Perform the grinding parallel with the centerline.

6.17 **Opening to Service**

6.17.1 **General**

Maintain moisture and physical protection for concrete until it develops sufficient strength to open it to service.

Open pavement to construction and public traffic when the concrete attains a verified compressive strength of 3000 pounds per square inch. In the absence of opening strength information the engineer may allow the contractor to open pavement based on Equivalent Curing Days.

The contractor may operate concrete saws and profilers on concrete that does not conform to opening criteria. Clean the surface of the pavement by sweeping before allowing traffic of any kind on the pavement.

6.17.2 **Equivalent Curing Days**

When using Equivalent Curing Days to determine opening to service open pavement after the following minimum times, as adjusted for changes in the ambient air temperature on the project:

Concrete Grade	Equivalent Curing Days
High early strength concrete	3
Grade A	4
Grade A-FA	5
Grade A-S, A-IS, A-IP and A-T	7

The equivalent curing day is based on a daily average ambient temperature of 60 F. The daily average ambient temperature is the average of the high and low engineer recorded temperatures on the project site for each day. Accumulate equivalent curing days based on the daily average ambient temperature as follows:

1. 60 F or more; accumulate one equivalent curing day per calendar day.
2. 40 to less than 60 F (4 to <16 C); accumulate 0.6 equivalent curing day per calendar day.
3. Less than 40 F (4 C); accumulate 0.3 equivalent curing day per calendar day.

6.17.3 **Opening Strength**

When using opening strength to determine opening to service provide opening strength data based on compressive strength testing of field cured cylinders. Compute the opening strength as the average of compressive strength test results for 2 cylinders. Fabricate cylinders according to AASHTO T 23 and test the cylinders according to AASHTO T 22.

6.18 **Pavement Thickness**

Construct pavement to the plan thickness. Measure pavement thickness by probing or other acceptable methods.

6.18.1 **Pavement Units**

Divide the pavement into basic units 250 feet long, measured along the pavement centerline.
Treat fractional units less than 250 feet but greater than or equal to 100 feet long as a whole basic unit.
Include fractional units less than 100 feet long as a part of a contiguous basic unit.

The basic unit is one lane wide, measured from the pavement edge to the adjacent longitudinal joint; from one longitudinal joint to the next; or between pavement edges if there is no longitudinal joint.

Establish special units for areas of fillets, intersections, gaps, ramps, and other special areas not included in basic units.

6.18.2 **Measured Thickness**

Make 2 measurements for each basic unit. Perform both measurements at a single longitudinal location selected at random. Perform individual measurements at transverse locations near wheel lanes or as agreed upon by the engineer.

Determine the measured thickness of a pavement unit by averaging the 2 measurements made within that unit. If an individual measurement exceeds plan thickness by more than ¼ inch compute the measured thickness using the plan thickness plus ¼ inch for that individual measurement.
Measure the thickness of a special unit at a minimum of 2 locations as the engineer approves.

The contractor may provide coring thickness results to resolve disputed probing results. Perform coring according to AASHTO T 24 and evaluate cores according to AASHTO T 148.

6.18.3 **Tolerances**

Interpret the following terms used to describe measured thickness as follows:

1. **Conforming**: Greater than or equal to plan thickness minus 3/8 inch.
2. **Nonconforming**: Greater than or equal to the plan thickness minus 1 inch but less than the plan thickness minus 3/8 inch.
3. **Unacceptable**: Less than plan thickness minus 1 inch.

6.18.4 **Conforming Areas**

If the measured thickness of a pavement unit is conforming, the engineer will not require more measurements or adjust pay. If the measured thickness is consistently less than the plan thickness, adjust the operation to construct the plan thickness.

6.18.5 **Nonconforming Areas**

If the measured thickness of a pavement unit is nonconforming, the pay adjustment for that unit will be contingent upon the final thickness of the next unit in that lane. If the location for the next required random probing series is within 125 feet of the first test location, the contractor may select and document a new random location to provide space for corrective action.

If the measured thickness of the next unit is conforming, the engineer will not assess any pay adjustments for either unit. If the measured thickness of the next unit is nonconforming or unacceptable, the engineer will adjust the pay for both units. The engineer will continue pay adjustment for each succeeding unit until the contractor produces a unit with conforming measured thickness.

6.18.6 **Unacceptable Areas**

The pavement is unacceptable if one or more of the following is true:

1. An individual required contractor probe measurement is unacceptable.
2. A dispute resolution core is unacceptable.

Core the hardened concrete to determine the extent of the unacceptable area. Take cores at points approximately 20 feet in each direction of the unacceptable measurement on a line parallel to the centerline or longitudinal axis of the unit. Continue coring in each direction until locating a core that is not unacceptable. The engineer will determine the limits of the unacceptable area, at each end, by drawing lines across the unit of pavement midway between the location of the last 2 cores.

Perform coring according to AASHTO T 24. The engineer will evaluate the results according to AASHTO T 148.

7 **Measurement**

Measure the Concrete Pavement bid items by the square yard acceptably completed, measured using the centerline length and the width from outside to outside of completed pavement, but limited to the width the plans show or the engineer directs. The engineer will include fillets for widened sections, or at drain basins and similar locations, placed monolithic with the pavement.

8 Payment

8.1 General

Payment for the Concrete Pavement and Concrete Pavement HES bid items is full compensation for preparing the foundation, unless provided otherwise; for furnishing, hauling, preparing, placing, curing, and protecting the concrete; for measuring opening strength including fabricating and testing cylinders, and obtaining and testing cores; for measuring pavement thickness, and for filling all core holes. Payment includes jointing and providing tie bars and dowel bars in unhardened concrete.

8.2 Adjusting Pay for Thickness

For nonconforming pavement thinner than plan thickness minus 3/8 inch and subject to pay adjustment, payment will be adjusted as follows:

For Pavement with a Measured Thickness	Percent of the Contract Unit Price
> 3/8 inch but <= 1/2 inch	80
> 1/2 inch but <= 3/4 inch	70
> 3/4 inch but <= 1 inch	50

If areas of pavement have unacceptable measured thickness the engineer will direct the contractor to remove and replace with concrete pavement of conforming thickness. Payment for unacceptable areas removed and replaced with concrete pavement of conforming thickness will be at the full contract price.

SECTION 11-C

CONCRETE PAVEMENT JOINT SEALING SPECIFICATION

Joint Sealing shall consist of cleaning the joint in preparation for sealing and sealing all expansion, contraction and construction joints in the (horizontal) concrete surface with a Hot-Poured elastic type sealing material. The work shall conform to the plan details and these specifications.

All joints shall be sealed with a hot applied joint sealant conforming to the Specification for Joint and Crack Sealants, Hot-Applied, for Concrete and Asphalt Pavements, ASTM Designation D6690, Type II, modified to require the bond strength test to be run at -20 degrees F. A Certification of Compliance shall be furnished to the Engineer prior to application.

All joints within and adjacent to new concrete pavement, shall be sealed, such as but not limited to; longitudinal, transverse, skewed, diagonal, dog-leg, etc; including expansion, contraction, construction, sawed and hand-tooled concrete pavement and curb and gutter (flangeline and gutter pan) of streets, alleys, commercial driveways, parking lots, etc. All joints of new concrete pavement to an abutting existing concrete surface shall also be sealed. 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. Joints shall not be sealed until they have been inspected and approved by the Engineer. Application of the joint sealer shall be made when the joint surfaces are clean and dry.

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.

The sealing compound shall be heated to the pouring temperature recommended by the manufacturer in an approved kettle or tank, constructed as a double boiler, with the space between the inner and outer shells filled with oil or other satisfactory heat transfer medium. The heating kettle shall be equipped with a mechanical agitator, positive temperature control and an approved dial thermometer for checking temperatures of the compound. The heating kettle, if and when operated on concrete, shall be properly insulated against the radiation of heat to the concrete surface.

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 where relatively small quantities of sealer are used. Any material heated above the maximum safe heating temperature shall be discarded.

Pouring of joints shall be made when the sealing material is at the required temperature and, insofar as practicable, the sealing compound shall be maintained at a uniform temperature during pouring operations. Pouring shall not be permitted when the temperature of the sealing compound in the applicator, as it is applied to the joint, is more than 10° F below the recommended pouring temperature. Pouring of the molten sealer in the joint opening shall be done with such equipment that the sealer completely fills the joint opening without overflowing on the adjoining surface and when finished, after shrinkage, the sealer is approximately flush to 1/8 inch below the adjoining surfaces. 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.

Joint sealing will be considered incidental to construction unless specifically listed for payment.

SECTION 12

BITUMINOUS PAVEMENT AND SURFACE TREATMENTS

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SECTION 13

CONCRETE CURB AND GUTTER

SECTION 13.1 GENERAL

13.1.1 DESCRIPTION

This work shall consist of constructing concrete masonry combination curb and gutter of the dimensions, shape and design as indicated in the Plans and placed in one course on the prepared subgrade or base, at the locations and to the required lines and grades as shown on the Plans and provided by this Contract.

SECTION 13.2 MATERIALS

13.2.1 GENERAL

All materials (concrete, tie bars, expansion joints, etc.) for curb and gutter construction shall conform to the requirements as outlined in Section 11 of these Standard Specifications.

SECTION 13.3 CONSTRUCTION

13.3.1 CURB & GUTTER CONSTRUCTION

Construction methods, workmanship, quality control, testing, delivery, placement, consolidation, finishing, curing, cold weather concreting and protection of concrete for concrete combination curb and gutter shall comply with the requirements of Section 11 of these Standard Specifications, in addition to the requirements discussed herein (Section 13).

13.3.2 FORMS

Forms shall be of metal or wood materials, except at radii where flexible materials are required. Forms must be full depth (same height as the thickness of the proposed concrete) and shall be of sufficient strength to resist springing, tipping, or displacement during the process of depositing and consolidating the concrete. The ends of forms shall abut the successive form (without overlap), utilizing a splice/stiffener on the back side such that the curb and gutter section is not affected. Face forms are required. All forms shall be cleaned thoroughly and oiled before the concrete is placed against them.

13.3.3 TIE BARS

Combination curb and gutter shall be tied to adjacent concrete pavement. Drill and install tie bars into existing concrete pavement in accordance with plan details and Section 17 of these Standard Specifications. Tie new curb and gutter to new concrete pavement per plan details, utilizing bent bars or other methods if approved by the City Engineer.

13.3.4 PLACING CONCRETE

The Contractor shall use a slip form machine for placing, forming, and consolidating the curb and gutter. The resulting curb and gutter shall meet the requirements of this section (Section 13).

Where fixed forms are allowed, the concrete shall be deposited to the proper depth, spaded against the forms, thoroughly consolidated using hand spud vibration, and struck off and finished to the required section, to provide a neat, consistent and high quality appearance.

13.3.5 FINISHING

Float the face and pan surfaces of the curb and gutter. Round the edges (at back, flangeline, joints, etc.) using a ¼-inch edger. Lightly broom finish all faces transversely, and approximately 3-inches wide longitudinally for the flowline.

Tuckpoint all honeycomb areas.

13.3.6 CONTRACTION JOINTS

Form contraction joints by sawing or forming an induced plane of weakness at least 2-inches deep, full width. Curb and gutter contraction joints shall be directly opposite or aligned with adjacent construction joints in concrete pavements. Contraction joints for curb and gutter adjoining asphalt pavement shall be spaced 15-feet apart, typical.

13.3.7 EXPANSION JOINTS

Expansion joints shall be placed in the curb and gutter directly opposite the expansion joint in abutting pavement and at the end of the radius at intersections or other curb returns and shall be of the same type and thickness as the joints in the pavement. Expansion joints shall also be placed at the ends of a transition (mountable to barrier curb, etc.) and at three-feet from a catch basin, for curb and gutter adjacent to asphalt pavement.

SECTION 13.4 MEASUREMENT AND PAYMENT

Combination curb and gutter shall be measured for payment by the lineal foot along the flow line of the gutter. It shall be paid for at the Contract Price per type of curb and gutter successfully constructed and said payment shall be considered full compensation for all preparation of subgrade; forming, placing, finishing, curing, protection and testing; all construction required at drainage structures, driveway entrances and curb ramps; for furnishing all materials including concrete masonry, expansion joints, and tie bars (abutting new work); and for all labor, tools, equipment, and incidentals necessary to complete the work including the disposal of surplus and/or waste materials and restoring the site of the work.

SECTION 14

INTEGRAL CURB

SECTION 14.1 GENERAL

This work shall consist of the construction of a curb and/or gutter integral with the pavement and placed at the same time as the pavement. The curb head, gutter/ flowline and pan shall be of the dimensions, shape and design as indicated in the plan, and constructed to the required lines and grades as shown on the plans.

SECTION 14.2 MATERIALS

Concrete and all materials used for integral curb shall conform to the requirements of Sections 11 and 13 of these Standard Specifications.

SECTION 14.3 CONSTRUCTION

14.3.1 INTEGRAL CURB, AND/OR GUTTER CONSTRUCTION

Construction methods, workmanship, quality control, testing, delivery, placement, consolidation, finishing, curing, cold weather concreting and protection of concrete for concrete integral curb and/or gutter shall comply with the requirements of Sections 11 and 13 of these Standard Specifications, in addition to the requirements discussed herein (Section 14).

Concrete curb, and/or gutter constructed as Integral Curb shall be constructed such that it and the concrete pavement are monolithic.

The Contractor shall use slip form equipment such as a slip form paver with a curb shoe, slip form curb machine or other devices if approved by the City Engineer. The resulting curb and/or gutter shall meet the requirements of Section 13 and this section.

Reinforcement and load transferring dowels are not required within the limits curb, and/or gutter. Tie bars at the limits or flangeline of the curb, and/or gutter are not required unless the plans require that a sawed longitudinal joint be constructed at the flangeline.

SECTION 14.4 MEASUREMENT AND PAYMENT

14.4.1 MEASUREMENT

Integral curb, and/or gutter shall be measured by the lineal foot along the flowline of the gutter or face of the curb. The area of the curb head, gutter and/or gutter pan will not be included in the measurement (for payment) of the adjacent concrete pavement.

14.4.2 **PAYMENT**

Integral curb, and/or gutter shall be paid for at the Contract Unit Price, per type of integral curb successfully constructed. Payment shall be considered full compensation for all preparation of subgrade; forming, placing, finishing, curing, protection and testing; all construction required at drainage structures, driveway entrances and curb ramps; for furnishing all materials including concrete masonry, expansion joints; and for all labor, tools, equipment, and incidentals necessary to complete the work including the disposal of surplus and/or waste materials and restoring the site of the work.

SECTION 15

CONCRETE SIDEWALKS

SECTION 15.1 DESCRIPTION

15.1.1 CONSTRUCTION

This work shall consist of constructing concrete sidewalk with or without reinforcement, placed on the prepared subgrade or base and one course of concrete constructed to the required dimensions and design as shown on the Plans and provided by the Contract.

Where required on the plans, necessary for construction or required by the City Engineer, the Contractor shall construct concrete stairways, with or without handrails.

15.1.2 PROJECT LOCATION(S)

The project locations for sidewalks and related items under this Contract shall be as designated by the City Engineer, with the right reserved by the City Engineer to add thereto or subtract therefrom.

15.1.3 SIDEWALK AND RELATED ITEMS

These Specifications shall apply to all sidewalks and related items constructed within the limits of all public lands and public easements in the City, whether constructed by a property owner, Contractor, or others.

15.1.4 ADA REQUIREMENTS

All sidewalks and associated components such as curb ramps, detectable warning field, etc. which comprise an accessible route shall comply with all requirements of the Americans with Disabilities Act and the current codes addressing these issues. Areas of concern include but are not limited to slopes, vertical offsets, horizontal openings (joints, etc.), surface quality and drainage. These requirements apply to new sidewalks and the interface of new sidewalks to existing sidewalks.

SECTION 15.2 MATERIALS

15.2.1 CONCRETE

The concrete used for sidewalks shall conform to the requirements as specified for concrete in Section 11 of these Specifications.

15.2.2 WIRE MESH

The wire mesh/welded-wire reinforcement shall meet ASTM A 185 requirements, designation 6 x 6 –WI.4 x WI.4 with longitudinal and transversial wire 10 Ga. or larger and spaced six (6) inches or less center to center.

15.2.3 SYNTHETIC FIBER MESH

Synthetic fibers shall be 100% virgin polypropylene, ¾” in length and meet ASTM Designation C1116. Fiber mesh shall be mixed into the concrete at a rate

of 1.5 pounds of fiber (minimum) per yard of concrete. Concrete shall be mixed at mixing speed per the fiber manufacturer's recommendations after all the fibers are placed in the mixing drum.

15.2.4 **EXPANSION JOINT**

Expansion joint material shall be ½-inch thick, meeting the requirements as specified is Section 11 of these Standard Specifications.

15.2.5 **DETECTABLE WARNING FIELD – TRUNCATED DOMES**

Detectable Warning Field - Truncated Domes meeting the requirements of the Americans with Disabilities Act, (Title 49 CFR Transportation, Part 37.9 Standards for Accessible Transportation Facilities, Appendix A, Section 4.29.2 Detectable Warnings on Walking Surfaces) shall be utilized. The Contractor shall use Cast or Ductile Iron plates, cast-in-place/embedded unfinished cast iron plates as manufactured by Neenah Foundry Co., Wisconsin. Sizes of Detectable Warning Fields may vary per each curb ramp location (typical size is 24" x 48").

15.2.6 **HANDRAILS**

Handrails and all components shall be comprised of ruse-proof materials or coated with an approved paint system such as Sherwin-Williams Epolon II Rust Inhibitive Epoxy Primer and Metalatex Semi-Gloss Finish Coat, or approved equal.

SECTION 15.3 CONSTRUCTION METHODS

15.3.1 **SECTION 11 SPECIFICATIONS APPLICABLE TO SIDEWALKS**

Quality control, testing, delivery, placing, consolidation, finishing, curing, cold weather concreting and protection of concrete for sidewalks shall comply with Section 11 of these Standard Specifications, in addition to the requirements discussed herein (Section 15).

15.3.2 **SIDEWALK SLOPES**

Sidewalks shall be constructed in accordance with plan details and the Americans with Disabilities Act/Accessibility requirements. The maximum longitudinal slope shall be 20:1 (5.00%) and the change in slope shall not exceed 9.1:1 (11%). The transverse slope shall not exceed 50:1 (2.00%).

15.3.3 **CURB RAMPS**

All curb ramps and handicap ramps shall be constructed of 6-inch reinforced concrete. Slope, width and alignment shall comply with plan details and the Americans with Disabilities Act (ADA)/Accessibility requirements. The maximum ramp slope shall be 12:1 (8.33%). The cornerstone/landing (sidewalk adjoining curb ramp) shall be considered part of the curb ramps and constructed of 6-inch reinforced concrete, with slopes (any direction) not exceeding 50:1 (2.00%). Curb ramps shall be constructed on 6-inches of base aggregate and include truncated domes as a detectable warning field.

15.3.4 **WIDTH AND THICKNESS OF WALKS**

All walks, unless otherwise ordered or provided for, shall have a standard width of five (5) feet with a transverse slope of 1/4 inch per foot toward the gutter and

shall be laid to the exact line and grade given by the Engineer. As the walk approaches a street intersection, specific direction shall be obtained as to its slope and grade. On corner lots, special grades shall be secured from the Engineer.

The minimum thickness of any part of a walk shall be four (4) inches, and in places where driveways are encountered over which vehicles may be expected to pass, the walk shall have a minimum thickness of six (6) inches and shall be reinforced with wire mesh reinforcement placed two (2) inches above the subgrade or fiber mesh uniformly mixed throughout the concrete.

The length of 6" sidewalks at driveway aprons shall be as shown on the plans and details.

Normal sidewalk shall be 4-inch concrete over 4-inches of base aggregate. Sidewalk at private driveways shall be 6-inch reinforced concrete over 6-inches of base aggregate, isolated through the use of expansion joint per plan details.

15.3.5 **SUBGRADING WITH OR WITHOUT AGGREGATE BASE**

The Contractor shall do all necessary grading to bring the surface of the ground to the subgrade required for the walks and related items. When cutting is necessary, the material shall be excavated to the depth as necessary for the proposed aggregate base or if plans do not require an aggregate base to a depth two (2) inches below the under side of the concrete and brought to grade with the leveling course material typically sand or base aggregate. When filling is required to bring the surface to the required subgrade, the filling shall be done with excavated material unless so directed by the Engineer or Inspector. The filling shall be made in uniform layers not to exceed six (6) inches in thickness and shall be thoroughly compacted by mechanical tamping as may be required to insure a solid unyielding subgrade, free from future settlement. Any soft or spongy material, organic matter, or other material that cannot be made solid and compacted shall be removed and replaced with materials, as specified, for the foundation. All roots from trees and stumps adjacent to the work encountered in the excavation shall be cut and removed to a depth of not less than six (6) inches below the finished surface of the sidewalk and the end next to the tree and stump carefully trimmed. If trees or other obstructions are encountered in the area to be occupied by the walk, notice shall be given the Engineer and specific instructions will be given for their treatment or removal. A template four (4) inches in depth shall be used to shape the subgrade to insure a full four- (4) inch thickness for the finished sidewalk. This is especially essential where two- (2) inch by four (4) inch wood forms are used. A six- (6) inch depth template is required for walks six (6) inches in thickness.

If plans or typical sections require an aggregate base for sidewalk, then the subgrade shall be shaped and prepared without an additional 2-inch leveling course. If plans or typical sections do not require an aggregate base for sidewalk, then the foundation shall include a minimum 2-inch leveling course for cut and if necessary, fill conditions.

15.3.6 **ADJUSTING STOP BOXES**

All stop boxes, gate valves, and other municipal utility fixtures within the limits of the work shall, if needed, be adjusted by the Contractor, with their covers set to the grade and contour of the new work.

15.3.7 **FORMS**

Sidewalk may be constructed by the use of a slip-form machine upon approval by the City Engineer (in writing).

Suitable forms of wood or metal for the work shall be provided by the Contractor; they shall be sufficiently strong and rigid to support the concrete and remain practically unyielding during the process of depositing and ramming the same in place. From depth/height shall be equal to the thickness of the concrete, i.e. 6-inch sidewalks require 6" tall forms. Wooden forms shall be of uniform thickness which in no case is to be less than two (2) inches nominal thickness and dressed smooth on the side next to the concrete. The forms shall be staked with at least two (2) stakes per form and rigidly secured in position and remain true to the required line, grade, and dimensions. Forms that are used more than once shall be thoroughly cleaned before again being used and forms that have become warped or distorted in shape will be rejected. If forms which have been previously rejected are again placed for use, work shall be immediately halted until such forms are replaced with suitable forms. No claim for damage will be allowed on account of such delay. No bracing of the forms from the inside shall be left in place during the depositing of the concrete.

15.3.8 **REINFORCEMENT OVER DITCHES AND EXCAVATED AREAS**

Wire mesh, synthetic fiber mesh or steel reinforcing rods shall be placed in the concrete over excavated areas and service ditches, such as sewer and water laterals, if directed by the Engineer. Payment shall be made at the normal cost of reinforcement.

15.3.9 **CONSISTENCY, CONSOLIDATION AND FINISHING OF CONCRETE**

Slump of concrete shall not exceed 4-inches. The Engineer reserves the right to require Contractor to slump test at any time while pouring concrete.

Use hand spud vibrators when placing concrete thicker than 5-inches. The use of a vibratory screed does not negate the requirement for supplemental hand spud vibration.

15.3.10 **CONTRACTION JOINTS**

Walks shall be cut into lengths of five (5) feet, except that a reasonable tolerance in said size shall be allowed when the total length of the walk being constructed is not equally divided by five (5) feet, but not to exceed eight (8) feet, or be less than four (4) feet.

The grooves or contraction joints used to mark off the above sidewalk blocks shall be formed with a suitable jointing tool to a depth of at least one (1) inch in such a way that the finished product will retain such depth.

15.3.11 **EXPANSION JOINTS**

All concrete sidewalks shall be constructed with 1/2-inch thick transverse expansion joints. In no instance shall such joints exceed 55 feet spacing. A ½-inch expansion joint shall be installed where walks and drive approaches abut against curb and gutter, or where thickness of the concrete walk changes.

All expansion joints shall be placed and secured prior to concrete placement and shall extend through the entire thickness of the concrete and made straight and true at right angles to the length of the walk and subgrade.

Such joints shall be preformed strips of asphaltic cement encased in a fiber matrix or similar preformed asphaltic filler or other material of an approved quality and character.

Additional expansion joints of the type described above and not less than 1/2 inch in thickness shall be used in such places as around all poles, light standards, gas and water shutoffs, concrete slabs installed over pull boxes, and as a separation between public sidewalks and all abutting concrete driveways, drive approaches, entrance walks, and terrace walks where terraces are greater than six (6) feet wide. When the expansion joint is omitted between the public sidewalk and abutting concrete, on terraces six (6) feet or less, a contraction or construction joint shall be submitted.

15.3.12 **SURFACE REQUIREMENTS**

The surface of the concrete sidewalk (and components) shall comply with ADA requirements such as but not limited to the following: Vertical offsets (or changes in level) shall not exceed ¼-inch; horizontal openings including joints shall not exceed ½-inch; surface texture shall be consistent and slip resistant, without irregularities or defects; and all surfaces shall be adequately drained (within specified slope requirements) without ponding.

15.3.13 **STAMP**

A stamp bearing the name of the Contractor and year of construction shall be imprinted on each end of each City block. Where the sidewalk does not traverse a full block, the stamp shall be imprinted at each end of each new segment placed.

15.3.14 **DETECTABLE WARNING FIELD – (TRUNCATED DOMES)**

Assemble modular plates to achieve the required size of the warning field. The Contractor shall verify the layout of Detectable Warning Field – plates and jointing of the curb ramp with the Engineer prior to placement at the curb ramps. Concrete shall be finished to be flush with the detectable warning plate.

15.3.15 **BACKFILLING**

When the walk and related items have been completed, the Contractor shall backfill, with good soil or material at least as good as existed originally, in a manner as to leave a temporary berm of one (1) foot in width on each side and flush with the top of the completed walk.

Such backfilling shall not begin until the Engineer or Inspector has checked and approved the walks and related items in the area in which the backfilling is to be done.

If directed by the Engineer, excess excavation will be used to fill low terrace areas.

15.3.16 **SURFACE TESTING AND CORRECTION**

The Engineer shall test the sidewalk surfaces (including slopes) and measure accordingly. Sidewalks which do not comply with the specified surface

requirements shall be corrected using equipment and methods approved by the Engineer, or replaced. Vertical offsets exceeding ¼-inch but not more than ½-inch may be corrected by grinding a beveled slope not to exceed a 2:1 (50.0%) slope. Vertical offsets exceeding ½-inch but not more than 1-inch may be corrected by grinding a ramped slope not to exceed a 12:1 (8.33%) slope. Vertical offsets exceeding 1-inch shall require replacement of sidewalk blocks. Horizontal openings exceeding ½-inch but less than 1-inch may be filled with an approved crack filling material. Horizontal openings exceeding 1-inch may require replacement. Improper slopes, drainage and surface defects or irregularities shall require replacement.

SECTION 15.4 MEASUREMENT AND PAYMENT

Payment for sidewalk shall be made at the contract unit price per square foot as measured in place and shall be full compensation for furnishing all materials, including concrete masonry, reinforcement, expansion joints; for all excavation and preparation of subgrade, unless other wise paid for in the pay item 'Excavation', and also including backfilling and disposal of surplus material within one (1) foot of the surface; for placing, finishing, protecting, and curing; and for all labor, tools, equipment, and incidentals necessary to complete the work and restore the site of the work.

For all sidewalks, including sidewalks at driveways and curb ramps, the base aggregate shall be measured and paid for separately.

The leveling course, where required, shall be considered incidental to construction of sidewalk.

Curb ramps shall be measured and paid for at the contract unit price for Sidewalk, 6-inch, per square foot.

Detectable Warning Fields shall be measured and paid for per square foot and said payment shall be considered full compensation for all materials, labor and incidentals necessary to complete the work. Note: Costs for Detectable Warning Fields shall not be included in costs for Concrete Sidewalk, 6-inch.

Concrete Steps (one step per location) shall be measured and paid for per Each.

Concrete stairways (two or more steps per location) shall be measured by the square foot of horizontal surface area within the pay limits as shown on the plan details.

Handrails shall be measured by the lineal foot, horizontally between the center of each end support pipe.

SECTION 16

FINISHED TERRACES

SECTION 16.1 GENERAL

16.1.1 DESCRIPTION

The work under this Section shall consist of placing topsoil, seed, fertilizer, and mulch, if required, on the area between the shoulder point or curb and the sidewalk and between the sidewalk and the slope intercept shown on the cross sections or, where there is not sidewalk, between the shoulder point or curb and the slope intercept shown on the cross sections, and on all other areas disturbed by construction.

SECTION 16.2 MATERIALS

16.2.1 TOPSOIL

Topsoil for urban areas shall be processed so that 100 percent will pass a 1-inch sieve and at least 90 percent will pass the No. 10 sieve (2.00 mm) and be free of rocks, twigs, roots, clods, trash and other materials that will not break down. Salvaged topsoil may be respread in lieu of processed topsoil for rural locations (areas without sidewalks or residential/commercial lawns).

16.2.2 SEED

Seed and seed mixtures shall conform to Section 630 of WisDOT Standard Specifications and as listed below:

- No. 30 per WisDOT mixture proportions
- No. 40 per WisDOT mixture proportions
- City of Marshfield Mix (for current contract year) per the following mixture proportions:
  - 25% Park Kentucky Bluegrass
  - 25% Wildhorse Kentucky Bluegrass
  - 15% Creeping Red Fescue
  - 10% Celia Slender Fescue
  - 15% Playoff Perennial Ryegrass
  - 10% Ecologic Perennial Ryegrass

16.2.3 FERTILIZER

Fertilizer shall conform to Section 629 of WisDOT Standard Specifications, Type ‘B’.

16.2.4 MULCH

a. Standard Mulch

Mulch material shall consist of locally grown straw or hay in an air-dry condition, substantially free of noxious weed seeds and objectionable foreign matter.

b. Hydro-Mulch

Hydro-Mulch shall be a bonded fiber matrix material. Acceptable products include Soil-Guard as manufactured by Mat, Inc., Hydro-Blanket BFM as manufactured by Profile Products LLC, or approved equal.

16.2.5 **SOD**

Sod shall conform to Section 631 of WisDOT Standard Specifications.

SECTION 16.3 CONSTRUCTION

16.3.1 **PREPARATION**

In preparation of the roadway, all areas designated to be covered with topsoil shall be undercut or underfilled to such a degree that when covered to the required depth with topsoil the finished work will be in accordance with the required lines, grades, slopes, and cross sections.

Such work will be considered subsidiary to the item of 'Finished Terraces' items and no additional compensation will be made thereof, nor will allowance be made thereof in the final measurement for quantities of the several types or classes of excavation.

16.3.2 **TOPSOIL**

Topsoil shall be placed at a minimum of four (4) inches and shall be so placed that it provides a smooth grade between the sidewalk and curb or from the curb to the terminus of the slope or from the sidewalk to the terminus of the slope, as the case may be. It shall be raked and seeded and protected insofar as is practicable while the Contract is in force, including the warranty period. It is the intent of these Specifications to so finish the terrace that it will give the same appearance as a well kept lawn. It shall also be understood that any grass which does not grow or is washed out shall be replaced by the Contractor as part of the warranty.

16.3.3 **SEED**

Seed shall be applied in accordance with Section 630 of WisDOT Standard Specifications, Method A or B. The minimum seed application rate shall be 5-lbs./1000 SF.

Seed (as well as fertilizer and mulch) shall be applied immediately following preparation of the topsoil. Seed shall not be applied to substandard areas such as; rough, uneven or eroded topsoil; topsoil containing deleterious materials; topsoil covered by leaves; topsoil with existing weeds or other undesirable vegetation, etc.

16.3.4 **FERTILIZER**

Fertilizer shall be applied in accordance with Section 629 of WisDOT Standard Specifications. Fertilizer shall be applied at 7-lbs./1000 SF.

16.3.5 **MULCH (STANDARD)**

Mulch shall be applied in accordance with Section 627 of WisDOT Standard Specifications, Method B or C.

16.3.6 **HYDRO-SEEDING**

Hydro-Seeding includes application of a hydraulically applied mixture of seed, fertilizer and Hydro-Mulch. Hydro-Mulch-Seed is intended to be used on slopes steeper than 4:1 and in ditches (used instead of erosion mat at select locations). Mixing, testing and application shall be in accordance with the manufacturer's recommendations, including certification(s). The mixture shall be spray applied utilizing standard hydraulic seeding equipment, at a rate of not less than 3500 lbs/acre, and achieving 100% coverage, applied from two different directions and typically ¼-inch minimum thickness.

Hydro-Seeding may be allowed for use at other locations if approved by the Engineer, based upon past performance of Hydro-Mulch (as proposed by the Contractor) and review of specific locations, application rate, etc.

16.3.7 **SOD**

Sod shall be installed in accordance with Section 631 of WisDOT Standard Specifications, including water as necessary.

16.3.8 **TURF RESTORATION AT STORM STRUCTURES IN UNPAVED AREAS**

Special turf restoration measures (sod) are required at storm structures/area drains which are located in unpaved areas per Section 7.3.8 and Apron Endwalls per Section 6.3.7 (costs are incidental to these items).

16.3.9 **WATERING**

If necessary to initiate or maintain plant health/growth, the Contractor shall provide and apply water throughout the construction and warranty period. This work shall be considered incidental to Finished Terraces.

SECTION 16.4 MEASUREMENT AND PAYMENT

16.4.1 **MEASUREMENT**

Finished Terraces shall be measured per square yard for all areas successfully finished without deduction for drainage structures. The Engineer reserves the right to determine the quantity based upon the plan/estimated quantity without measurement thereof unless significant deviations from the plan occur during construction.

Where salvaged topsoil is expected to be windrowed and temporarily stored on site, or where plans/details require rounding at the slope intercept, Finished Terraces shall be measured per square yard for all areas successfully finished without deduction for drainage structures. The area to be measured shall be from the outside edge of the shoulder to a point 5-feet beyond the slope intercept. The additional 5-foot width will not be measured within wetland areas. The Engineer reserves the right to determine the quantity based upon the plan/estimated quantity without measurement thereof unless significant deviations from the plan occur during construction.

Additional restoration (finished terrace) work beyond the limits to be measured per above shall be restored per these specifications fully at the Contractor's cost.

Sodded areas such as but not limited to area drains, inlets, flumes, etc. shall not be measured for payment but shall be considered incidental to construction.

16.4.2 **PAYMENT**

Payment will be made at the Contract Unit Price, measured in accordance with these specifications, for the specific items listed below:

Finished Terraces – Seed Mix No. 30
Finished Terraces – Seed Mix No. 40
Finished Terraces – City Seed Mix (Current Contract Year)
Finished Terraces – Hydro-Mulch-Seed, Seed Mix No. 30
Finished Terraces – Hydro-Mulch-Seed, Seed Mix No. 40
Finished Terraces – Hydro-Mulch-Seed, City Seed Mix No. 1

Payment for Finished Terraces shall be considered full compensation for removing, storing, providing, processing, hauling, placing, preparing, repairing, protecting and clean-up of topsoil, salvaged topsoil, seed, fertilizer, water and mulch, along with all materials, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 17

CONCRETE PAVEMENT REPLACEMENT AND REPAIRS

SECTION 17.1 DESCRIPTION

This work shall consist of installing a Portland cement concrete pavement (replacement, repair or base patch) required to comply with project plans and/or the City of Marshfield Street Repair Standards. The pavement is to be installed on a prepared foundation and in reasonable close conformity with the lines, grades, thickness and typical cross section now existing or established by the Engineer.

Materials and construction requirements for companion work items shall be as specified elsewhere within these Standard Specifications.

SECTION 17.2 MATERIALS

17.2.1 GENERAL

All materials required to complete work under this section, including concrete, dowel bars, tie bars, expansion joint, etc. shall conform to the requirements of Section 11 of these Standard Specifications, and to the requirements as listed on the City of Marshfield Street Repair Standards.

17.2.2 DRILLED DOWEL BARS

Dowel bars installed by drilling into existing concrete pavement shall be 1-1/4-inches diameter x 18-inches long epoxy coated steel.

Use dowel bar baskets (pre-manufactured assembly of multiple dowel bars) with bars spaced 12-inches center to center for joints where drilling is not required.

17.2.3 DRILLED TIE BARS (#6x12")

Tie Bars installed by drilling into existing concrete pavement shall be No. 6, epoxy coated deformed steel reinforcement bars, 12-inches long.

Use No. 4 epoxy coated deformed steel reinforcement bars, 24-inches long for joints where drilling is not required.

17.2.4 BOND BREAKER

Bond Breaker, used to isolate new concrete pavement repairs from existing concrete pavements, shall be full depth, and extending the full length of the repair section. Allowable materials include 0.5 mm (minimum) free standing plastic sheeting, release agent, curing compound, 30 lb. tar paper and/or other materials as approved by the City Engineer.

17.2.5 EPOXY ANCHOR ADHESIVE

Epoxy Anchor Adhesive shall be used to secure drilled dowel bars and drilled tie bars into existing concrete. Epoxy Anchor Adhesive shall comply with AASHTO M235, Grade 3, Type IV, Class B (for 40° - 60°F) or Class C (>60°F). Submit product information/data sheets to the City Engineer prior to construction.

SECTION 17.3 CONSTRUCTION

17.3.1 CONCRETE CONSTRUCTION

Construction methods, workmanship, quality control, testing, delivery, placement, consolidation, finishing, curing, cold weather concreting and protection of concrete shall comply with the requirements of Section 11, 13 and/or 14 of these Standard Specifications, in addition to the requirements discussed herein (Section 17).

17.3.2 REMOVAL AND PREPARATION

The Contractor shall remove the existing pavement, to the limits of the areas as designated by the Engineer. The abutting edges shall be saw cut to the full depth of existing pavement to the maximum extent possible, however over-sawing (into adjacent panels to remain) will only be allowed when approved by the City Engineer. At locations where over-sawing is not approved by the City Engineer, the Contractor shall carefully remove unsawed pavement using special operations (small/special saw/blade, chiseling, etc.), without additional compensation. Contractor's means and methods shall be such that the removal can be completed without damage to the remaining pavement. If the remaining pavement is damaged by the Contractor's operations, the pavement shall be repaired by the Contractor at his expense with no additional compensation. Such repair may consist of resawing the damaged pavement with a full depth saw cut for the entire width or length of the panel (from joint to joint) or removing and replacement of an additional section of pavement, in accordance with the City's Street Repair Standards and to the satisfaction of the City Engineer.

If an adjacent lane is to be removed in a later phase, then at least one foot of that adjacent section of pavement shall also be removed so as not to damage the first patch paved when all of the adjacent section is removed.

The foundation, upon which the patch is to be placed, shall be prepared in accordance with the pertinent provisions of these Standard Specifications, using approved, hand shaping and compaction methods.

The concrete repair/patch shall be placed to match the thickness of the adjacent pavement, but shall not be less than 8-inches.

17.3.3 PREPARATION AND SETTING OF DOWEL AND/OR TIE BARS

Drill holes for Dowel and/or Tie bars in accordance with the Plans/Street Repair Standards and these Specifications (locations, sizes, bar spacing, spacing from existing/proposed joints, etc.). All Dowel/Tie bars shall be anchored using Epoxy Anchor Adhesive (force-driven bar installation is <u>not</u> allowed).

Clean/remove drilling dust, debris, moisture, etc. from drill holes before inserting the epoxy.

Inject epoxy into the back of the drill hole, with sufficient volume to provide a small quantity of excess material at the face of the concrete after fully inserting the dowel. Completely fill the annual space between the bar and concrete/drill hole with epoxy.

Insert the dowel/tie bar into the fresh epoxied drill hole to the proper depth and rotate the bar ½ turn.

17.3.4 **DRILLED DOWEL BARS**

Drilled dowel bars shall be spaced 15-inches center to center and shall be set 9-inches into the existing vertical face of the pavement parallel to the longitudinal direction of travel. Each dowel bar shall be at the proper alignment to provide a true working joint, set parallel with the centerline and concrete surface. The free end of the bars shall be covered with a thin layer of grease. Drill 1-3/8-inch holes and anchor the dowel bar using an epoxy anchor adhesive.

17.3.5 **DRILLED TIE BARS (#6x12")**

Drilled tie bars (#6x12") shall be spaced 30-inches center to center when placed perpendicular to the longitudinal joint, and spaced 12-inches center to center when placed perpendicular to the transverse joint (asphalt overlay base patch and other special jointing areas). Drill 7/8-inch holes 6-inches into the face of the existing concrete (pavement, curb & gutter, etc.) and anchor the tie bar using an epoxy anchor adhesive.

17.3.6 **PLACING CONCRETE**

The concrete masonry shall be deposited upon the subgrade in a manner to require as little re-handling as possible. The concrete shall be consolidated using hand spud vibrators and struck off by an approved mechanical vibrating screed and finished with hand floats to produce a plane surface which conforms to grade and elevation of the adjoining surfaces. The area adjacent to the patch on which the screed rides shall be thoroughly cleaned of all dirt and debris to ensure conformity to adjacent surfaces. Forms will not be required except when necessary, (length of patch) or as determined by the Engineer, to provide the required edge, grade or alignment.

Transverse pavement joints will be required and shall be as determined by the Engineer in the field. Construction of transverse and longitudinal joints shall conform to City of Marshfield Street Repair Standards. Parting strips shall not be used.

All joints (longitudinal, transverse, perimeter, etc.) shall be sealed in accordance with Section 11 of these Standard Specifications.

SECTION 17.4 MEASUREMENT AND PAYMENT

17.4.1 **MEASUREMENT**

17.4.1.1 **DOWELED CONCRETE PAVEMENT**

For concrete pavement replacement and/or repair patches that are to be measured and paid for as Doweled Concrete Pavement, per type of concrete mix, per thickness, said measurement shall be by the square yard under Section 11 of these Standard Specifications, and Dowel Bars (placed within new concrete), tie bars (placed within new concrete), jointing (including sawing of contraction joints), etc. shall be considered incidental to this item of work.

17.4.1.2 **CONCRETE PAVEMENT**

For concrete pavement replacement and/or repair patches that are to be measured and paid for as Concrete Pavement, per type of concrete mix, per thickness, said measurement shall be by the square yard under Section 11 of

these Standard Specifications, and tie bars (placed within new concrete), jointing (including sawing of contraction joints), etc. shall be considered incidental to this item of work, however Dowel Bar Baskets will be measured and paid for separately.

17.4.1.3 **DRILLED DOWEL BARS**

Drilled Dowel Bars will be measured per size, per each dowel bar installed successfully by the drilling method.

Dowel Bar Baskets, where required to be measured and paid for separately as discussed above, will be measured per size, per lineal foot from center of bar to center of bar.

Unless required to be measured and paid for separately and/or listed for payment in the Contract Unit Price Schedule, Dowel Bars (Baskets) will be considered incidental to construction.

17.4.1.4 **DRILLED TIE BARS (#6x12")**

Drilled Tie Bars will be measured per each tie bar (#6x12") installed successfully by the drilling method.

Tie bars will be considered incidental to concrete pavement, when drilling is not required (set concurrent with new concrete work).

17.4.1.5 **COMPANION ITEMS OF WORK**

Sawing will be measured and paid for in accordance with Section 3 of these Standard Specifications.

Removing pavement will be measured and paid for in accordance with Section 3 of these Standard Specifications.

Excavation where quantified will be measured and paid for in accordance with Section 4 of these Standard Specifications, however, unquantified excavation for grading, shaping, etc. of the existing base course shall be considered incidental to construction.

Base Aggregates where quantified will be measured and paid for in accordance with Section 5 of these Standard Specifications, however, unquantified volumes of Base Aggregates needed for grading, shaping, etc. of the existing base shall be considered incidental to construction.

17.4.2 **PAYMENT**

17.4.2.1 **DOWELED CONCRETE PAVEMENT**

The quantity of Doweled Concrete Pavement measured as described above, will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing all materials; the preparation of the foundation, including all necessary cutting and trimming, filling of depressions to shape the subgrade to grade and section, and satisfactory compaction; for disposal of all removed, or excess materials, for furnishing, placing, consolidating, finishing, curing and protecting concrete masonry; for furnishing and installing dowel bars (baskets) in transverse contraction joints; for providing and installing bond breaker; for sawing of all transverse and longitudinal contraction joints; for sealing all transverse and longitudinal joints; for furnishing and installing tie bars

in longitudinal contraction joints; and for furnishing all labor, equipment, tools and incidentals necessary to complete the work.

17.4.2.2 **CONCRETE PAVEMENT**

The quantity of Concrete Pavement measured as described above, will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing all materials; the preparation of the foundation, including all necessary cutting and trimming, filling of depressions to shape the subgrade to grade and section, and satisfactory compaction; for disposal of all removed, or excess materials, for furnishing, placing, consolidating, finishing, curing and protecting concrete masonry; for providing and installing bond breaker; for sawing of all transverse and longitudinal contraction joints; for sealing all transverse and longitudinal joints; for furnishing and installing tie bars in longitudinal contraction joints; and for furnishing all labor, equipment, tools and incidentals necessary to complete the work.

17.4.2.3 **DOWEL BAR BASKETS**

The quantity of Dowel Bar Baskets measured as described above will be paid for at the contract unit price per lineal foot of Dowel Bar Baskets installed, which price shall be full compensation for furnishing all materials, including dowel bars, placing baskets, greasing bars, and for furnishing all labor, equipment, tools, and incidentals necessary to complete the work.

17.4.2.4 **DRILLED DOWEL BARS**

The quantity of the Drilled Dowel Bars measured as described above will be paid for at the contract unit price per each Drilled Dowel Bar installed, which price shall be full compensation for furnishing all materials, drilling and preparing holes, greasing bars, installation of dowel bars with epoxy anchor adhesive, and for furnishing all labor, equipment, tools, incidentals necessary to complete the work.

17.4.2.5 **DRILLED TIE BARS (#6x12")**

The quantity of Drilled Tie Bars (#6x12") measured as described above will be paid for at the contract unit price per each Drilled Tie Bar (#6x12") installed, which price shall be full compensation for furnishing all materials, drilling and preparing holes, installation of tie bars with epoxy anchor adhesive, and for furnishing all labor, equipment, tools, and incidentals necessary to complete the work.

SECTION 18

EROSION CONTROL

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SECTION 18.1 GENERAL

Erosion controls shall be installed by the Contractor prior to disturbance of the existing surfaces. The Contractor shall limit the area and time that soils are exposed to the elements. Existing surfaces and turf shall be maintained until removal or disturbance is necessary.

Erosion controls are also required for all off-site project locations including but not limited to borrow pits, supply pits, materials processing locations and disposal sites. Erosion controls at these locations shall be considered incidental to construction.

18.1.1 INSTALLATION

Erosion and sediment control measures shall be constructed, installed and maintained in accordance with the plans, details and the Wisconsin Construction Site Best Management Practices Handbook. All erosion control devices shall be adjusted to meet field conditions at the time of construction. Overland flows shall be prevented from leaving or damaging the work site by installing erosion controls parallel to the contours and located down gradient from the work area.

Storm sewer inlets, manholes and collection basins shall be protected from runoff and siltation by installing appropriate devices as discussed below. For pipeline/trench construction, the Contractor shall place spoil on the high side of the trench and backfill/compact the trench as soon as possible. All trench water shall be discharged into a settling basin or filtering device prior to release to storm sewer or stream. All tracked soil shall be collected and removed from remote or adjacent areas near the construction sites.

18.1.2 **MAINTENANCE**

The Contractor shall inspect erosion controls weekly and after each rainfall of a half-inch or larger. Any damages or deficiencies of erosion controls shall be repaired immediately. All erosion controls shall be in proper working order at the end of each day. The Contractor shall regularly maintain all erosion controls.

18.1.3 **REMOVAL**

Erosion controls shall remain in place until surfaces have been restored and turf is rooted, growing and healthy. All erosion controls shall be removed by the Contractor upon approval of the Engineer.

18.1.4 **MATERIALS**

Erosion control materials and devices shall conform to WisDOT requirements and shall be approved for use and listed on WisDOT's Product Acceptability List.

18.1.5 **EROSION MAT**

Erosion mat of the class/type(s) indicated on the plan shall be installed in accordance with the plans or as directed by the Engineer. All erosion mat shall be securely anchored, using biodegradable stakes or staples where possible. Areas receiving erosion mat shall be fertilized and seeded in accordance with the specifications but shall not receive mulch.

The quantity of erosion mat, per class/type, shall be measured by the square yard as suitably placed, without measurement or allowance for anchorage or overlap.

18.1.6 **SILT FENCE**

Silt Fence shall be installed as indicated on the plans. Fence material shall be as required for the soils expected to be encountered. Silt fence shall not impede the channelized flow of stormwater.

Silt Fence shall be measured by the lineal foot as suitably installed, without measurement or allowance for overlap.

18.1.7 **TEMPORARY DITCH CHECKS**

Temporary Ditch Checks shall be installed as indicated on the plans or directed by the Engineer. Rock bags or other approved diversions are recommended. Erosion bales will not be allowed unless they can be installed properly. Alternate approved materials include Triangular Silt Dike. The ditch check shall span the entire width of the drainage way such that the bottom of the ditch check at each outside end shall be higher in elevation than the low point or crest of the ditch check. The drainage way at the downstream/discharge location of the ditch check shall be protected with erosion mat (minimum length of seven feet)

concurrently with installation of each temporary ditch check. Temporary ditch checks shall be staked or anchored as necessary.

Remove and dispose of deposits of sediment or debris when the buildup exceeds half of the storage volume created by the ditch check. Maintain the ditch check in associated areas in accordance with pertinent specifications and/or permits.

Remove and dispose of temporary ditch checks after slopes and drainage ways are stable and turf is rooted and healthy, such that further erosion is unlikely. Reshape the areas affected by the ditch check and restore with seed, fertilizer and mulch or erosion mat, if required.

Temporary Ditch Checks shall be measured per each (per each location, regardless of the number of rock bags or devices) as suitably installed and maintained. Erosion mat for temporary ditch checks will not be measured separately but will be considered incidental to this item.

18.1.8 **CULVERT PIPE CHECKS**

Culvert Pipe Checks shall be installed as indicated on the plans or as directed by the Engineer. Rock bags shall be placed at the inlet ends of culverts and/or storm sewer pipes, with or without endwalls. Remove and dispose of used rock bags and accumulated sediment after slopes and drainage ways are stable and turf is rooted and healthy, such that further erosion is unlikely.

Culvert Pipe Checks shall be measured per each (per each location, regardless of the number of rock bags) suitably installed and maintained.

18.1.9 **INLET PROTECTION**

Install Inlet Protection shall be installed as indicated on the plans or as directed by the Engineer. Geotextile fabric shall be filter fabric, WisDOT Type FF. Inlet Protection, per type shall conform to plan details.

Inlet protection shall be measured per type suitably installed and maintained, per each.

18.1.10 **TRACKING PADS**

This work shall consist of placing stone Tracking Pads where construction vehicles will egress a construction site. Tracking Pads shall be comprised of clear stone such as Select Crushed Material except said materials shall be substantially free of fines (particles passing a No. 10 sieve). Install Tracking Pads prior to any traffic leaving a site. Tracking Pads shall be at least 12-inches thick, 50-feet long and wide enough to accommodate necessary traffic. Materials shall be placed and maintained in accordance with the requirements of the plans and these specifications.

Traffic Pads will be considered incidental to construction unless specifically listed for payment on the unit price schedule/contract.

Where measured for payment, this work will be measured per each location installed, maintained and thereafter removed. Payment will be made at the contract unit price per each and said payment shall constitute full compensation for excavation, preparation, materials, placement, maintenance, removal, restoration and disposal of waste, and for all labor, equipment, tools and incidentals necessary to complete the work.

18.1.11 RIPRAP AND GEOTEXTILE FABRIC

This work shall consist of placing riprap and fabric in accordance with the requirements of the plans and these specifications. Riprap materials shall include Heavy Riprap, Medium Random Riprap and/or Riprap, as noted on the plans. Fabric shall include Geotextile Fabric, Type 'HR' and/or 'R', as noted on the plans. Materials and construction methods shall be in accordance with WI-DOT Standard Specifications Sections 606 (Riprap) and 645 (Geotextile Fabric). The use of waste concrete slabs for riprap will not be allowed. This work will be measured by the square yard (depth as shown on the plans and/or details). Payment will be made at the contract unit price per square yard and said payment shall constitute full compensation for excavation, preparation, materials, placement, restoration and disposal of waste, and for all labor, equipment, tools and incidentals necessary to complete the work.

18.1.12 DUST CONTROL

The Contractor is hereby required to (prevent and) control the generation and dispersion of particulate matter in the air hereafter referred to as dust which may occur through construction and exposure of soils and aggregates to the elements. Dust control is required throughout all phases of construction, regardless of the reason for its generation (wind, residential traffic, etc). Dust abatement measures such as the application of water or a water-absorbing suppressant/ surface treatment such as calcium chloride shall be applied within 24 hours following its request by the City Engineer. The Contractor shall obtain the Engineer's approval prior to applying any abatement measures excluding water. The Engineer reserves the right to remedy dusty conditions which persist beyond this 24 hour period, with all costs for said dust abatement assessed back to the Contractor. The Contractor is solely responsible for dust prevention, dust control, maintaining adequate visibility and maintaining the quality of the subgrade/base/subbase/surface through the appropriate use of dust control measures. Materials, equipment and application shall comply with WisDOT Standard Specifications, Sections 623 and 624. All costs associated with Dust Control, as discussed herein shall be the Contractor's responsibility and shall be considered incidental to

construction, unless specifically listed for payment on the unit price schedule/contract.

Where specifically listed for payment in the unit price schedule/contract, Dust Control shall be measured and paid for at the contract unit price per each application per type of control method, including but not limited to water and/or surface treatment, per number of applications within the right-of-way covering the entire project (including temporary access/ roadways for residents/businesses). Dust control for areas outside of the project areas as described above shall be the Contractor's responsibility and shall be considered incidental to construction.

Payment for Dust Control shall constitute full compensation for all materials, mobilization, hauling, application, clean-up and disposal of waste, along with all labor, equipment, tools and incidentals necessary to complete the work.

18.1.13 **STREET SWEEPING**

The Contractor shall sweep street surfaces to control dust and/or clean-up tracked materials. Street sweeping shall be accomplished through the use of specialized equipment utilizing broom(s) with water or air scrubbing, vacuum, filters and containment hopper(s); and shall not create or allow escapement of air-born particles or dust. Remove all collected wastes from the project site and adjacent areas and legally dispose of said materials as necessary. Street sweeping shall commence within 24 hours following its request by the City Engineer. The Engineer reserves the right to remedy conditions which persist beyond this 24-hour period by utilizing private contractors and/or City Forces (including on-call and/or overtime rates if applicable), with all costs for said remedy assessed to the Contractor. Street sweeping shall be considered incidental to construction unless specifically listed for payment on the unit price schedule/contract.

Where specifically listed for payment in the unit price schedule/contract, Street Sweeping shall be measured and paid for at the contract unit price, per project, per Each (occurs within and immediately adjacent to the right-of-way covering the entire project/limits, including access roadways for residents and/or businesses). The per Each quantity(s) are intended to cover street sweeping (per stage) at the following milestones of construction:

- After placement and sawing of concrete pavement and immediately prior to joint sealing.
- After placement of asphalt binder/lower layers and immediately prior to placing Tack and/or the top/upper most layer of asphalt (surface).
- After final completion but before opening to traffic.

Street Sweeping for areas outside of the project areas as described above shall be the contractor's responsibility and shall be considered incidental to construction. Street Sweeping, if required due to careless or improper operations by the Contractor, in the opinion of the Engineer,

are also considered the Contractor's responsibility (incidental) and shall not be measured for payment.

SECTION 19

WATER MAIN AND SERVICES

SECTION 19.1 GENERAL

19.1.1 SCOPE OF WORK

a. Water main work will generally include supply and installation of polyethylene encased ductile iron pipe water main, with appurtenances and copper water services.

b. Contractor shall furnish and install all pipe, fittings, valves, bedding and appurtenances for water main and services as shown on the plans and specified herein.

19.1.2 QUALITY ASSURANCE

ASTM and AWWA Standards shall apply to materials and testing procedures.

SECTION 19.2 MATERIALS

19.2.1 GENERAL

All pipe, valves, fittings and appurtenances shall be as called for on the plan and as specified herein. All materials installed under this contract shall be new.

19.2.2 DUCTILE IRON PIPE

Ductile iron pipe shall conform to the requirements of the latest revision of AWWA C150 and AWWA C151. Ductile iron pipe shall be cement-mortar lined and coated in accordance with the latest revision AWWA C104. All ductile iron pipe shall be Class 52, 350 psi working pressure, push-on joint, with electrical conductivity straps/cables.

19.2.3 POLYETHYLENE WRAP

a. Polyethylene wrap conforming to AWWA C105 shall be provided. Film shall be tube type, Class "C", blue, with a minimum nominal thickness of 0.008 inches (8 mils). Tape for securing the film shall be thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, bituminous coating, and polyethylene. Tape shall have a minimum thickness of 8 mils, and a minimum width of 1 inch.

b. The polyethylene wrap shall be free of gels, streaks, pinholes, particles of foreign matter and undispersed raw material.

19.2.4 FITTINGS

Ductile iron fittings shall be mechanical joint fittings conforming to the latest revision of AWWA C111 and C153. Fittings shall have a pressure rating of 350 psi. Electrical conductors to carry a 200-ampere current across the joint shall be furnished. The inside coating for fittings shall be cement mortar.

19.2.5 SLEEVES/COUPLINGS

a. Sleeves or couplings shall be ductile iron mechanical joint fittings conforming to the latest revision of AWWA C111 and C153.

b. Where sleeves or couplings are connected to other than Class 52 ductile iron pipe and standard ductile iron fittings will not properly fit the pipe, sleeves or couplings shall be cast straight with stainless steel bolts, sized to fit Class 52 ductile iron pipe through sand cast iron pipe. Sleeves shall be Rockwell 441, Romac, or Hymax.

19.2.6 **VALVES**

All valves shall be mechanical joint, epoxy coated ductile iron bonnet and body, resilient seat gate valves constructed with rubber encapsulated wedge, non-rising stem, 2-inch square operating nut, stainless steel fasteners, and with a 250 psi working pressure design. Stem material shall be series 400 stainless steel or bronze. Bronze stem shall have a minimum of 38,000-psi yield strength. Series 400 stainless steel stem shall have a minimum of 400,000-psi yield strength and contain no lead, zinc, or aluminum. Valves shall open counter-clockwise (left hand opening). Valves shall conform to AWWA C509.

19.2.7 **VALVE BOXES**

Valve boxes shall be cast iron conforming to ASTM A48, Class 20. Valve boxes shall be 36 inches L x 10¼ inches OD base, screw type adjustable riser, 26 inches L top section, 5¼ inches drop lid with 2-inch skirt. Box covers shall be clearly marked "Water". The box shall be coated with a 1 mil thickness of bituminous coating. Valve boxes shall be Tyler Model 6850. Valve box hangers shall be the Valve Box Adaptor II, as manufactured by Adapter Inc.

19.2.8 **HYDRANTS**

a. All fire hydrants shall fully comply with the latest revisions of AWWA C502 in addition to the following specifications. All hydrants shall be of the traffic model design consisting of a safety flange and a safety sleeve coupling. The design shall permit rotation of the upper barrel to position the nozzle in any direction. The nozzle placement shall not be restricted by bolt hole placement. The hydrants shall be designed for 150 pounds working pressure and tested to 300 pounds hydrostatic pressure test. All hydrants shall be of compression type main valve closing with the line pressure. Hydrants drain holes must be tapped and plugged at the factory. All working parts shall be bronze. The inlet connection shall be 6-inch mechanical joint complete with accessories including gland, gaskets, nuts, and bolts.

b. The hydrants shall have two 2½-inch hose nozzles with National Standard threads. Hydrants shall have one 4½-inch pumper nozzle with National Standard threads. The operating nut shall be 1½-inch pentagon shaped and shall open left (counter clockwise). The hose nozzle caps shall be 1½-inch pentagon shaped with chains. The main valve and seating shall be removable through the upper barrel from above ground without disassembling at the ground line flanges. The main valve opening shall be 5¼-inch in size. The stem threads shall be lubricated by removal of a screw located in the operation nut. The stuffing box shall have o-rings for seals.

c. Hydrants shall be as manufactured by Mueller (model Centurion), or Waterous (model WB67 – Pacer). Hydrants shall be painted at the factory, color to be Naperville orange. The depth of cover shall be 7½ feet or as specified. **7½ feet of cover requires 8-ft bury hydrants.** Hydrant breakaway flange shall be located 2 inches above proposed finished grade.

d. Each hydrant shall be fitted with a 'Hydrafinder' fire hydrant marking device, 5-foot length, as manufactured by RoDon Corp. of St. Charles, IL (800/858-5516).

e. Hydrants shall include tags on the upper flange indicating the bury depth, plugged drain hole, and extension height (if so equipped).

19.2.9 **HYDRANT EXTENSIONS**

Hydrant extensions shall be manufactured by the hydrant manufacturer, and designed to fit existing hydrants or hydrants as provided/installed. Maximum height of extension on new hydrants shall be 12-inches (requires Engineer's approval).

19.2.10 **JOINT RESTRAINT**

Joint restraint shall be sized to fit ductile iron pipe. Joint restraint shall be EBAA Iron Megalug, or approved equal.

19.2.11 **WATER SERVICE PIPE**

Water service pipe shall be Type "K" of annealed seamless copper tubing conforming to ASTM B88 and AWWA C800.

19.2.12 **SERVICE SADDLES**

Service saddles shall be an all stainless steel shell and hardware, double bolt style, copper compression out and shall comply with ANSI/AWWA C800 standards.

19.2.13 **CORPORATION STOPS**

1" corporation stops shall be Mueller or Ford ground key type. 1 ½" and 2" corporation stops shall be Mueller 300 or Ford ball type. Corporation stops shall have AWWA tapered inlet thread and Mueller 110 compression outlet. Stops shall be designed to connect to Type "K" copper. Stops shall meet AWWA C800 specifications.

19.2.14 **CURB STOPS**

Curb stops shall be Mueller Mark II Oriseal or Ford curb stops, with compression inlet and outlet, ¼ turn, inverted key with stationary rod, arch pattern for connection to Type "K" copper water service pipe.

19.2.15 **CURB BOXES**

Curb boxes shall be of the arch type pattern and telescopic in length. The normal bury depth will be 7.5 feet. Curb box diameter will be 1" for 1" curb valves and 2" for 1 ½ "and 2" curb valves. Curb boxes will have shut-off rods of 5/8" diameter for 1" valves and ¾" for 1 ½" and 2" valves. Curb boxes and rods shall be of proper length to allow installation to be flush with finished ground elevation. Curb box caps shall be the two hole style, marked "water", and shall be of the proper size for the corresponding curb box. Curb boxes shall be Mueller or equal.

19.2.16 **POLYSTYRENE INSULATION**

Material shall be rigid, cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base rein in an extrusion process complying with ASTM C578 for Type IV, with 5 year aged R-values of 5.4 and 5.0 at 40° F and 75° F, respectively. The minimum density of the insulation shall be equal to 1.6 pcf unless noted otherwise. The insulation boards shall have a minimum dimension of 2 inches thick by 2 feet wide.

SECTION 19.3 CONSTRUCTION

19.3.1 OPERATING VALVES OF THE WATER SYSTEM

Only representatives of Marshfield Utilities (MU) will be allowed to operate existing water valves and new water valves used to isolate new water mains. The Contractor shall coordinate all work requiring operation of water valves (such as depressurization of existing water mains) with the MU. Minimum 24 hour notification is required.

19.3.2 REMOVE OR ABANDON EXISTING WATER MAIN

All existing water mains, including valves, valve manholes and appurtenances, shall be removed and disposed of by the Contractor. Backfilling and compaction shall meet requirements as specified herein and shown on the plans. Water main which is abandoned in place shall have a bulkhead place on each end of the abandoned main. This work shall be considered incidental to water main construction regardless of location.

19.3.3 BEDDING AND COVER MATERIAL

a. The bedding of the pipe and backfill of the trench shall provide lateral support against deflection of the pipe diameter, and shall prevent any subsequent settlement which might result in excessive pressure and consequent rupture of the pipes.

b. The bedding shall be select fine granular materials (washed sand) placed on a flat bottomed trench and compacted to a minimum depth of 4inches beneath the bell of the pipe, unless specified otherwise.

c. After placement of bedding, all pipe shall be carefully covered with bedding material to a distance of 12 inches compacted above the outside of the top of the pipe. Granular soil used for cover shall be carefully placed so as not to disturb the alignment of the pipe nor cause distortion of the pipe; it shall be carefully compacted by hand or mechanical methods in 12-inch lifts to at least 95% of Standard Proctor Density.

19.3.4 LAYING PIPE

a. All pipe shall be laid to provide a minimum cover of 7'-6" from the established or proposed grade to top of pipe, unless plans indicate otherwise.

b. Ductile iron pipe water main shall be installed in accordance with AWWA C151, standard laying condition type 5, granular bedding and cover. All pipe, fittings, valves and hydrants shall be wrapped with polyethylene in accordance with AWWA C105. Joint restrain shall be required for all hydrants, fittings and valves, including adjacent water main joints, in accordance with plan details.

c. The Contractor shall conduct water main installation work such that the use of sleeves is minimized. Sleeves shall only be installed at locations as approved by the Engineer

d. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. The open ends of the pipe shall be closed by a watertight plug, or other means approved by the Engineer, while placing the pipe in the trench. During laying operations, no debris, tools,

clothing, or other materials shall be placed in the pipe. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent soil from entering the joint space.

e. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. This provision shall apply during the noon hour as well as overnight. If any water is in the trench, the plugs shall remain in place until the trench is pumped completely dry.

19.3.5 **WATER MAIN - BORED**

a. Where indicated on the plans, water mains shall be installed by utilizing sub-surface methods such as boring and jacking, ramming, directional drilling or other approved methods, hereinafter referred to as boring. Open cut methods will not be allowed within the boring/excavation limits shown on the plans. The boring installation method and materials as recommended by the Contractor shall be approved by the Engineer prior to construction, however this approval does not relieve the Contractor of his responsibility to install a pressure-tight water main to the line and grade shown on the plans without damage to the pipe or adjacent facilities, irregardless of soil or groundwater conditions prevalent at the site.

b. Casing pipe, if required, shall be steel pipe, 35,000-psi yield meeting ASTM A53, grade B, with continuous welds, hardwood skids and end seals in accordance with City of Marshfield specifications available upon request. The annular space between the casing and carrier pipes shall be completely filled with blown sand.

19.3.6 **POLYETHYLENE WRAP**

a. Installation The polyethylene wrap shall be cut approximately 2 feet longer than the length of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately 1 foot and at all joints sealed with approved adhesive tape. Additional taping shall be used at 4-foot intervals along the pipe. Any rips, punctures or other damage to the polyethylene shall be repaired immediately with adhesive tape. All copper service connections shall be wrapped for a distance of 3 feet from the centerline of the main. Before installing the polyethylene wrap the exterior of the pipe shall be free of foreign material.

b. Wrapping of Special Fittings, Valves, etc. When hydrants, valves, tees, crosses, etc. cannot be wrapped practically in a tube, a double wrap of flat sheet or split tube shall be used. The wrap shall extend approximately 18 inches beyond all joints. All seams shall be taped securely.

c. Backfill Around Polyethylene Wrapped Pipe 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.

d. Bored Water Mains: Special measures are required for securing polywrap to water mains installed via bore/directional drill methods. The method as selected by the Contractor shall be approved by the Engineer after the Contractor successfully demonstrates the acceptability of the method.

19.3.7 **WATER SERVICE CORPORATION STOP/CONNECTION**

a. All service taps will be completed with the water main full and under pressure. Corporation stops for service laterals up to 1-inch diameter shall be directly tapped into ductile iron water main. Corporation stops greater than 1-inch diameter shall utilize service clamps or saddles. Maintain minimum horizontal separation of 12 inches between a service connection and the bell end of a pipe or fitting, and minimum 24 inches between service connections, independent of which side of the main services are installed. Service connections shall be installed so that the outlet is at an angle slightly above horizontal.

b. A permit is required for each new water service. Permit not required for replacement of an existing water service. The Contractor shall apply for said permits at least 3 working days prior to installation. Permits can be obtained through the Plumbing Inspection Department, 6th floor of City Hall, 630 South Central Avenue, Marshfield, Wisconsin. Contact the City of Marshfield Plumbing Inspector regarding these permits.

c. Water Contractor shall furnish all materials and install all water service corporation stops/connections.

19.3.8 **WATER SERVICE LATERAL**

Copper water service shall be installed in accordance with AWWA C800. New services shall extend 5 feet behind the property line. Copper water service laterals shall be installed without any coupling or joint from the corporation to the curb stop, except with the permission of the Engineer. The Contractor shall use a sizing tool on the copper pipe for services greater than 1-inch. A horizontal gooseneck is required at the service connection to the main. Bury depth shall be 7½ feet. Bedding and cover shall be as required for water main installation. The end of the water service line (if not connected to an existing water service pipe) shall be marked with an 8'x2"x4" board. Connecting to a lead water service lateral is prohibited unless under the direct approval of Marshfield Utilities.

19.3.9 **CURB STOP AND BOX**

Curb boxes shall be installed plumb and shall be fully extended when installed. Mark all curb boxes with a hardwood lath labeled "Curb Stop". (Also see Section 19.3.18 Adjusting Curb Boxes)

19.3.10 **WATER LINE INSULATION**

a. In some instances it may be necessary to adjust the depth of water mains and/or service laterals to avoid conflicts with sewers or other underground obstructions. In cases where this adjustment must be such that the minimum cover of 7½ feet cannot be maintained, the Contractor, at the direction or approval of the Engineer, shall furnish and install rigid extruded polystyrene insulation board. **In no case will the depth of cover over the top of the water line be less than 5 feet.**

b. Prior to the placement of the insulation boards, the Contractor shall place, level and compact the pipe bedding material, in accordance with the Specifications, to a height of 6 inches over the top of the pipe. The insulating boards shall be placed on top of the compacted bedding material, with the long dimension parallel to the centerline of the water line, for a minimum width of the pipe O.D. plus 24 inches. The boards shall be placed in a staggered arrangement so as to eliminate continuously aligned joints parallel to the centerline of the pipe. A minimum of a 4-inch final thickness of insulation shall be provided. When two

layers of insulation board are used, each layer shall be placed so as to cover the joints of the layer immediately below.

c. The first lift of backfill above the insulation shall consist of 6-inches of bedding material which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment or personnel does not operate directly on the insulation board. Following the compaction of this layer to the proper density, the remaining layers of backfill may be placed and compacted utilizing conventional procedures.

19.3.11 **SETTING HYDRANTS**

a. Location

1. Hydrants shall be located as shown or as directed and in a manner to provide complete accessibility, and also in such a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized.

2. When set in the lawn space near the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.

b. Position All hydrants shall stand plumb. Hydrants shall be installed or adjusted such that their nozzles are parallel with or at right angles to the curb. Hydrants shall be set to the established grade, or as directed by the Engineer. Hydrant breakaway flange shall be located 2 inches above proposed finished grade.

c. Connection of the Main Each hydrant shall be connected to the main with a 6-inch hydrant lead controlled by an independent 6-inch auxiliary gate valve, except as otherwise directed.

19.3.12 **HYDRANT EXTENSIONS**

If required on the plans or directed by the Engineer, hydrant extensions shall be utilized for adjusting existing hydrants to the proper grade. Only one extension shall be installed on a new/proposed hydrant, per Engineer's approval, and said extension shall be 12-inches or less. Hydrant extensions that are installed to correct improper hydrant setting by the Contractor shall be provided and installed at the Contractors expense. Every hydrant that receives a hydrant extension shall include a tag indicating the height of the extension. Hydrant extensions shall be installed in accordance with the manufacturer's instructions.

19.3.13 **SETTING VALVES AND VALVE BOXES**

New valves and valve boxes shall be set in accordance with plan details. Joint restraint is required for all valves. A 'Gate Valve Adaptor' shall be installed on the valve for setting of the valve box. All valve boxes shall be set plumb and marked with a hardwood lath labeled "Valve". (Also see Section 19.3.19, Adjusting Valve Boxes)

19.3.14 **ELECTRICAL CONDUCTIVITY REQUIRED**

The Contractor shall furnish and install on all joints, mechanical and push-on, a built in place conductor between socket and pipe end. Use copper cable (#6 AWG w/sheath) around coated fittings or valves. Capacity shall be sufficient to carry to a minimum of 200 amps current at each joint and meet the approval of the Engineer.

19.3.15 **BACKFILL AND COMPACTION**

a. Suitable native/excavated material shall be used as backfill. All roots, debris, rocks, or large stones, or other unsuitable materials, which in the opinion of the Engineer will cause interference with the compaction requirements, shall not be permitted in the backfill and shall be disposed of as directed by the Engineer.

b. Backfilling may begin immediately after the placement of cover material, and then may be carried on from the top of the trench by mechanical means or by dumping directly from trucks, or by hand. The backfill in no case shall be dropped from such a height or in such a volume that it's impact upon the pipe structure and will cause damage. Backfill material shall be placed in lifts not to exceed 12 inches thick when loose.

c. The Contractor shall have compaction equipment, in operating condition, on the job site before starting construction. All excavated areas shall be compacted to not less than 95% of maximum density as determined in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, AASHTO T99/ASTM D698 (Standard Proctor). Jetting, puddling or flooding to obtain compaction will not be permitted.

d. The City reserves the right to perform random compaction testing. All areas not meeting compaction requirements shall be re-excavated or replaced, and compacted until said compaction requirements are satisfied.

19.3.16 **DISINFECTION**

a. The interior of all pipe, fittings and other accessories shall be kept free as possible from dirt and foreign matter at all times.

b. The Contractor shall be required to disinfect all mains in accordance with the latest revision of AWWA C651 Standard for Disinfecting Water mains.

c. Initial disinfection of new water main facilities shall be accomplished using Hypochlorite tablets. Tablets shall be placed in each section of pipe and also in hydrants, hydrant branches, and other appurtenances. Calcium Hypochlorite tablets (65% available chlorine) shall be installed at the inside top of each length of pipe as it is being laid, and shall be attached to the pipe using Permatex '66B', clear RTV silicone sealant. The number of tablets required shall be according to Table 1. When installation has been completed, the main shall be filled with water at a velocity of less than 1 foot per second. MU will fill the water main if said segment is contiguous with the distribution system. This water shall remain in the pipe for at least 24 hours.

TABLE 1					
NUMBER OF HYPOCHLORITE TABLETS REQUIRED					
	LENGTH OF PIPE SECTION, FEET				
PIPE DIAMETER INCHES	**13' OR LESS**	**18'**	**20'**	**30'**	**40'**
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
14	3	5	5	8	10
16	4	6	7	10	13

d. Before the water main is placed in service, MU will flush the water main. Samples will be collected and tested for bacteriologic quality and shall show the absence of coliform organism. Two samples will be required a minimum of 24 hours apart. The main shall not be placed in service, and the Contractor shall not be paid the portion of moneys withheld on his contract until at least two bacteriologically safe samples has been obtained from each sampling location.

e. If the initial disinfection fails to produce safe samples, disinfection shall be repeated by the Contractor until satisfactory samples have been obtained. Liquid chlorine or hypochlorite solution shall be the only acceptable method for rechlorination of the mains.

19.3.17 **TESTING**

a. Pressure Test

1. After the pipe has been laid and backfilled but prior to installation of water services, the Contractor is encouraged to pressure test water main segments to confirm integrity of newly laid pipe.

2. Each valved section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection, gauges and all necessary apparatus shall be furnished by the Contractor.

3. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants or blowoffs are not available at high places, the contractor shall make the necessary taps at points of highest elevation before the test is made and insert the plugs after the test has been completed.

4. Acceptance of water main facilities shall be based upon a successful pressure test, after all water services have been installed and completed. All newly laid pipes, or any valved section thereof, shall be subjected to a **two-hour water pressure test at 150 psi**. The pressure within the test segment must remain between 150 psi and 145 psi for the two-hour period. During the test, the water main segment shall remain undisturbed, thus the addition of make-up water to increase or maintain the pressure is not allowed. Auxiliary gate valves at hydrants shall be open.

b. Electrical Conductivity Test

The Contractor shall test the conductivity of each section of line using a welder at 200 amps current. The Contractor shall be required to locate and correct any point of failure.

19.3.18 **EROSION CONTROL**

The Contractor shall provide erosion control as show on the plans and specifications. Erosion control is subject to WDNR approval. MU will not be responsible for site erosion due to flushing activities. The Contractor shall provide erosion control and site restoration due to disturbance from flushing.

19.3.19 **ADJUSTING CURB BOXES**

a. New Curb Boxes which control a live water service (connected to a building) shall be adjusted/set by the contractor such that the top is flush with the finished elevation of the adjacent surface.

b. New Curb Boxes which are not live or connected to a building shall remain in an extended position and shall include a marker (per plan details) which is intended to remain after completion of construction.

c. Existing Curb Boxes which are affected by construction (such as but not limited to street opening, reconstruction, patching, etc.) shall be adjusted by the Contractor such that the top of the box is flush with the finished elevation of the adjacent surface. Adjustment of Existing Curb Boxes, including locating, raising, lowering or straightening, may require excavation; removal of the existing top, box (pipe) and/or stationary rod; removal or extension of the base (pipe) including rethreading; couplers/fittings/etc; and reinstallation of the top; all resulting in a stable and operable curb box.

d. The Contractor shall furnish and install new materials, if necessary for proper adjustment of an existing curb box, including the top if necessary, in accordance with the material specifications for curb boxes.

e. It is the Contractors responsibility to protect Curb Boxes throughout all phases of construction. Curb Boxes damaged by construction may require complete replacement at no cost to the Owner.

f. Adjusting existing curb boxes shall be considered incidental to construction unless specifically listed for payment on the unit price schedule/contract.

19.3.20 **ADJUSTING VALVE BOXES**

a. All Valve Boxes which are located in a concrete or asphalt surface shall be adjusted by the Contractor to comply with requirements for setting manhole covers as specified in Section 9 of these standard specifications. Valve boxes which are not located in a concrete or asphalt surface shall be set flush with the finished elevation of the surface.

b. Existing Valve Boxes which are affected by construction (such as but not limited to street opening, reconstruction, patching, etc.) shall be adjusted by the Contractor. The Contractor shall be responsible for locating, exposing, cleaning out and protecting (from damage and debris) all valve boxes. Marshfield Utilities will be responsible for supplying parts for major adjustment of valve boxes (such as new sections) however the Contractor shall be responsible for all adjustments, which may require excavation; removal of existing top and lower section(s); installation of top and lower section(s); and final adjustment.

c. All materials shall comply with valve box materials specifications. Top sections shall be full body and threaded onto the lower section. Drop-in type lid/cover adjusting ring top sections will not be allowed unless approved by the Engineer.

d. Adjusting existing valve boxes shall be considered incidental to construction.

19.3.21 **OFFSET EXISTING WATER MAIN**

a. Where necessary for construction of sewer, the Contractor shall offset/relocate existing water mains. The offset shall be installed in accordance with plan details. Materials and installation shall comply with all requirements of Section 19 of these Standard Specifications.

b. All work associated with Offset Existing Water Main shall be coordinated with Marshfield Utilities – Water Superintendent.

19.3.22 **TEMPORARY WATER SUPPLY**

a. The Contractor shall provide a continuous supply of safe water to all affected properties. The Contractor shall coordinate with property owners and Marshfield Utilities the change over at start-up and termination of said temporary water supply system. The temporary water supply shall be maintained throughout the duration of construction and shall terminate only after new water main and services have been completed, pressured tested, disinfected and are bacteriologically safe. In no case shall property owners be without water for more than 4 hours.

b. The Contractor shall prepare a detailed temporary water supply plan and shall submit the plan to Marshfield Utilities for review and approval. HDPE pipe or other approved material shall be used. Garden hose will not be acceptable material for temporary water supply. The Contractor shall sample and test to assure bacteriological safety prior to utilization of the temporary system.

c. Marshfield customers will be billed average water consumption while connected to temporary water supply.

d. All temporary water supply lines shall have a tested and approved backflow prevention device installed at the furthest upstream point of the temporary water supply.

SECTION 19.4 MEASUREMENT AND PAYMENT

19.4.1 **WATER MAIN**

a. Measurement shall be per linear foot of each diameter installed, measured from the center of fitting/valve to the center of fitting/valve.

b. Payment shall be at the unit price bid per linear foot of the respective diameter which price shall be payment in full for furnishing, hauling and installing, excavation, sheeting, shoring, dewatering, bedding/cover material, backfill and compaction, disposal of waste materials, all test procedures, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.2 **WATER MAIN - BORED**

a. Measurement shall be per linear foot of water main-bored per each diameter installed by boring/sub-surface methods, measured from the end of a bell to the end of a bell.

b. Payment shall be at the unit price bid per linear foot of the respective diameter which price shall be payment in full for furnishing, hauling and installing via sub-surface boring/directional drilling methods, including water main and casing, excavation, sheeting, shoring, dewatering, backfill and compaction, disposal of waste materials, all test procedures, and all labor, material, equipment, tools and incidentals necessary to complete the work.

19.4.3 **FITTINGS**

a. If specifically listed in the Contract as a pay item, measurement shall be per each size and type installed, per each. If not specifically listed in the Contract as a pay item, fittings will not be measured for payment, thus all work and materials for fittings will be considered incidental to water main construction.

b. Payment shall be at the unit price bid each size and type installed, which price shall be payment in full for furnishing, hauling and installing, including joint restraint, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.4 **VALVES**

a. Measurement shall be per each size and type installed, per each.

b. Payment shall be at the unit price bid per each size and type valve installed, which price shall be payment in full for furnishing, hauling, installing and adjusting, including the valve box, adaptor and joint restraint, and all labor, material, equipment, tools and incidentals necessary to complete the work.

19.4.5 **HYDRANTS**

a. Measurement shall be per each per bury depth of hydrant, per each.

b. Payment shall be made at the unit price bid per each, which price shall be payment in full for the hydrant, marker, tie back, blocking, etc. and for furnishing, hauling and installing, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.6 **HYDRANT EXTENSIONS**

a. Measurement shall be per each length installed, per each.

b. Payment shall be made at the unit price bid per each, which price shall be payment in full for furnishing, hauling and installing, and all labor, material, equipment, tools and incidentals necessary to complete the work.

19.4.7 **HYDRANT LEAD**

a. If specifically listed in the Contract as a pay item, measurement shall be per linear foot, measured from the centerline of the water main to the centerline of the hydrant. If not specifically listed in the Contract as a pay item, hydrant lead pipe length will be measured as water main and included in the quantity for 6-inch water main.

b. Payment shall be made at the unit price bid per linear foot, which price shall be payment in full for furnishing, hauling and installing, and all labor, material, equipment, tools and incidentals necessary to complete the work.

19.4.8 **CORPORATION STOP**

a. Measurement shall be per size of corporation stop installed, per each. This work will not be measured for payment if construction/installation of said connection is done by Marshfield Utilities or others.

b. Payment shall be at the contract unit price per each corporation stop (installed for a water service line), which price shall be payment in full for furnishing all materials (including the valve and service clamp/saddle), permit fees, hauling and installing, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.9 **WATER SERVICE LATERALS**

a. Measurement shall be per linear foot per specific size of water service installed.

b. Payment shall be at the unit price bid per linear foot of each size lateral installed, which price shall be payment in full for furnishing, hauling and installing, connecting to existing, excavation, sheeting, shoring, dewatering, bedding/cover material, backfill and compaction, disposal of waste materials, all test procedures, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.10 **CURB STOP**

a. Measurement shall be per each size of curb stop installed, per each.

b. Payment shall be at the contract unit price per each curb stop installed (for a water service line), which price shall be payment in full for furnishing all materials, hauling, installing and adjusting, including the curb box, and all labor, material, equipment, tools, and incidentals necessary to complete the work.

19.4.11 **ADJUSTING EXISTING CURB BOX**

a. Measurement shall be per each existing curb box adjusted.

b. Payment shall be at the contract unit price per each existing curb box adjusted, which price shall be payment in full for furnishing all materials, hauling, removing, installing and adjusting the existing curb box, and all labor, material, equipment, tools and incidentals necessary to complete the work.

19.4.12 **OFFSET EXISTING WATER MAIN**

a. Measurement shall be per lump sum for each existing water main offset.

b. Payment shall be at the Contract Unit Price per lump sum for Offset Existing Water Main, which price shall be payment in full for all coordination, delay, pipe materials and appurtenances, excavation, backfill and compaction, sheeting, shoring, dewatering, disposal of waste, testing and disinfection, along with all materials, labor, equipment, tools and incidentals necessary to complete the work.

19.4.13 **TEMPORARY WATER SUPPLY**

Measurement and payment shall be lump sum. Payment shall be payment in full for furnishing, installing, testing, disinfecting, maintaining and removing the system, and for all labor, material, equipment and tools necessary to complete the work.

SECTION 20

SANITARY SEWER AND MANHOLES

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1. General
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3. Sanitary Sewer Pipe and Fittings
4. Bedding and Cover Material
5. Sanitary Sewer Main – Various Sizes
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7. Manholes
8. Manhole Frames and Covers
9. Chimney Seals
10. Backfilling and Compaction
11. Testing
12. Final Cleaning Requirements

Except as herein stated or shown on the accompanying plans and detail sheets, the sanitary sewer construction to be performed under this contract shall conform to *Standard Specifications for Sewer and Water Construction in Wisconsin*, Sixth Edition, excluding the general conditions thereof.

1. GENERAL

Construction of new or reconstructed sanitary sewer mains, manholes and laterals shall conform to the requirements of the Public Works Industry Improvement Program "Standard Specifications for Sewer and Water Construction in Wisconsin", Sixth Edition, along with subsequent updates (excluding the General Conditions), hereinafter referred to for sanitary sewer items as the 'Standard Specifications', and these specifications and the Special Provisions.

All sanitary sewer work such as mains, (including connection to existing mains) manholes (including connections to new or existing mains, connections to existing laterals and clean-outs) shall be constructed to be water-tight. Mains, manhole flowlines and laterals shall provide smooth and consistent flow characteristics without offsets or obstruction of the flow.

The Contractor shall be responsible for protecting existing and new sanitary sewer components within the project limits. Special care shall be exercised to prevent entry of groundwater, surface water, foreign materials such as stone/gravel, debris or any other objects or materials, into the sewer system through openings at manholes, mains, laterals, clean-outs, temporary connections, etc. The Contractor shall be responsible for all costs associated with investigation, cleaning, repairs and/or restoration as a result of his failure to protect sanitary sewers.

Sanitary manholes (covers) must remain accessible throughout construction of the project unless the contractor requests alternate arrangements, which are to be reviewed and approved by the City Engineer prior to implementation. If alternate arrangements are implemented, it shall still be the Contractor's responsibility to provide access to manholes if necessary for emergency purposes (repairs, jetting, maintenance, etc.).

The Contractor shall provide reasonable access for City of Marshfield personnel and equipment, along with others/subcontractors hired by the City, who are to perform work on sanitary sewers. This work may include manhole rehabilitation, lining of existing pipelines, cleaning and/or televising of new or existing pipelines, etc. In addition, the Contractor shall provide access and cooperate with property owners and their contractor/plumber when said private entity is attempting to rehab or replace their facilities.

2. WASTEWATER FLOW MANAGEMENT

The Contractor shall maintain service for all users impacted by sanitary sewer work.

The wastewater flow in the existing sewer shall be bypass pumped, manhole section to manhole section, around the segment of sanitary sewer being installed. Bypass pumping shall be continued until the sanitary sewer segment is completed, tested and deflection tested, as required elsewhere.

Wastewater will not be allowed to flow into an open trench. Wastewater and groundwater will not be allowed to flow from an open trench into new or existing sanitary sewers. Wastewaters must be safely and properly conveyed to a downstream sanitary sewer, without exposure to the open air and without adverse impact to downstream sewers and/or users.

Wastewater flow management shall be incidental to construction of sanitary sewers and will not be paid for separately.

3. SANITARY SEWER PIPE AND FITTINGS

Sanitary sewer main pipe and fittings shall be PVC, SDR-35, and conform to the requirements of ASTM D-3034 (Standard Specification for PVC Sewer Pipe and Fittings) or ASTM F-679 (Standard Specification for PVC Large-Diameter Plastic Gravity Sewer Pipe and Fittings). All joints shall be push-on type with elastomeric gaskets.

Sanitary sewer lateral pipe and fittings shall be PVC consisting of either; SDR-35 conforming to ASTM D-3034 requirements with push-on type joints and elastomeric gaskets; or Schedule 40 conforming to ASTM-D1785 and D-2665, with solvent cemented joints conforming to D-2564.

When connecting to similar sized (inside diameter) PVC sewers use a gasketed PVC repair coupling.

When connecting sewers with different inside diameters, use a gasketed PVC eccentric reducer.

When connecting to existing similar sized (inside diameter) concrete, vitrified clay or other non-PVC and unlined sewer pipe use an appropriately sized flexible plumbing adaptor as manufactured by Fernco Inc.

When connecting to existing similar sized (incised diameter) lined (cured-in-place thermoset resin pipe) sewers use a Fernco, sealant and concrete (for encasement) as shown on the plan details.

Where required on the plans, Ductile Iron pipe shall be installed (typically at low clearance storm sewer crossings). This pipe shall be Class 52, cement mortar lined with seal coat, and shall be polywrapped in accordance with water main requirements. Ductile iron pipe shall be connected to PVC pipe with an approved gasketed adapter. Ductile iron pipe, polywrapping and adapters shall be incidental to sanitary sewer work.

4. BEDDING AND COVER MATERIAL

Bedding material shall conform to the gradation requirements listed on the plans and details. The bedding material shall also be used as cover material to 24" above the pipe as shown on the detail accompanying the plans. Bedding and cover material shall be placed and compacted (walk-behind vibratory plate equipment) in lifts not exceeding 12-inches.

At approximately 20 feet upstream of manholes, install clay (suitable native materials) trench plus extending 6-feet along the pipe and the full trench width, in lieu of bedding and cover material.

The bid price for sanitary sewer, including laterals, per lineal foot and at various sizes shall include full compensation for the cost of supplying, placing, and compaction of the bedding and cover material.

5. SANITARY SEWER MAIN - VARIOUS SIZES

All gravity sewers shall be installed to line and grade with an automatic grade and line laser of the "in the pipe" type beam with the appropriate size pipe target. Blowers must be provided to prevent laser beam distortion in the pipe.

The trench shall be excavated to provide a smooth, compacted flat bottom. Bottom width shall accommodate the pipe and the use of compaction equipment between the pipe OD and trench wall. Place and compact bedding material prior to setting pipe.

All connections of a new PVC sanitary sewer to an existing sewer shall be water tight. The slope of the new sewer shall match the slope of the existing sewer. Flowlines shall match and shall not offset horizontally or vertically at the connection.

Remove sharp edges on the inside of the upstream pipe and bevel (1/4") the inside edges of the downstream pipe.

Connections will be verified by internal inspection, and/or televising by the City. The Contractor shall coordinate with the City and Wastewater Utility, and provide reasonable access and assistance to accomplish inspection. Any downtime or delay shall be considered incidental to the work. Leaking or offset connections shall be remedied by the Contractor (incidental). Leaks may be repaired by pressure grouting within the main.

When connecting to lined sanitary sewer mains, carefully remove the host pipe from the liner, connect the Fernco to the liner and encase with concrete as shown on the plan details.

The measurement for payment for sanitary sewer shall be the number of lineal feet of pipe actually in place measured from centerline of manhole to centerline of manhole or from centerline of manhole to the end of a portion not starting or ending in a manhole.

Such payment shall be full compensation for furnishing all materials, including any necessary fittings, connections, couplings, bedding material, cover material; for removing existing sanitary sewer pipe and manholes in proposed sanitary sewer trenches, all excavation, sheeting and shoring, forming foundation, laying pipe, making all connections to existing fixtures, backfilling, compaction, removing sheeting and braces, and restoring the site of the work, disposal of surplus material; and for all labor, tools, equipment, and incidentals necessary to complete the work in accordance with the plans and contract.

6. SANITARY SEWER LATERALS

Sanitary laterals shall be installed in accordance with specifications for Sanitary Sewers (such as laid on a prepared bed of stone and covered with stone, compacted, etc.) with the following exceptions:

- Pipe laser not required (maintain positive and consistent slope by frequent checks using a level).
- Do not install trench plugs on laterals.
- Deflection testing is not required unless the lateral can be accessed (via manholes/clean-outs/etc.).
- Air test shall be accomplished in conjunction with air testing of the main where possible (such as no live laterals, or live laterals with access/manholes/clean-outs).

Install laterals in accordance with the State of Wisconsin Department of Commerce Plumbing Code and plan detail requirements.

Sanitary laterals shall generally be constructed as type A. Risers where necessary and approved by the City Engineer shall be constructed as Lateral Type C (sloped). A Type B (Vertical) Lateral/Riser shall only be allowed for special circumstances. Risers will only be allowed where depth criteria is met/exceeded (10-foot minimum cover at right-of-way line for residential properties, 12-foot

minimum cover at right-of-way for commercial properties), or where the sanitary sewer main is at least 2.5-feet lower than the existing lateral (or minimum bury as discussed above). A 'Drop Connection to Existing Lateral' (see detail) may be utilized on all types of laterals.

Shallow existing laterals (less than 6-feet of cover) shall be lowered in accordance with plan details (Drop connection to Existing Lateral), if possible.

Straighten existing laterals which are skewed if possible or required on the plans.

The locations of existing sanitary sewer laterals and lengths of replacement laterals shown on the plans are approximate and may vary in the field. It is the contractor's responsibility to locate each existing sanitary lateral serving properties affected by construction. Existing sewer laterals (designated to be replaced) at various locations shall be replaced from the sewer main to a point indicated on plan details, typically five feet beyond the adjacent street right-of-way. The new PVC lateral shall be connected to the existing lateral with a Fernco coupling or equal if the existing pipe is not PVC, however if the existing lateral pipe is PVC this connection shall be made using a gasketed PVC repair coupling.

If an existing lateral scheduled for replacement is found to be either PVC or any existing pipe material sliplined with PVC and in good condition (proper slope, alignment, joints, etc), the lateral shall remain in place per discretion of the City Engineer.

The Engineer reserves the right to televise existing sanitary sewer laterals from within the excavation to determine pipe condition or status (live vs. abandoned) prior to replacement with a new lateral. This televising shall be performed by the Engineer with assistance by the Contractor using equipment supplied (stored and transported) by the City. The Contractor shall provide safe access to the lateral. This work and any down time or delay shall be incidental to construction.

When requested by the Engineer, the Contractor shall expose or leave exposed the existing sanitary sewer lateral, at a point near or within the limits of replacement, for access and use by others intending to replace or rehabilitate (including but not limited to slip-lining, pipe-bursting, cured-in-place lining, etc.) the existing lateral to remain. The Contractor shall protect the excavation as necessary for safety and shall provide safe access for others/private contractors as appropriate. This work and any down time or delay shall be incidental to construction.

New laterals for future use (not connected to an existing lateral) shall be capped, blocked and marked with a 4" x 4" hardwood board extended from the pipe invert to finished ground.

New and replacement sanitary sewer laterals to be installed as part of this project shall be field surveyed via GPS by the City Engineer concurrent with construction. The intent of this GPW data acquisition is to comply with Section 182 of the Wisconsin Statutes, without installation of an actual tracer wire. The Contractor shall provide adequate notice to the City Engineer (at least three working days prior to commencing lateral work), allow reasonable time for the City Engineer to acquire said GPS survey data, provide safe trench conditions and access for the City Engineer, and assist the City Engineer with acquisition of this survey data if necessary. This work and any downtime or delay shall be considered incidental to construction.

Two or more sanitary laterals may be installed in a common trench if approved by the City Engineer. Common trench laterals will be reviewed on a case by case basis, in the field, in accordance with criteria established by the City Engineer.

The measurement for payment for the sanitary sewer lateral shall be the number of lineal feet of pipe actually in place measured along the centerline of the lateral, including the connection to an existing lateral or cap/marker for new laterals.

Sanitary sewer lateral connections to the sewer main shall consist of a PVC wye with a 45° bend, to be measured as a unit, per each.

Such payment shall be full compensation for furnishing all materials, including any necessary fittings, adapters, or connections, bedding material, cover material, for all labor, tools, equipment, and incidentals necessary to complete the work in accordance with the plans and contract.

7. MANHOLES

The manhole manufacturer shall prepare shop drawings for sanitary manholes and provide them to the Contractor. Shop drawings must be labeled with the project name and ID number, the manufacturer's name and the Contractor's name. Structures must be identified using plan ID numbers. The Contractor shall review the submittals and stamp his approval on them which is evidence that he has checked them for accuracy and compliance with the plans and specifications. The Contractor shall then submit the shop drawings to the City Engineer for approval (prior to manufacturing). City Engineer's review will be for general conformance to the design concept.

New or reconstructed manholes shall be watertight. All pipes connecting to a sanitary manhole shall include an approved watertight rubber boot type connection meeting ASTM C-923, and secured to the pipe with two stainless steel band clamps. The annular space between the sewer pipe and the manhole/boot inside of the manhole shall be filled with an approved grout. The annular space between the sewer pipe and the manhole/boot on the outside of the manhole shall be filled with an approved grout with a concrete collar placed to encapsulate the rubber boot. Flowlines shall be provided for all pipes connecting to a manhole. Each flowline shall be comprised of precast or ready-mix concrete or PVC pipes (halved) encased in concrete, and shall be the same size as the connecting pipe. Flowlines shall be smooth and free of defects, offsets, voids, protrusions, etc. All concrete flowlines shall be ground to provide a surface as smooth as a PVC sewer pipe. Flowlines must be inspected and approved prior to installation of each manhole. Flowlines which catch solids or debris when in service must be reground/repaired.

When required on the plans, connect new manholes directly to existing PVC pipes, and/or CIPP liners.

Concrete manhole structures shall have a monolithic base with precast flowlines and tongue and groove risers, manufactured in accordance with ASTM C-478. Lifting lugs required (lift holes through the wall are not allowed). Manhole riser sections shall be tongue and groove type joint and sealed with two rings of 1-inch butyl seal, placed on the upper and lower horizontal face of the manhole riser joint. The external joint area of each manhole riser joint shall be sealed with a 12-inch wide joint wrap, Gator Wrap, as manufactured by Sealing Systems Inc., or approved equal (submit data sheets for approval), installed in accordance with the manufacturers recommendations.

The top section of a manhole shall be a precast eccentric cone. Flat top sections, if necessary, shall be keyed (tongue and groove joint) and shall only be used upon approval of the City Engineer.

Steps shall be ductile iron or steel reinforced plastic case integral with the manhole. Steel steps will not be allowed. Steps shall have a non-slip surface with reflectorized corners.

Sanitary manholes shall be set plumb/vertical and level across riser joints, on a level and compacted stone base.

Manhole frames are to be adjusted to grade in accordance with Section 9 of these standard specifications.

The payment for this work shall be the contract price per vertical foot, measured from the bottom of the casting to the lowest invert, for manhole type 1 (with or without an inside drop) or manhole type 1 outside drop, as the case may be. This price shall be full compensation for furnishing all materials, including all masonry, conduits and sewer connections, flexible pipe to manhole seals, smooth flowlines, butyl seals, external riser joint seals, excavation, backfilling and compaction, manhole cover adjustment, disposal of surplus material, and restoring the site of the work; and for all labor, tools, equipment, and incidentals to complete the work.

8. MANHOLE FRAMES AND COVERS

Standard and low profile sanitary sewer manhole frames and covers shall be as described in Section 8 of these Standard Specifications per type as indicated on the plans.

The payment under this section shall be the contract price for each manhole cover and shall be full compensation for furnishing all materials, including all masonry, frames, grates, and lids, and for all excavation, backfilling, temporary plating, protection, adjustment and restoring the site of the work, and for all labor, tools, equipment, and incidentals.

9. CHIMNEY SEALS

Chimney seals shall be installed on sanitary sewer manholes as noted on the plans, where the cover/rim is at or below the adjacent finished grade. Chimney seals are not required for manholes where the cover is sufficiently above the adjacent finished grade or is located within pavements with a drained subbase.

Internal chimney seals, where required, shall be installed on sanitary sewer manholes after the manhole cover is set to final grade, typically after the concrete street has been restored. The chimney seal shall extend from the precast concrete manhole cone to the cast iron manhole cover frame. Internal chimney seals shall be the as manufactured by Cretex Specialty Products of Waukesha, WI.

External chimney seals, where required, shall be installed on sanitary sewer manholes after the manhole cover is set to final grade but prior to any asphaltic paving or final turf restoration. The external chimney seal shall extend from the precast concrete manhole cone to the cast iron manhole cover frame. External chimney seals shall be the Internal/External Adaptor Seal as manufactured by Adaptor Inc. of West Allis, WI for all sanitary manholes with conic top sections. For manholes with flat-top covers, the external chimney seal shall be Infi-Schield Uni-band as manufactured by Sealing Systems Inc.

Chimney seals shall be measured per type, per each cover sealed and paid for at the contract unit price, per each, for each type of chimney seal installed. This payment shall be full compensation for furnishing all materials, labor, tools, equipment and all incidentals needed for installation.

10. BACKFILLING AND COMPACTION

Suitable native/excavated material shall be used as backfill. Backfill material must be compacted to a minimum of 95% standard proctor density. This material shall be installed in lifts not to exceed 12" thick when loose. Compaction of backfill material shall be accomplished through the use of equipment specifically designed to compact the soils encountered/utilized. Tamping or pounding backfill material with the backhoe bucket does not satisfy this requirement. Special compaction measures and equipment (vibratory rammer or hoe-mounted vibratory plate) are required at manholes, cleanouts, and other vertical appurtenances, and where standard compaction equipment cannot be utilized. The City reserves the right to perform random compaction testing. All areas not meeting compaction requirements shall be re-excavated or replaced, and compacted until said compaction requirements are satisfied. Flooding of backfill shall not be allowed. All trenches shall be backfilled and compacted by the end of the day. Also see Specification Section 4 – Excavation and Trenches as these requirements shall apply in addition to those discussed above.

11. TESTING

All new sanitary sewers shall be tested in the presence of the designated City representative, prior to acceptance and placing the sewer in service. The contractor shall provide all labor, equipment and materials to perform this testing, which shall be incidental to the project.

Deflection Testing shall be performed on all new PVC sewer pipe via use of a Go-No-Go mandrel, based on 5% deflection of the base inside diameter.

A low-pressure air test shall be performed on new sewers when these sewers can be isolated (no live laterals).

All new sanitary sewers (including stubs and connections) shall be televised by the City of Marshfield Wastewater Department prior to placement of the roadway surface. The Contractor shall coordinate with the Engineer to schedule this task. It is the Contractor's responsibility to provide vehicular access for the televising equipment, to expose each manhole to be accessed and provide safe working conditions in the immediate area. If the manhole is temporarily plated and covered with road base, the Contractor shall excavate down to said plate and at least 12-inches beyond the outside diameter of the manhole/cone. The Contractor shall be responsible for filling in and/or protecting this excavation upon completion of the televising work.

The City reserves the right to televise any portion of the new sewer, or existing sewer which could be damaged by construction activities at any time/stage of construction. Any damage, deficiency or leakage shall be repaired to the City's satisfaction, by the Contractor at his expense. Televising and repair if needed shall be done prior to placement of subbase materials.

12. FINAL CLEANING REQUIREMENTS

All sanitary sewer components must be clean upon completion of construction of the project. All manhole steps, benches, flowlines, covers (pickholes, lids and seats) and pipes shall be clean and free of accumulations, deposits or splatter (including those resulting from roadway construction).

SECTION 22

ELECTRICAL

SECTION 22.1 GENERAL

This work shall consist of removing existing and/or installing new electrical, street lighting and/or traffic signal facilities such as concrete bases, cabinets, poles, fixtures, conduits, boxes, wire, etc., along with all appurtenances.

For most projects, existing poles, cabinets, wire and control equipment will be removed by others, prior to or concurrent with project construction. New poles, cabinets, wire and control equipment will also (typically) be installed by others, concurrent with project construction.

22.1.1 ELECTRICAL PERMIT REQUIRED

The Electrical Contractor is required to get an Electrical Permit from the City of Marshfield – Development Services Department for all electric wok. A single permit shall cover all electrical work per contract (i.e. a single contract may include multiple projects however only a single electrical permit is required). The Electrical Permit Application is available from the City's Development Services Department or via the City's website (Development Services, Building Inspection; Applications and Permits). The cost for this permit shall be $300. All costs associated with said electrical permit shall be distributed amongst unit prices for pertinent electrical pay items, as there will not be a pay item or allowance specifically for permit costs on proposal(s) or unit price schedule(s) for the contract.

SECTION 22.2 MATERIALS

22.2.1 All materials shall comply with current WisDOT requirements (Part 6, Electrical Sections).

22.2.2 CONDUIT

Nonmetallic conduit shall be Schedule 40 PVC (typically used for loop detectors, pull box runs, etc.).

Conduit for longer/bored runs shall be ETL Listed HDPE, Schedule 40, UL651A&B.

22.2.3 PULL BOXES

Pull Boxes, per size indicated on the plans, shall utilize corrugated steel pipe (for pavement and non-pavement areas) and shall include equipment grounding provisions. Locking covers are required for pull boxes located in pavement.

22.2.4 CONCRETE BASES

Concrete bases for light poles, signal poles and/or control cabinet equipment shall meet WisDOT requirements and comply with plan details.

SECTION 22.3 CONSTRUCTION

22.3.1 REMOVALS

Existing concrete signal/pole and/or control cabinet base shall be removed where indicated on the plans. Sizes, thickness, diameter, depth, reinforcement, etc. of existing bases will vary.

Removal of bases shall include the following:

- Cut and remove conduit and/or wire such that removal of the base will not damage nearby facilities to remain.
- Remove all concrete, reinforcement/steel and formwork.
- Cut and seal all existing conduits below grade.
- Backfill the resulting hole/excavation using suitable native materials up to the subgrade, immediately following removal.
- Compact the backfill in lifts appropriate for the compaction device but not more than 12-inches per lift.

Note: Removal of existing pull boxes shall be considered incidental to construction within the excavation limits on street reconstruction projects.

22.3.2 NEW ELECTRICAL COMPONENTS

Construction methods and installation shall comply with WisDOT Standard Specifications, detail drawings included in the plans and these Standard Specifications. All trenches and excavation shall be backfilled and compacted per the City's Standard Specifications in a manner acceptable to the Engineer. All electrical conduit, fittings and pull boxes shall be installed by a State of Wisconsin licensed electrician. Excavation, backfilling and other non-electrical related work may be done by other trades.

Note: Potholing/ULO's needed for installation of bored conduits shall be considered incidental to construction, including repair of surfaces. Removal and replacement of street/sidewalk surfaces which are not indicated on the plans but desired by the Contractor shall be considered incidental to construction of the bored conduit.

Nonmetallic Conduit, including loop detector conduit (for loop detector runs) shall be installed per plan details. Conduit for longer bored runs shall be continuous from pull box to pull box without a joint. Conduit for short bored runs such as crossing a driveway shall be PVC similar to the remaining length of the run. Do not directly connect HDPE and PVC conduits together. Drain sumps are not required. A nylon pull string shall be placed inside each entire run of conduit from existing/proposed pull box to existing/proposed pull box.

Where conduit is to be utilized for street lighting or is otherwise to be electrically energized, said conduit shall be installed at least 24-inches below finished ground with a red caution tape installed 12-inches above the conduit.

Permanently mark the ends of all conduit installed for future use utilizing #4 rebar, 24-inches long driven to 4-inches below finished ground.

SECTION 22.4 MEASUREMENT AND PAYMENT

Removing bases shall be measured per each base removed, per type (signal/pole or control cabinet). Payment shall be made at the contract unit price and shall be considered full compensation for all excavation, removal, materials, backfilling, compaction, disposal of waste and clean-up, along with all mobilization, labor, tools, equipment and incidentals necessary to complete the work.

Nonmetallic conduit will be measured per size, per type of use, per type of installation (normal/open excavation vs. bored) and shall be measured per lineal foot from/to the center of pull boxes and/or bases. Payment shall be made at the contract unit price and shall be considered full compensation for all excavation, materials, backfilling, compaction, disposal of waste and clean-up, along with all mobilization, permits, labor, tools, equipment and incidentals necessary to complete the work.

Pull Boxes will be measured per size, per depth, and shall be measured per each pull box successfully installed. Payment shall be made at the contract unit price and shall be considered full compensation for all excavation, materials, backfilling, compaction, disposal of waste and clean-up, along with all mobilization, permits, labor, tools, equipment and incidentals necessary to complete the work.

Concrete Bases will be measured per type, per each successfully installed. Payment shall be made at the contract unit price and shall be considered full compensation for all excavation, materials, backfilling, compaction, disposal of waste and clean-up, along with all mobilization, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 24

TRAFFIC CONTROL

The Contractor shall be responsible to furnish, erect and maintain traffic control devices and facilities, including flagging and guidance service if necessary for construction operations, in accordance with project plans, details and specifications, and Section 643 of the WisDOT Standard Specifications. Placement of signage shall be as required by the Manual of Uniform Traffic Control Devices, Part VI unless plan details show otherwise. All traffic control devices shall, unless otherwise specified, conform to the latest revision of Part VI, Traffic Controls for Street and Highway Construction and Maintenance Operations of the USDOT, FHWA's Manual of Traffic Control Devices for Streets and Highways, and Section 1.5.5 of the City Specifications.

The Contractor shall have a designated employee or traffic control company available 24 hours a day to insure that traffic control is operating properly. The Contractor shall supply the Police Department and the City Engineer with a 24-hour telephone number of the designated employee or traffic control company. The Contractor is responsible for maintaining the correct traffic control in working order.

Detours are not required (by the Contractor) unless indicated on the plans or special provisions.

The proposed traffic control layout shall be reviewed with the City Engineer prior to installation. The number, location and spacing of all signs shall be adjusted to fit conditions. Any signs (temporary or existing) which conflict with Traffic Control 'in use' shall be removed or covered.

Traffic control must be in place and approved by the Engineer prior to the start of any construction.

Barricades that must be moved for Contractors work operation shall be immediately re-established upon completion of the operation.

All Type III barricades shall have rails reflectorized on both faces. Stripes shall be properly sloped down toward the traffic side or to the center barricade for a full road closure. Type 'A' low-intensity flashing warning lights ('flashers') shall be visible on both sides of the barricade (where flashers are required). Road closure signs (R11-2, R11-4) shall be mounted to Type III barricades and shall not cover more than the top rail (must not cover middle or bottom rails).

For full road closure, the center Type III barricade shall include 2 flashers and the road closed sign. A minimum of one flasher shall be provided on each of the other barricades, placed near the outside edge of the top rail (uniformly spaced).

Additional advanced warning signs are required if the closest alternative (bypass) route is more than one standard block from the project's construction limits.

Fixed message signs shall be required where collector or arterial streets intersect with the road that is closed due to construction. Fix message signs shall be 2' x 4' minimum size and must be legible by traffic traveling at reasonable speeds at the location it is to be installed.

Where existing sidewalks are to be removed, inaccessible or unsafe, traffic control signage shall include sidewalk-closed signs and advanced warning signs.

This item shall be measured and paid as one lump sum for each project. This bid price shall be full compensation for transporting, installing, inspecting, maintaining and furnishing all labor, materials, equipment, tools and incidentals necessary to complete the work for each project.

SECTION 25

MISCELLANEOUS CONSTRUCTION

SECTION 25.1 POLYSTYRENE INSULATION BOARD, 2”

SECTION 25.2 PAVEMENT MARKING, EPOXY

SECTION 25.3 PERMANENT SIGNING

SECTION 25.4 RETAINING WALLS

SECTION 25.5 STEEL PLATE BEAM GUARD

SECTION 25.1 POLYSTYRENE INSULATION BOARD, 2”

25.1.1 DESCRIPTION

This work shall consist of furnishing and placing polystyrene insulation board as shown on the plans and as hereinafter provided.

25.1.2 MATERIALS

The polystyrene insulation board shall conform to the requirements for Extruded Insulation Board, AASHTO Designation M230, except as hereinafter revised:

- The flammability requirement is deleted.

Said insulation board shall be produced as a homogeneous closed-cell matrix material, tested to resist absorption of water (<0.3% volume), with a minimum compressive strength of 40 psi. The size of each board shall be 4’ x 8’ typical, with squared edges.

The Contractor shall obtain from the manufacturer and furnish to the project engineer before installation a certification indicating compliance with these specifications.

25.1.3 CONSTRUCTION

Insulation board shall be placed upon a compacted and leveled surface such that said insulation boards are fully supported and without voids underneath.

Gaps and irregularities between boards shall not exceed ½-inch.

Boards (cut-offs) sizes smaller than 2’ x 4’ shall not be used.

Use dry silica sand where necessary for leveling and to fill voids between and/or adjacent to insulation boards.

25.1.4 METHOD OF MEASUREMENT

Polystyrene Insulation Board, 2” will be measured by installed area in square feet completed and accepted.

25.1.5 **BASIS OF PAYMENT**

Polystyrene Insulation Board, 2" measured as provided above, will be paid for at the contract unit price per square foot, which price shall be full compensation for all excavation; furnishing, cutting and placing the insulation board; sand leveling and joint filling; waste and disposal; along with all labor, equipment, tools and incidentals necessary to complete the work.

SECTION 25.2 PAVEMENT MARKING, EPOXY

25.2.1 **DESCRIPTION**

Roadway and/or path pavements shall be marked in accordance with plan details using reflectorized epoxy paint.

25.2.2 **MATERIALS**

All materials shall comply with Sections 646 and 647 of the Wisconsin Department of Transportation Standard Specifications.

25.2.3 **CONSTRUCTION**

Pavement markings shall be installed in accordance with the patterns and minimum widths as shown on plans and details. Do not mark crosswalks or stop lines within the pan area of concrete curb and gutter (typically 24-inches from the gutter/face of curb). Ladder bar type crosswalks shall be laid out such that a ladder bar is aligned and centered on the adjacent approach centerline marking (or centerline joint if unmarked). Ladder bars shall be oriented parallel with the traffic. Do not mark partial or incomplete ladder bars (at ends of ladder bar crosswalks).

Application of pavement markings shall comply with WisDOT Specifications and the following:

All surfaces to receive pavement markings shall be clean and dry.

Brush-off blasting as required for concrete surfaces, shall not remove curing compound beyond areas to be covered by pavement marking. The Engineer reserves the right to require Contractor to re-seal/re-cure excessive areas that have been blasted but not covered by pavement markings.

All blasting materials and debris shall be contained to prevent damage to adjacent facilities and minimize dust/emissions.

All debris and waste materials, including bead, sand, removal debris, etc. shall be swept, collected and removed from the project site and shall be properly disposed of (off-site).

25.2.4 **METHOD OF MEASUREMENT**

Pavement marking lines including solid or intermittent (skip-dash) lines, stop lines, crosswalk component lines, etc. shall be measured by the lineal foot of line actually placed and acceptably completed, per width/component as the case may be. Pavement marking words or symbols shall be measured per each unit/assembly acceptably completed.

25.2.5 **BASIS OF PAYMENT**

Payment shall be full compensation for all layout, preparation of surfaces, materials, application and protection of pavement markings including all labor, equipment, tools and incidentals necessary to complete the work. Removal of existing pavement markings shall not be measured and paid for separately (considered incidental to construction) for re-trace work.

SECTION 25.3 PERMANENT SIGNING

25.3.1 **DESCRIPTION**

The Contractor shall furnish, assemble, erect and install permanent signs and posts for streets and/or paths as required on the plans.

Signs shall meet the requirements of the current MUTCD adopted by the State of Wisconsin, the Wisconsin MUTCD Supplement and shall conform to Section 637 of the WisDOT Standard Specifications.

25.3.2 **MATERIALS**

Sign base shall be sheet aluminum. Nominal thickness shall be 0.080-inches for small signs 24-inches wide and under, 0.100-inches for signs 24-inches to 36-inches wide and 0.125-inches for signs wider than 36-inches.

Sign face sheeting shall be High Intensity Prismatic Retro-reflective however Parking/Standing/Stopping signs and plaques shall have Engineer Grade sheeting.

Posts shall be steel U-Channel posts. Posts for street signs shall be 3 lbs. per foot with 3/8-inch holes on 1-inch centers. Posts for path signs shall be 2 lbs. per foot. All sign posts shall be galvanized however street sign posts to be installed on designated truck routes shall be yellow polyester power coated.

Hardware for street signs shall be 304 stainless steel. Hardware for path signs shall be 304 stainless steel and vandal resistant (submit shop drawings for approval).

Hardware for street signs shall be as follows, per type of mounting:

U-Channel post mountings shall use:

- 5/16” hex bolts x 2-1/2” long (UNC thread)
- Flat washers 1-1/4” OD x 3/8” ID x 1/16” (2 per bolt)
- Nylon washers 1-1/4” OD x 3/8” ID x 0.80
- 5/16” lock washer
- 5/16” hex nut
- Order = Hex Bolt Head – Flat Washer – Nylon Washer – Sign – Post – Flat Washer – Lock Washer – Hex Nut.

Decorative Street Light Pole mountings shall use:

- 3/8” hex bolts, 1” long (UNC thread)
- 5/16” lock washer
- Flat washer 1-1/4” OD x 3/8” ID x 1/16”
- Nylon washer 1-1/4” OD x 3/8” ID x 0.80
- Order = Hex Bolt Head – Lock Washer – Flat Washer – Nylon Washer – Sign – Trac-Nut (supplied by City).

Bands/straps for signs to be mounted to power poles shall comply with Marshfield Utilities requirements. Hardware shall be similar to the Decorative Street Light Pole mounting, as described above.

25.3.3 **CONSTRUCTION**

Install signs in accordance with plan details.

Height/length of posts shall be as necessary to accommodate the proposed installation of each sign/assembly, including bury (3-feet minimum embedment) and under sign clearance, without post protrusion above upper edge of sign. Ends of posts that are cut shall be de-burred; and rust-proofed, galvanized or touch-up painted as approved by the Engineer.

Use two posts on signs/assemblies that are 48-inches wide or wider.

Use two fasteners per sign post, however, signs greater than 9 SF require three fasteners per sign post.

Mount signs to posts such that the top of the sign shall be 1" above the top of the post (±1/2").

Posts to be installed within concrete and/or asphalt surfaces shall utilize a 4-inch PVC sleeve set flush with said surface, or a 3-1/2-inch core-drilled hole through said surface. Fill the annular space after post installation utilizing special mortar (See Section 9 of these Standard Specifications), 2-inches thick and slightly mounded to the post.

Provide and affix identification code and installation stickers on the back of each sign, lower right corner.

25.3.4 **MEASUREMENT**

Signs shall be measured per square foot of area for each sign face, per sign face sheeting material.

Posts shall be measured per each per type (path, street, color, etc.) and/or length, as listed on the unit price schedule/bid form.

25.3.5 **PAYMENT**

Payment shall be made at the Contract Unit Price(s) and shall be considered full compensation for providing all materials, hauling, handling, assembling, erecting and installing, along with all labor, tools, equipment and incidentals necessary to complete the work.

SECTION 25.4 RETAINING WALLS

25.4.1 **GENERAL**

25.4.1.1 **DESCRIPTION**

This work shall consist of designing, furnishing and constructing permanent earth retaining walls, with or without Geogrid reinforcement, vertical or sloped face, in accordance with lines, grades, elevations and details as shown on the plans. Work under this item will also include preparation and installation of the

foundation and leveling pad, drainage backfill, pipe underdrain, reinforced (native) soil backfill, Geogrid, concrete block wall and cap units and all appurtenances.

25.4.1.2 **DESIGN REQUIREMENTS**

Final design of all retaining walls shall be done by the wall manufacturer in accordance with these specifications. Retaining walls and all components shall be designed to be sound and stable for the design life of 75 years. Retaining wall design shall consider all factors of internal, external and global stability including but not limited to sliding, overturning, bearing, pull out, shear and bending. Factors of safety for all design parameters shall be 1.5 minimum, 2.0 preferred. Detailed soils information if necessary for final design shall be the Contractor's responsibility. The design shall be in compliance with current National Concrete Masonry Association (NCMA) recommendations/standards and standard engineering design procedures as determined by the City Engineer.

25.4.1.3 **SUBMITTALS**

The Contractor shall submit detailed shop drawings including design calculations, material and installation specifications, details, dimensioned drawings and quantities/schedule of materials, to the engineer for review. Design calculations shall clearly indicate all factors of safety, soil pressures, retained earth mass, etc. The title page of the shop drawings and design calculations shall be signed, sealed and dated by a Professional Engineer licensed in the State of Wisconsin. Any exceptions to the plans and these specifications shall be clearly identified and discussed.

Submittals shall be checked, approved and stamped/initialed by the Contractor before transmittal to the Engineer. Contractor approval indicates that measurements, quantities, dimensions, materials, means, methods, construction procedures and safety precautions have been reviewed and verified.

Final design/shop drawings shall be prepared on 11" x 17" sheets including a letter block with pertinent project identification/information, page numbers, revision/date and initials of designer and checker. Submittals shall be compiled, bound and indexed. Deliver three (3) sets of submittals to the Engineer no later than 21 calendar days prior to Contractor's scheduled beginning of construction of the wall.

Note: References hereinafter to plans, details, etc. shall include any and all documents submitted to the Engineer (such as shop drawings, details, design data, etc.).

25.4.1.4 **QUALIFICATIONS OF RETAINING WALL MANUFACTURER**

The retaining wall units and components shall be designed and manufactured by a reputable firm doing business in this field for a period of at least five (5) years. Provide contact names and telephone numbers for similar projects where the specific retaining wall system has been successfully constructed. The Engineer shall approve or disqualify manufacturers based upon these qualifications and contact information.

25.4.1.5 **QUALIFICATIONS OF INSTALLER**

Provide contact names and telephone numbers for similar projects where the specific retaining wall system was successfully constructed by the proposed installer. The installer must be trained, experienced and familiar with the

specified requirements and methods required for the proper installation and performance of the work of this item.

25.4.2 MATERIALS

25.4.2.1 BLOCK UNITS AND COMPONENTS

Retaining block wall units and components shall be comprised of straight single pane split-face finish precast concrete units. A single block type and style shall be used throughout each wall. The color of the block shall be concrete gray or as labeled on the plans and/or unit price schedule. Joints between units shall be mortarless but incorporate interlocking through installation of pins/mechanisms/ devices to develop a mechanical connection between vertical courses. Block units shall not be chipped, cracked, or have imperfections, and dimensions shall not vary by more than 1/8-inch from the standard values published by the manufacturer. Block unit dimensions shall be approved by the Engineer (via submittal process) with acceptable block heights between 6-inches and 8-inches and acceptable block widths between 16-inches and 18-inches, excluding top/cap units. Block units shall comply with ASTM requirements for minimum compressive strength and water absorption rates, and shall produce acceptable results for durability tests as conducted by WisDOT.

The top course of facing units shall be a solid block with a smooth top surface and shall be bonded/secured to the underlying facing units with a durable, high strength, flexible, concrete adhesive compound compatible with the block material. In addition, cap units shall comply with all the requirements discussed herein for block units.

Connectors, pins, rods, clips or other devices used to develop mechanical interlock between facing unit block courses shall be as manufactured or recommended by the block manufacturer and comprised of corrosion resistant materials.

25.4.2.2 BASE LEVELING PAD

Materials to be utilized for the Base Leveling Pad shall meet requirements for Base Aggregate Dense, ¾-Inch as specified in Section 5 of these City of Marshfield Standard Specifications for Public Works Construction.

25.4.2.3 GEOTEXTILE FABRIC

Materials for Geotextile Fabric shall meet requirements as specified in Section 5 of these City of Marshfield Standard Specifications for Public Works Construction.

25.4.2.4 GEOGRID

Materials for Geogrid (reinforcement) shall meet requirements for Geogrid as specified in Section 5 of these City of Marshfield Standard Specifications for Public Works Construction.

25.4.2.5 DRAINAGE AGGREGATE BACKFILL

Materials to be utilized for Drainage Aggregate Backfill shall meet requirements for Open Graded Base as specified in Section 5 of these City of Marshfield Standard Specifications for Public Works Construction.

25.4.2.6 **REINFORCED SOIL BACKFILL**

Materials to be utilized for Reinforced Soil Backfill shall meet requirements for Excavation or Borrow Materials as specified in Section 4 of these City of Marshfield Standard Specifications for Public Works Construction.

25.4.2.7 **PIPE UNDERDRAINS**

Materials to be utilized for Pipe Underdrain shall meet the requirements for Corrugated Polyethylene Pipe, as specified in Section 6 of these City of Marshfield Standard Specifications for Public Works Construction. Pipe underdrain for retaining walls shall be perforated, with sock.

25.4.3 CONSTRUCTION

25.4.3.1 **EXCAVATION**

The Contractor shall excavate to the lines and grades as necessary to construct retaining walls per plan requirements. Contractor shall take precautions to minimize over-excavation. Over-Excavation volume shall be backfilled and compacted using Base Leveling Pad material for over-excavation below the foundation; and Drainage Aggregate Backfill for gravity/nonreinforced walls and Reinforced Soil Backfill for reinforced walls for over-excavation behind the wall, all at the Contractor's expense. Foundation soils shall be leveled and compacted to a minimum of 95% standard proctor density or otherwise creating an unyielding foundation, utilizing a suitable vibratory plate compactor. Remove/ trim/prune all exposed roots using appropriate forestry practices.

25.4.3.2 **BASE LEVELING PAD**

The Base Loading Pad shall be constructed in accordance with plan details to the required line and grade. The minimum thickness of the base material shall be 6-inches compacted. The footprint of the base material shall extend at least 6-inches in each and all directions from the footprint of the bottom course of block units. The Base Leveling Pad shall be compacted utilizing a vibratory plate compactor to provide a firm, level and unyielding bearing surface for the bottom/first course of block units. Well graded sand may be used to smooth the top ¼-inch of the leveling pad.

25.4.3.3 **BLOCK UNITS AND COMPONENTS**

Retaining wall facing units shall be placed to the proper lines and grade per plan requirements. The initial course of units shall be centered on the base leveling pad, set to be level in all directions, in full contact with the base and properly seated. This course shall be reviewed with the Engineer prior to placement of additional courses upon/above this course. The front face of units shall be placed side by side without gaps between adjacent units. Facing units shall be placed in a running bond configuration with joints occurring at the midpoint (vertically) of the adjacent course below. Each course of block facing units shall be swept clean immediately prior to placing the next course. Place and compact backfill material(s) as wall construction progresses, however at no time shall wall construction progress beyond more than two courses above backfilling and compacting.

All connections, pins, rods, clips or other devices shall be installed and set in accordance with the manufacturer's requirements.

The Engineer shall be allowed to inspect the wall prior to installation of the cap and make adjustments as necessary or desired per the discretion of the Engineer.

25.4.3.4 **BACKFILLING AND COMPACTING**

Backfill and compact drainage aggregate as wall construction progresses. Drainage aggregate material shall be hand tamped or otherwise suitably compacted without adversely affecting the wall. Lifts shall not exceed 8-inches when loose/uncompacted. Reinforced soil shall be placed and compacted in lifts not exceeding 8-inches when loose and shall be mechanically compacted to 95% of the maximum standard proctor density.

Do not backfill or cover the wall until measured by the Engineer.

25.4.3.5 **GEOTEXTILE FABRIC**

Geotextile Fabric shall be installed as indicated on the plan details and as required in Section 5 of the City's Standard Specifications.

25.4.3.6 **GEOGRID REINFORCEMENT**

Geogrid reinforcement shall be installed per final design requirements, laid horizontally on compacted reinforced soil backfill and attached to the block wall units. Geogrid shall be continuous throughout the embedment length, pulled taught and anchored prior to placement of the next block course and/or backfill material. Installation of Geogrid Reinforcement shall comply with requirements as specified in Section 5 of the City's Standard Specifications.

25.4.4 MEASUREMENT AND PAYMENT

25.4.4.1 **METHOD OF MEASUREMENT**

Retaining walls with or without reinforcement (gravity wall) as the case may be, shall be measured by the square foot of wall face actually installed, on a vertical plane, between the top of the base leveling pad and the top of the wall (including the cap) as required and shown on the plans. Wall area constructed above or below these limits, or beyond the plan location limits shall not be measured for payment unless ordered or agreed to by the Engineer.

25.4.4.2 **BASIS OF PAYMENT**

Retaining walls, as measured above, shall be paid for at the contract unit price per square foot, per type of wall constructed (gravity, reinforced, etc.) and said payment shall be considered full compensation for providing final design submittals/shop drawings; site preparation; excavation for placement of the base leveling pad, wall, behind/above the wall, and all necessary backfill material(s); and providing, hauling, placing and installing all necessary wall components to produce a functional retaining wall system including but not limited to the base leveling pad, pipe underdrain, block units and components, Geotextile Fabric, Geogrid, drainage aggregate backfill, reinforced soil backfill, and all compaction; along with all materials, labor, equipment, tools and incidentals necessary to complete the work. This work shall also include providing, hauling and placing of low permeability soil and topsoil for all disturbed areas behind and adjacent to the retaining wall.

Excavation in front of the wall, (measured to/from a vertical plane at the base of the wall at the proposed ground surface), railings on or behind the wall, and turf restoration behind the wall will be measured and paid for separately.

SECTION 25.5 STEEL PLATE BEAM GUARD

25.5.1 DESCRIPTION

This work shall consist of constructing a steel plate beam guard protection system, including treated wood posts, steel plate beams, terminal ends, reflectors/decals and all hardware/appurtenances.

25.5.2 MATERIALS

All materials shall comply with Section 614 of the WisDOT Standard Specifications for Highway and Structure Construction.

25.5.3 CONSTRUCTION

Installation shall comply with Section 614 of the WisDOT Standard Specifications for Highway and Structure Construction.

Voids adjacent to posts and those resulting from post driving operations shall be filled and compacted with base course materials.

Rounded end sections shall include a 12” x 12” reflectorized object marker decal.

The Contractor shall touch-up and repair protective coatings/treatments disturbed by construction, including but not limited to cutting posts, trimming bolts, and all abraded or damaged surfaces.

Application of pavement markings shall comply with WisDOT specifications and the following:

All surfaces to receive pavement markings shall be clean and dry.

Brush-off blasting as required for concrete surfaces, shall not remove curing compound beyond areas to be covered by pavement marking. The engineer reserves the right to require contractor to re-seal/re-cure excessive areas that have been blaste3d but not covered by pavement markings.

All blasting materials and debris shall be contained to prevent damage to adjacent facilities and minimize dust/emissions.

All debris and waste materials, including beaks, sand, removal debris, etc. shall be swept, collected and removed from the project site and shall be properly disposed of (off-site).

25.5.4 MEASUREMENT AND PAYMENT

Steel Plate Beam Guard shall be measured per lineal foot, from center of post to center of post, plus the longitudinal length of the end section(s) unless the end section is measured and paid for separately.

Payment shall be at the Contract Unit Price, per class or item as measured herein. Said payment shall constitute full compensation for all materials, including posts, blocks, beams, channels, ends, fittings, hardware, reflectors/

decals and surface treatments, driving posts, excavation, backfilling, installation, trimming, touch-up/repair, disposal of surplus/waste, and clean-up, along with all mobilization, materials, labor, equipment, tools and incidentals necessary to complete the work.