### SECTION 500

PORTLAND CEMENT CONCRETE CONSTRUCTION

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501 - CONCRETE - GENERAL

501.1 Scope of Work
The work under this section shall consist of constructing new or removing and replacing Concrete Sidewalk, Curb & Gutter, and/or Pavement of the dimensions and design shown on the plans or as specified in the Contract Documents. The work shall be placed in one course on the prepared foundation or base, at the specified locations, and to the required lines and grades.

The Contractor shall furnish all labor, equipment, materials, supervision, tools, supplies, and incidentals for the construction of new or remove & replace Concrete Pavement, Curb & Gutter, Sidewalk and/or any other concrete surface work released by the City of Manitowoc for public construction in accordance with the plans and specifications for the project.

501.2 Associated Sections of These Standard Specifications
The Contractor is advised that associated work is covered in other sections of this document and he shall be familiar with all applicable standards required for the work. While not all inclusive, the Contractor is especially advised to be familiar with the sections on Erosion and Sediment Control; Earthwork, Grading, and Graveling; Traffic Control; and Landscaping.

501.3 Material Source
The source of materials for use on the project shall be subject to the approval of the Engineer.

501.4 Concrete Masonry
Concrete Masonry shall consist of a mixture of the Portland cement, fine aggregate, coarse aggregate, and water, and shall be proportionally mixed in such a manner as to provide for a hard, durable, impervious substance, free from the effects of any spalling, disintegration, or cracking.

501.4.1 Concrete

501.4.1.1 Cement Content
Six (6) bags per cubic yard, unless otherwise specified in the special provisions. (High Early mix shall consist of an 8 bag mix, or as further specified in the Special Provisions for the work). No accelerators or other admixtures shall be used except for air and water reducers unless approved in writing or included in the special provisions.

501.4.1.2 Slump
Pavement - maximum three (3") inches.
Curb & Gutter - maximum three (3") inches.
Sidewalk - maximum four (4") inches.
Testing shall conform to ASTM C143 standard slump cone field test procedure. Slip formed work shall be sufficiently stiff as to hold its form and not deform until set.

501.4.1.3 Aggregate Size
Maximum one and one-half (1 1/2") inches for pavement and curb. Maximum
three quarter (3/4”) inch for sidewalk.

501.4.1.4 **Air Entraining**
Require six (6) percent (+ one (1%) percent) air (by volume).
Air entraining admixture conforming to ASTM C 260 is permitted.

501.4.1.5 **Fly Ash**
Only permitted up to twenty (20%) percent of the ratio of cement by weight if specifically called for in the special provisions. Only Type "C" fly ash will be allowed, if approved. NO FLY ASH SHALL BE USED IF NOT INCLUDED IN THE SPECIAL PROVISIONS OR IF NOT AUTHORIZED IN WRITING.

501.4.1.6 **Maximum Mixing Time**
One and one-half (1 1/2) hours or 300 revolutions.

501.4.1.7 **Minimum Mixing Time**
Seventy (70) revolutions prior to discharging.

501.4.1.8 **Minimum Air Temperature at Time of Pour**
Thirty-three (33) degrees and rising. However, in NO event shall concrete ever be placed upon frozen ground.

501.4.1.9 **Concrete Temperature at Time of Pour**
Minimum temperature fifty (50) degrees Fahrenheit.
Maximum temperature eighty (80) degrees Fahrenheit.

501.4.1.10 **Compression Strength**
Minimum 3,200 P.S.I. @ 28 days.

501.4.1.11 **Calcium Chloride**
The use of up to 2% calcium chloride in the concrete mix is permitted when temperatures may drop below freezing within 24 hours of finishing of concrete, unless reinforced concrete is specified. Any use of calcium chloride must be pre-approved in writing by the City Engineer or his designee.

501.4.1.12 **Admixtures**
Except as noted above will not be permitted. Use of same will result in an order for removal of the pavement and reconstruction with a conforming product. This shall occur at no cost to the City.

501.5 **Concrete Requirements**
Concrete shall conform to Section 501.4.1 of these Standard Specifications.

Ready mix concrete shall conform to Section 501.3.5, Wisconsin D.O.T. Specifications and also the requirements of the Standard Specifications for Ready Mix Concrete, ASTM C 94 with exceptions noted elsewhere in this Standard Specification (eg. fly ash or other admixtures not allowed)

The ready mix supplier shall furnish duplicate delivery tickets, one for the Contractor and one for the Engineer, which shall provide all pertinent information as specified in Section 501.8 of these Standard Specifications.
Batching plants shall conform to Section 501.3.6, D.O.T. Specifications, and all scales used shall be certified by the State, prior to construction.

The use of site mixed concrete shall not be permitted for city sidewalk, curb & gutter, or pavements.

501.5.1 Adding of water on site strictly prohibited
At no time shall water be added to the concrete after the hauling which has left the supplier. Unacceptable concrete shall be returned to the supplier.

501.6 Concrete Design Mix
The Contractor shall secure a concrete design mix from the concrete supplier, which conforms to the concrete requirements of these specifications. The exact proportions of fine and course aggregate and the amount of water used per cubic yard of concrete will be the responsibility of the Contractor. Prior to placing of any concrete, the Contractor shall submit to the Engineer for his review, the name of the concrete supplier and the concrete suppliers proposed design mix for the contract. The Engineer reserves the right to reject any, or all, design mixes and suppliers, if he feels that they will not meet the defined concrete requirement criteria. If a design mix fails to meet the requirements as specified, the Contractor shall remove any and all concrete installed which used the non-conforming design mix and replace it with concrete meeting these specifications at no cost to the owner. The design mix once reviewed by the Engineer, shall not be altered in any way without the consent of the Engineer.

501.7 Consistency
The concrete consistency shall conform to section 415.3.6 of the D.O.T. Specifications. The consistency shall be tested and regulated by means of the slump test (ASTM C 143).

501.8 Load Ticket
With each load of concrete delivered to the job, the concrete producer shall furnish duplicate delivery tickets, one for the Contractor and one for the Engineer, certifying to the following data pertaining to the concrete delivered.
- Date
- Name of ready mix concrete plant or other supplier
- Project location
- Truck number
- Cement content in bags per cubic yard of concrete
- Aggregate size
- A.E. admixture, if used
- % Fly ash, if used
- Other admixtures (Only with prior approval of the Engineer)
- Batch out time
- Arrival time at job site
- Time truck finished unloading
502 - MATERIAL SPECIFICATIONS - GENERAL

502.1 Cement
Normal Portland Cement conforming to ASTM Designation C 150 Type 1, with the addition of air entraining admixture conforming to ASTM Designation C 260, or Air Entraining Portland Cement conforming to ASTM Designation C 150 Type 1A may be used.

502.2 Water
Intended to be used with cement in concrete masonry shall be clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious substances. Water which is suitable for drinking or for ordinary household use shall be considered satisfactory.

502.3 Aggregates
Coarse and fine aggregates furnished for use in concrete masonry shall conform to the pertinent requirements hereinafter set forth.

502.3.1 Fine Aggregates
Fine aggregates shall consist of a combination of sand with fine gravel, crushed gravel, or crushed stone consisting of hard, strong, durable particles conforming to the requirements set forth in this section. At the time of its use, the fine aggregate shall be free of deleterious substances such as frozen material and all foreign material such as wood, hay, burlap paper, or dirt. The fine aggregate shall also be free from injurious amounts of organic impurities.

502.3.1.1 Size Requirements
Fine aggregates for curb & gutter, sidewalk, and concrete pavements shall be well graded from coarse to fine and shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>% Passing</th>
<th>Sieve Size</th>
<th>(By Weights)</th>
</tr>
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<tbody>
<tr>
<td>100</td>
<td>3/8 inch</td>
<td></td>
</tr>
<tr>
<td>90 - 100</td>
<td>No. 4</td>
<td></td>
</tr>
<tr>
<td>45 - 85</td>
<td>No. 16</td>
<td></td>
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<tr>
<td>5 - 30</td>
<td>No. 50</td>
<td></td>
</tr>
<tr>
<td>0 - 10</td>
<td>No. 100</td>
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These above gradation requirements for fine aggregate represent the extreme limits to be allowed for use in determining the suitability of material from all possible sources of supply.

502.3.2 Coarse Aggregates
Coarse aggregates shall be those aggregates predominately retained on the No. 4 sieve. Coarse aggregates for curb and gutter and concrete pavement shall be clean, hard, durable gravel, crushed gravel, or crushed stone free from an excess of thin or elongated pieces, frozen lumps, vegetation, deleterious substances, or adherent coating which would be considered injurious. Course aggregates for concrete sidewalk and driveway approaches shall be clean, hard crushed limestone. The amount of acceptable deleterious substances present in coarse aggregate shall be negligible. A maximum amount of allowable chert is 1.5% by weight.
502.3.2.1 **Size Requirements**  
Coarse aggregate for curb and gutter and pavement shall be of Size No. 1 and in conformance with the limits specified in the following. Size No. 2 shall be utilized only when specified in the special provisions.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Size No. 1 (By Weight)</th>
<th>Size No. 2 (By Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 inch</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>1 1/2 inch</td>
<td>90 - 100</td>
<td>20 - 55</td>
</tr>
<tr>
<td>1 inch</td>
<td>100</td>
<td>0 - 15</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>90 - 100</td>
<td>0 - 5</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>20 - 55</td>
<td></td>
</tr>
<tr>
<td>No. 4</td>
<td>0 - 10</td>
<td></td>
</tr>
<tr>
<td>No. 8</td>
<td>0 - 5</td>
<td></td>
</tr>
</tbody>
</table>

502.3.2.2 **Sidewalk Size Requirements**  
Coarse aggregate for sidewalk shall be well graded between the limits specified above for Size No. 1 only.

502.3.2.3 **Roadway Size Requirements**  
Course aggregate for roadway and curb shall be well graded between the limits specified for Size No. 2 only.

502.4 **Admixtures and Additives**  
The following admixtures and additives may be used in the mix design as long as they conform to the stated conditions. The use of other admixtures or additives without prior written approval of the Engineer is prohibited.

502.4.1 **Air Entraining Admixtures**  
Air entraining admixture shall conform to Section 501 of these Standard Specifications.

502.4.2 **Fly Ash**  
The use of fly ash in the design mix shall conform to Section 501 of these Standard Specifications and shall only be used with prior written permission by the Engineer.

502.4.3 **Calcium Chloride**  
The use of calcium chloride shall conform to Section 501 of these Standard Specifications and shall only be used with prior written permission by the Engineer.

502.5 **Jointing Material**  
Expansion joint filler shall conform to the requirements of Section 415.2.3 of the D.O.T. Specifications.

502.6 **Concrete Curing Agents**  
Curing shall be accomplished by the use of a liquid membrane-forming compound. Materials for moist curing of all concrete work shall be on hand at all times, shall be applied at a rate of 200 square feet per gallon, and shall conform to the requirements of ASTM C 309, White Pigmented.
503 - CONSTRUCTION STANDARDS & METHODS - GENERAL

503.1 Construction Work Area
The construction work area for concrete pavement shall be limited to two (2') feet behind the back of curb.

The construction work area for curb and gutter shall be limited two (2') feet behind the back of curb.

The construction work area for new and remove & replace sidewalk shall be one (1') foot on each side of the sidewalk. This area may be expanded if necessary and if approved by the Engineer to accommodate the construction of a 3:1 slope.

The Contractor shall be liable for any damage caused beyond the construction work area, as noted above, unless otherwise specified in the Contract Documents. Restoration of the area within the construction work area shall be included in the bid price for the work being done, except that seed or sod along sidewalk remove and replacement or new sidewalk construction is not included (except in the case of a full street and sidewalk reconstruction).

503.2 Phasing of Work
On all projects where both curb & gutter and sidewalk are to be constructed, the curb & gutter shall be installed prior to the installation of the sidewalk.

503.3 Damage By the Contractor
Except as directed by the Engineer, the Contractor shall be responsible for the restoration of all areas outside the project limits of the contract. This shall include, but not be limited to lawn, pavement, sidewalk, curb & gutter, utilities, land survey monuments, trees, other vegetation, and topsoil.

Any damage that causes a complaint to be registered against the Contractor shall require a written release from the complainant prior to processing final payment of the contract. The Contractor shall be responsible for negotiating and obtaining said written release. This requirement may be waived by the Engineer, if in the Engineer’s determination, the Contractor has performed adequately.

503.4 Traffic Control
The Contractor shall provide adequate traffic control devices in conformance with Section 900 on Traffic Control in these Standard Specifications.

503.4.1 Basis of Payment
The cost of this item shall be included in the lump sum for “Traffic Control”, unless specifically stated otherwise in the contract documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, install, and maintain the traffic control devices required for the project.

503.5 Erosion and Sediment Control
The Contractor shall be responsible for the installation and maintenance of
erosion and sediment control devices for the project. Erosion and sediment control shall conform to Section 800 on Erosion and Stormwater Control in these Standard Specifications.

503.5.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for each specific erosion control method (e.g. erosion mat, silt fence, stone filter bags, etc.), unless specifically stated otherwise in the contract documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, install, and maintain the erosion and sediment control devices required for the project.

503.6 Staking
All staking required by the work shall conform to Section 203 of these Standard Specifications.

503.7 Standard Design Dimensions
Unless otherwise specified in the Contract Documents, the following shall be standards for design of concrete curb & gutter, sidewalk, and pavement. (See details in this section for additional dimensions and standard details.)

The standard separate curb & gutter is thirty (30") inches wide from back of curb to face of flange and the head is six (6") inches high.

The standard width for new sidewalk is four (4') feet wide unless specified otherwise. The standard thickness of residential sidewalk is four (4") inches. Sidewalks across driveways shall be a minimum of six (6") inches. Reinforcement for sidewalk is not allowed unless otherwise specified in the Contract Documents.

The standard pavement thickness is a minimum of seven (7") inches for residential streets and (8") or (9") for functionally classified streets as stated in the Contract.

The standard intersection radii shall be 20’ (feet) unless noted otherwise in the Contract Plans.

Additional dimensions are shown in the detail section and may be detailed on the plans as well.

503.8 Curb Ramps
Curb ramps shall be installed at all intersections when either the sidewalk or the curb at the intersection is initially installed or when either is removed and replaced or when work is done within five (5') feet of the intersection of the sidewalks measured from the “house-side” of the walk intersection. Curb ramps shall conform to the details in these Standard Specifications. See sections on sidewalk and curb & gutter construction for specifics on ramp construction.

503.9 Equipment

503.9.1 Paving Machine
Paving machines will be permitted for the placement of concrete pavement, curb & gutter, and new or large stretches of remove and replace sidewalk. No modifications to manhole frames and covers, or inlet frames and grates shall be made to accommodate the use of paving machines. The Contractor shall be required to accommodate the City manhole and inlet frames and covers as well as water valve boxes in his work. The Contractor shall make such modifications and adjustments to his work as required to accommodate the facilities. The Contractor shall also comply with the details of these Standard Specifications as to dimensions for curb & gutter. See also Sections 413.5 and 413.7 in these Standard Specifications.

503.9.2 Forms
Forms shall be of a minimum height equal to the thickness of the concrete slab. Forms shall be free from twists, bends, warps, and kinks and shall be of sufficient strength and rigidity to resist pressure or load.

Metal forms are preferred to be used on all standard work and on 65 foot or larger radius curves. In special cases, such as irregular shapes and short sections, wood forms are permitted. If the Contractor has flexible metal forms that can be used on said special cases, he shall use the flexible metal forms instead of wood forms.

Wood forms are permitted for short sections of remove & replace sidewalk, new sidewalk and curb & gutter only if the wood forms are premium quality and have no warps, twists or bends. The Contractor will strictly conform to this section. They shall be commercially surfaced two (2") inch thick planks having a minimum height equal to the proposed thickness of the concrete being poured. Standard 2 x 4's will not be permitted for sidewalk construction. Form lumber having less width may be permitted, but only on irregular shapes and on radii of less than sixty-five (65') feet.

503.10 Form Setting
Forms shall be staked and set to the proper line and grade.

String line grade shall be set not less than two hundred (200') feet in advance of the forms.

The forms shall be completely cleaned of all mortar and foreign substances. The forms shall also be thoroughly oiled before the concrete is placed into them.

The foundation under the form shall be firm and cut true to grade so that the form, when set upon it, will be firmly in contact with the foundation for its entire length and so that the form is set at the desired grade.

The conformity of the alignment and grade shall be checked with the required alignment and grade of the proposed work, and necessary corrections shall be made by the Contractor prior to placing the concrete.

Where any form has been disturbed, it shall be reset and rechecked.

Forms shall be set a reasonable distance in advance of the placing of the
concrete, so that satisfactory alignment, both vertically and horizontally, can be obtained to the satisfaction of the Engineer.

In areas of fill, the forms shall be placed after the subgrade has been placed and compacted. Forms set before subgrade is compacted shall be removed and reset after compaction is completed. Compaction shall conform to Section 305 of these Standard Specifications.

503.11 Placing of Concrete
Concrete shall not be placed before 6:30 A.M. or after 5:00 P.M. without the permission of the Engineer.

The Contractor may, with the approval of the Engineer, elect to use a machine for placing, forming, or consolidating the work. If a machine is used, the resulting work shall be of such quality as to equal or exceed that produced by methods herein described.

The subgrade, forms, and any required reinforcement shall be checked and approved by the Engineer prior to the placing of concrete. It is the responsibility of the Contractor to notify the Engineer one day prior to the pour. The Contractor shall not place concrete before forms have been approved.

After any necessary corrections have been completed, the concrete shall be placed on a moist subgrade.

The concrete shall be placed in such a manner that will provide for one course construction. Placement in layers will not be permitted. The concrete shall be tamped, spaded, or vibrated in such a manner to prevent any honeycombing when the forms are removed. If honeycombing is found, it will be the decision of the Engineer whether to patch, or to remove the defective section. The Contractor shall perform said patching or removal at no cost to the City. If patching is allowed, the voids shall be filled with a well mixed grout composed of one (1) part Portland Cement and three (3) parts of fine aggregate. The surface shall then be finished to a true surface. No feathering of the grout will be allowed on exposed surface.

The concrete shall be placed promptly after mixing and in such a manner to prevent any segregation of the mix. The concrete shall be distributed to such a depth and sufficiently above grade so that, when consolidated and finished, the slab or curb thickness required by the plans will be obtained at all points and the surfaces will conform to all specified grades and slopes.

Placing of the concrete shall be continuous. In case of a temporary shut down, the unfinished end of the concrete slab or curb shall be covered with wet burlap. When the delays are of such a duration as to permit the concrete to attain its initial set, or if the delay exceeds more than thirty minutes, a construction joint shall be installed.

The placing of the concrete shall be discontinued whenever the finishing and curing operation cannot keep up with the placing, or whenever materials, workmanship, or the resultant product fail to meet the requirements of the contract.
The Engineer reserves the right to discontinue or halt any concrete placement if, in the opinion of the Engineer, the Contractor has failed to comply with any portion of the plans and specifications.

Concrete shall not be placed around any frames, castings, catch basin/inlets, or stop boxes until they have been properly aligned and/or accurately adjusted to the specified pitch, alignment, and grade required by the work.

503.12 Manhole, Catch Basin/Inlet Adjustment and Reconstruction
When the work under this section requires the adjustment of manholes, or catch basin/inlets, the work shall be done in accordance with the specifications under Section 400 of these Standard Specifications.

503.13 Expansion Joints
A one-half (1/2”) inch wide expansion joint shall be installed at the junction of the sidewalk and the back of curb. Where the sidewalk is constructed curb side, a one-half (1/2”) inch wide expansion joint shall be installed between the walk and the curb.

A one-half (1/2”) inch expansion joint shall be installed at the following locations; the junction of either side of the walk and a concrete driveway, the intersection of two concrete walks and other stationary objects. (ie. Hydrant, power poles, etc.)

Where the sidewalk is built in contact with a building or wall, one (1”) inch joint material shall be placed between the sidewalk and such structure. Where the face of the structure, at the point of contact with the walk is in such a condition that the material cannot be placed properly, the material shall be installed as directed by the Engineer.

A one-half (1/2”) inch expansion joint shall be installed between the back of curb and a concrete driveway approach, at the ends of all radii for curb and gutter and, at points of curvature (P.C.) of curb and gutter curves.

A one-half (1/2”) inch expansion joint shall be placed at ninety (90’) foot intervals for curb and gutter and sidewalk. A spacing of two-hundred and fifty (250’) feet will be permitted for curb and gutter and sidewalk constructed with slip forming equipment.

At catch basin and storm inlet structures a one-half (1/2”) expansion joint shall be installed in the curb and gutter on both sides of the structure at ten (10’) from the edges of the structure.

The joint filler shall extend through the entire cross section of the curb and gutter and sidewalk and be placed just below an elevation flush with the exposed surfaces.

503.13.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for the work causing its need, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision,
supplies, tools, and incidentals required to install the expansion joints required for the project.

503.14 Sawcut Joints
Contraction joints at least one (1") inch in depth and approximately one-eighth (1/8") inch in width may be sawed in the concrete curb and gutter or sidewalk. The sawing shall be done as soon as practical after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking takes place in the concrete. Joint locations shall conform with the standard details.

503.14.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for the work causing its need, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to saw cut the contraction joints required for the project.

503.15 Finishing Concrete
Before the mortar has set, the concrete surface shall be worked until a uniform, thin mortar surface is obtained.

Immediately after the water glaze or sheen has disappeared, the surface shall be troweled smooth. The application of neat cement to the surface is prohibited.

After the surface has become partially set and the water glaze or sheen has disappeared, the surface shall be brushed lightly with a damp fine bristle broom. Care shall be taken in brushing so that scratches or ridges are not formed.

Forms shall not be removed until the concrete has been allowed to set.

503.16 Concrete Disposal
The Contractor shall properly dispose of all waste material from the project. See Section 210 of these Standard Specifications regarding proper disposal of waste materials.

503.17 Existing Stone, Brick, or Block Walks
If stone, brick, or block sidewalks are removed, the Contractor shall place the material adjacent to the project on the property owner's yard, preferably off of any grass area, if possible. It shall be the property owner's responsibility to restore his private walk or dispose of the materials. If the owner is not interested in saving the material, the Contractor shall be responsible for disposing of the material.

503.17.1 Method of Measurement
The method of measurement will be per square foot of walk removed.

503.17.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Walk Removal. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools,
and incidentals required to remove the material and place at a location on the owner's property.

503.18 Curing
Curing shall be required for all concrete masonry work and shall be accomplished by the impervious coating method. Failure to provide a sufficient amount of approved curing materials or failure to properly perform the requirements prescribed herein shall be cause for immediate suspension of concrete placing operations.

As soon as the free water has disappeared after the finishing operations, the entire concrete surface shall be sealed by spraying it with a uniform coating of curing material in such a manner as to provide a continuous, water-impermeable film on the entire concrete surface. The curing compound shall be applied by an approved mechanical power sprayer or by hand where mechanical power sprayer is impractical.

The curing material shall be applied to form a uniform coverage at the rate of not less than one (1) gallon per two-hundred (200) square feet of surface area, unless the manufacturer recommends a heavier application.

Between October 1st, and April 1st, the Contractor shall utilize curing compounds of linseed oil membrane-forming emulsions, or emulsifiable concentrates, for curing and protection of concrete pavement and curb and gutter. See Cold Weather Construction in this section of these Standard Specifications.

503.18.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for Concrete Sidewalk, Curb and Gutter, and/or Pavement, New or Remove and Replace, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required for the work.

503.19 Asphaltic Concrete Removal
When required by the work, or where directed by the Engineer, the Contractor shall remove existing asphaltic concrete pavement or driveway as required to facilitate the work.

503.19.1 Basis of Payment
The cost of this item shall be a unit price item, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required for the work, including proper disposal of the waste material.

503.20 Street Pavement and Driveway Restoration
All areas of street, alleys, private drives, etc. that are disturbed by the work under this section shall be restored by the Contractor to the original condition and thickness.

If, in the case of an asphalt driveway, the Contractor is able to saw the pavement along the edge of his work and the pavement is of adequate thickness, line, and grade, the Contractor may use the edge for his form in
placing the new work. The Contractor shall be responsible for any damage to the pavement caused by his work. Any undermining shall result in additional pavement removal, at the Contractor’s expense, so that replaced pavement is upon undisturbed ground.

Prior to patching, the Contractor shall saw cut the pavement or driveway. This saw cutting shall not be included in the unit price for the item causing its need unless specifically state in the Specifications.

Where asphalt pavement patching is required, the Contractor shall excavate to allow for the placement of eight (8”) inches of compacted No. 2 gradation road gravel below the pavement. Pavement thickness shall be as existing with a minimum of three (3”) inches for roadways and commercial driveways and two (2”) inches for residential driveways.

The Contractor shall backfill existing gravel driveways with compacted Gradation No. 2 crushed aggregate or road gravel, minimum thickness of six (6”) inches, and a minimum of eighteen (18”) inches behind the back of the walk. Driveway elevations shall meet the finished abutting concrete elevation.

503.20.1 Basis of Payment
The cost of this item shall be included as a unit Contract Price, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to prepare the area, including saw cutting the pavement, and to furnish, transport, and properly install the materials required to restore the area.

503.21 Driveways With Excess Pitch In Area Of Proposed Walk
Subject to field verification, where driveway pitch is in excess of four percent (4%) across the sidewalk portion of the driveway, the driveway shall be subject to removal by the Contractor upon the direction of the Engineer.

When removal is directed by the Engineer, the Contractor shall remove the portion within the area of the walk and shall extend the removal to the first joint either side of the walk, or to a point indicated by the Engineer, to allow for reasonable ingress and egress.

To facilitate the ingress and egress, the Contractor shall place a compacted granular base material in the area of the removed driveway, to match the grade of the existing remaining driveway section on either side of the walk.

503.21.1 Method of Measurement
The method of measurement will be per square foot.

503.21.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Removal and Replacement of 6” Concrete Driveway. Said payment shall be full and complete compensation for the furnishing of all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove the existing concrete driveway on both sides of the proposed walk, to regrade the area for construction of the walk, to furnish and install granular fill, to provide ingress and egress to the property, and to replace the concrete.
driveway sections removed.

503.22 Backfilling
Backfill material shall be earth material, 90% free of stone and rubble. No stone or rubble shall be larger than one and one-half (1 1/2") inches in diameter. All acceptably sized stone and rubble shall be placed a minimum three (3") inches below the finished subgrade elevation. Backfill material shall conform to material specified in the Section 300 of these Standard Specifications.

All backfilling shall be done within ninety-six (96) hours of removing the forms.

Backfill shall extend to a point three (3") inches below the top of the curb and gutter or sidewalk. The remaining three (3") inches shall be backfilled with approved topsoil.

503.23 Protection Of The Work
Protection of freshly poured concrete shall be provided by the Contractor. The Contractor shall erect and maintain suitable barricades and employ watchmen as may be necessary to exclude (pedestrian or vehicular) traffic from the newly constructed concrete masonry until it has sufficiently cured that it will not be affected by the traffic.

The Contractor shall have sufficient materials available to protect the unhardened concrete against damage by rain or hail. When rain is imminent, the unhardened concrete shall be immediately covered with paper, plastic sheeting, or other suitable material, and planks or forms shall be placed along the edge of the work to hold the protective materials in place.

Prior to acceptance, any part of the concrete damaged by traffic, weather, or other causes shall be repaired or replaced by the Contractor in a manner satisfactory to the Engineer and at no cost to the Owner.

Grinding or rubbing of minor defects will be allowed as an alternative to removal, provided the finish appearance is not damaged to the point of being noticeable.

Epoxy grout will only be permitted if the area of repair is minor and the color of the epoxy is similar to weathered concrete. Use of epoxy grout will not be permitted for repair of cracked sidewalk.

If, in the opinion of the Engineer, the repair work is not acceptable, the Contractor shall remove and replace the affected work at no cost to the Owner.

503.24 Underdrain
If required by the plans or by the Engineer, the Contractor shall install an underdrain under the curb and gutter or sidewalk to drain the base material.

The underdrain shall consist of a minimum six (6") inch diameter perforated drain pipe or other material as specified in the Contract Documents,. The pipe shall be installed at the location shown on the plans or as shown in the details of these Standard Specifications. It shall be placed at the bottom of the trench,
which shall be lined with filter fabric and filled with washed No. 1 stone.

The underdrain shall be connected to a downstream inlet or other storm water management facility, as shown on the plans or approved by the Engineer. The area around the drain at the connection shall be sealed with concrete.

The minimum pitch on the underdrain shall be 0.5% sloping toward the downstream inlet or storm water management facility.

The Contractor shall also restore any lawn area disturbed by the installation of the underdrain.

503.24.1 Method of Measurement
The method of measurement will be per lineal foot of drainage pipe installed.

503.24.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Underdrain. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, excavate, and install the drainage pipe, filter fabric, and stone; fill the excavation; and restore any damage to lawns and adjacent areas, including the connection to the storm sewer, in conformance with these specifications.

503.25 Construction Work Area Restoration
Restoration of the lawn area shall be done in conformance with the Section 700 on landscaping in these Standard Specifications and as specified herein.

Restoration shall be completed within fourteen (14) calendar days after the area is disturbed.

Damage restoration outside the specified construction work area shall not be a pay item unless authorized by the Engineer prior to the Contractor disturbing the area.

503.25.1 Basis of Payment
The cost of this item shall be paid as a unit price, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals necessary to restore the construction work area in conformance with these Standard Specifications.

503.26 Protection of Vegetation
The Contractor shall protect and preserve trees, shrubs, plantings, and other vegetation not shown to be removed in the Contract Documents. See Section 700 of these Standard Specifications as to procedure to follow during construction to assure protection of the vegetation.
504 - GRADING AND FOUNDATION PREPARATION

504.1 Grading And Foundation Preparation
The subgrade shall be accurately shaped to conform to the bottom contour of the work as shown on the plans. All soft and unsuitable material shall be removed and replaced with suitable granular fill and the foundation, or the material underlying the proposed work, shall be mechanically compacted and finished to a firm, true surface.

If the Contractor has done excessive cutting, beyond that required by the plans or required by the Engineer, he shall, at no expense to the Owner, return the subbase under the work to the correct grade with thoroughly compacted suitable granular fill.

The base material shall be thoroughly moistened immediately prior to the placing of the concrete.

504.2 Unstable Subgrade
See the grading Section 300 of these specifications for information on the preparation of subgrade and use of suitable and unsuitable materials.

504.3 Cut Existing Grade (e.g. High Curblawn)
Where the existing grade from sidewalk to roadway does not permit proper drainage, the Engineer may direct the Contractor to grade the area to provide for proper drainage. Payment for this item shall only apply to areas beyond the project limits, when required by the Engineer.

This work shall consist of excavation of excess material between the sidewalk and curb, and grading the area. The Contractor shall then place topsoil, seed, mulch, fertilize, and water the area per these Standard Specifications.

For calculation of quantities, excavation shall be limited to a maximum of eight (8") inches below a line from the top of the street side of the sidewalk to the top of the curb. Beyond this point, the Contractor shall receive additional payment for undercutting. This limit shall allow for unknown roots and other obstacles that might exist within the area of the excavation.

504.3.1 Method of Measurement
The method of measurement will be per square yard in place.

504.3.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Cut Existing Grade. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals necessary to excavate and dispose of excess materials and to fill and grade to subgrade. Topsoil, seed, mulch, fertilize, and water shall be paid per the appropriate bid item for such work.

504.4 Fill Existing Grade
The Engineer may direct the Contractor to adjust the grade of an area by use of borrow material. When so directed, the Contractor shall furnish, place, and
grade the material as needed to meet the grade and line required by the Engineer. Payment for this item shall only apply to areas beyond the project limits, when required by the Engineer.

The placement of topsoil, seed, mulch, fertilizer and watering shall be done by the Contractor in conformance with these Standard Specifications.

504.4.1 Method of Measurement
The method of measurement shall be per cubic yard.

504.4.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Fill Existing Grade. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to acquire, transport, furnish, install, and grade the fill material required for the work.

504.5 Compaction
Fill and subgrade material within the project limits shall be compacted in conformance with the Section 305 on Compaction in these Standard Specifications.

504.5.1 Basis of Payment
The cost of this item shall be included in the Contract Price for the work causing its need, and shall include all labor, equipment, material, supervision, supplies, tools, and incidentals to adequately compact the materials placed in accordance with the requirements of the section on Compaction in these Standard Specifications.
505 - COLD WEATHER CONSTRUCTION

505.1 General
Concrete placement shall not start before 8:00 am and shall be completed no later than 2:00 P.M.

All temperatures shall be taken from the weather forecast as broadcasted by WOMT or WCUB radio.

Concrete shall never be placed on a frozen subgrade. Concrete shall not be placed when the air temperature, in the shade and away from artificial heat, is below forty (40) degrees Fahrenheit, unless approved by the Engineer. Concrete may be placed when the air temperature, in the shade and away from artificial heat, is thirty-three (33) degrees Fahrenheit and rising with approval of the Engineer.

The mixed concrete when placed in the forms shall not have a temperature of less than fifty (50) degrees Fahrenheit, nor more than eighty (80) degrees Fahrenheit. Heating of the cement or the addition of other chemicals to the mix will not be permitted without prior permission of the Engineer.

Aggregates which contain frozen lumps shall not be used unless heated prior to being incorporated into the concrete mix. The aggregates shall be heated by steam or other means in a manner which will heat the mass uniformly and preclude the possible occurrence of overheated areas. Mixing water shall be heated in such a manner that its temperature is maintained under control.

Neither the aggregate nor the mixing water shall be heated to a temperature in excess of one-hundred (100) degrees Fahrenheit, when placed together with the cement in the mixer. If either the aggregates or water is heated to a temperature in excess of one-hundred (100) degrees Fahrenheit, the water and aggregates shall be premixed in such a way that the resulting temperature of the combined water and aggregates is not in excess of one-hundred (100) degrees Fahrenheit before the cement is added to the batch. Cold aggregates, which are not frozen and do not contain frost, may be used with water heated in excess of one-hundred (100) degrees Fahrenheit, provided the water and aggregates are first premixed as specified above before the cement is added to the batch.

505.2 Protection Of The Work
When the air temperature is below thirty-two (32) degrees Fahrenheit, or is predicted to fall below thirty-two degrees Fahrenheit at anytime in the 72 hours following placement of the concrete, it shall be covered with either a double layer of plastic or 12" straw/hay placed over one layer of plastic sheeting.

The Contractor shall take care in covering the concrete to assure that the surface is not damaged by the covering.

When removal of coverings is necessary to saw joints or to perform other required work, such removal shall be done as required by the Engineer and for the minimum time required by the work.

Curing shall conform to these Standard Specifications.
The Contractor shall be responsible for the protection of the concrete placed, and any concrete, damaged by freezing or frost action during the first seven (7) days following its placement, shall be removed and replaced by the Contractor at no cost to the Owner.

505.3 Linseed Oil Treatment
Linseed oil treatment is required when concrete is placed after October 1 and before April 1.

The linseed oil shall be applied in two applications according to the following directions and specifications and shall be “white” type linseed oil so that cured concrete is aesthetically similar to ordinary cured concrete;

- The curb & gutter, or pavement, shall be dry and swept clean, and have a temperature above 50 degrees Fahrenheit. Concrete must maintain a temperature of 40 degrees Fahrenheit 24 hours.

- The first coat shall be dry in two (2) to three (3) hours at the above temperature.

- The nozzle of the spraying equipment must be held close to the pavement to get complete coverage.

  NOTE: One gallon of the mixture will cover about two-hundred (200) square feet of pavement.

505.3.1 Basis of Payment
The cost of this item shall be included in the Contract Price for the item causing its need and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required for the work.
506 - TESTING

506.1 Cylinder Tests
The Owner shall be responsible for making all cylinder samples required for the work. If the Contractor is specified to perform the testing, the Contractor shall pay for the taking of the cylinders, protection of cylinders until delivered to the certified testing lab, the transportation to the certified testing lab, the testing of the cylinders by the certified testing lab, and the cost of mailing a copy of the test results to the Engineer.

Test cylinders shall be prepared and handled in accordance with ASTM C-31 Standard Practice for Making and Curing Concrete Test Specimens in the field.

A minimum of one set of four (4) 12" x 6" diameter cylinders shall be prepared for each seven-hundred and fifty (750) feet of roadway per pour day, as shown in the following chart.

<table>
<thead>
<tr>
<th>Distance Range</th>
<th>Sets Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 750 Feet</td>
<td>1 Set</td>
</tr>
<tr>
<td>750 – 1500 Feet</td>
<td>2 Sets Required</td>
</tr>
<tr>
<td>1500 – 2250 Feet</td>
<td>3 Sets Required</td>
</tr>
<tr>
<td>2250 – 3000 Feet</td>
<td>4 Sets Required</td>
</tr>
</tbody>
</table>

The Engineer may also require the Contractor to prepare additional cylinders, beyond the guidelines noted above, as deemed necessary and at the Owners expense.

506.1.1 Basis of Payment
When the Contractor is specified in the contract documents to perform testing, the cost of this item shall be included in the Contract Unit Price for the work causing its need and shall include all labor, equipment, materials, supervision, supplies, tools, and incidental required to furnish the test cylinders; prepare, protect, and transport the samples to the certified testing laboratory; test the cylinders; and prepare and mail the test results to the Engineer.

506.1.2 Failure of Cylinder Test
In the event that the twenty-eight (28) day cylinder fails to meet the required design compressive strength in 501.4.1.10 or as specified in the contract documents (whichever is more stringent), the spare cylinder shall be tested. If the spare test cylinder also fails to meet the required design compressive strength, the Contractor may elect to take a series of standard cores from the actual concrete in question. Said cores shall be taken and tested in accordance with ASTM Designation C-42 by a certified testing laboratory. If these test cores fail to show that the design compressive strength has been met, the Contractor shall then remove the defective concrete sections as designated by the Engineer. This requirement shall exist regardless of who is responsible for the cylinder preparation and testing.

506.1.2.1 Basis of Payment
The cost of additional testing, coring, and removal of defective work shall be the responsibility of the Contractor and the cost shall not be factored into any other bid items.
506.2 Slump, Air Entrained, and Concrete Temperature Testing
The Engineer shall complete all tests for slump, air entraining, and concrete temperature at no cost to the Contractor.

Failure of the concrete to pass the slump, air entrainment, or concrete temperature tests may result in rejection of the load being tested. The Engineer may require that concrete placed prior to the testing be removed from the work. The Contractor shall not be compensated for additional costs for labor, equipment, materials, supervision, supplies, tools, or incidentals due to rejection of the materials by the Engineer.
507 - CURB & GUTTER STANDARDS & CONSTRUCTION - GENERAL

507.1 Scope of Work
The work under this section shall consist of constructing new concrete curb and gutter or the removal and replacement of existing concrete curb and gutter of the dimensions and design shown on the plans or as specified in the Contract Documents. The work shall be placed in one course on the prepared foundation or base, at the specified locations, and to the required lines and grades.

The Contractor shall furnish all labor, equipment, materials, supervision, supplies, tools, and incidentals for the work.

507.2 Jointing
Curb and gutter shall be constructed in ten (10') foot sections with trowelled, sawed, or expansion joints separating the sections.

507.3 Expansion Joints
Placement of expansion joints shall conform to Section 503 of these Standard Specifications.

507.3.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for the work causing its need and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish and install the expansion joint material.

507.4 Fill Areas
The cost of unclassified excavation and fill required for the installation of the curb and gutter shall be included in the cost of curb and gutter construction (new and/or remove and replace).

All fill areas under the curb and gutter shall be filled with crushed aggregate compacted per Section 300 of these specifications.

This item shall be a pay item only if authorized by the Engineer prior to the excavation and if measured by the Engineer prior to the placement of fill material. The Contractor shall not be paid for unauthorized over-excavation.

507.4.1 Method of Measurement
When authorized by the Engineer, the method of measurement will be per cubic yard of excavation to be filled and shall be measured in place.

507.4.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Schedule of Fixed Prices or as agreed to by both parties in a work change directive. Contract Price for Over Excavation. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate, dispose of excess material, furnish new granular fill, place fill, grade, and compact the material.
507.5  **Base Material**  
The Contractor shall undercut and place a minimum of six (6") inches of granular base under all new, or remove and replace, curb and gutter, unless the construction is being done in conjunction with new construction, and gravel has been placed to proper depth and grade by the grading contractor. Said granular material shall consist of crushed aggregate gradation #1 conforming to Section 300 of these Standard Specifications.

Base material shall be placed, thoroughly compacted to the requirements of Section 300, and finished to a firm true surface.

507.5.1  **Basis of Payment**  
The cost of this item shall be included in the Contract Unit Price for New or Remove and Replace, Curb and Gutter, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, place, level, and compact the base material required for the project.

507.6  **Curb Ramps**  
Curb ramps shall conform to Section 503.8 of these Standard Specifications

This work shall include the modification of the curb and gutter by removing the curb head, if existing at the time of the ramp installation. The curb head shall be removed by sawing a two (2) inch deep joint at the gutter, parallel to the face of the curb and for the length of the ramp opening. The Contractor shall then excavate behind the curb head a minimum width of one (1) foot across the area of the proposed ramp. He shall then hammer off the curb head and grind, chisel, or otherwise remove any rough areas on the surface of the break. (As an alternative, the Contractor may utilize a specialized direction sawing machine (if approved by the Engineer)).

The Contractor may, with the consent of the Engineer, remove and replace the curb and gutter through the ramp area and restore it in lieu of removal of the curb head. This shall remain the Contractor's option at no change in cost to the Owner. It shall, however, require the Contractor to repair any pavement or roadway damaged by the work at no additional cost to the Owner and to the satisfaction of the Engineer. Separate curb shall be tied into existing curb and also into any existing Portland cement concrete pavement.

The Contractor, as directed by the Engineer, shall remove as many slabs of walk as necessary to provide a slope on the ramp, which does not exceed 1:12 or eight and one-third (8 1/3%) percent per Wisconsin Statutes. Prior to pouring the walk and curb, the Contractor shall install a felt expansion joint along the back of curb and pour the curb separate from the sidewalk section, so that they are not one unit. Should the entire curb and gutter section be removed and replaced, the felt expansion joint shall still be placed between the curb and sidewalk.

The Contractor shall furnish and install detectable warning fields per details in Standard Specifications. The detectable warning field shall be colored to provide contrast between adjacent concrete and the detectable warning field. The color shall be Federal Yellow 33538, unless specified otherwise by the City.
Engineer. The Contractor shall furnish detectable warning field from a manufacturer on the Wisconsin Department of Transportation’s approved product list.

507.6.1 Method of Measurement
The method of measurement shall be per lineal foot for curb repair, per square foot for sidewalk, new or remove and replace, and per square foot of curb ramp detectable warning field.

507.6.2 Basis of Payment
The basis of payment shall be as measured above. As specified in the Contract Documents, the cost of these items shall be included in the Contract Unit Prices for Curb Removal and Restoration for Curb Ramp Construction or Curb and Gutter Removal and Replacement, or in the Contract Unit Price for 4" or 6" Concrete Sidewalk New or Remove and Replace. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove the existing curb head or remove and replace the existing curb and gutter; remove the existing sidewalk; excavate, grade, and install the new walk; and repair the curb and gutter per these Standard Specifications.

507.7 End of Curb Transition
When the curb and gutter terminates, said termination shall include a transition curb head which shall consist of tapering the curb head from a normal six (6") inch high curb to matching the gutter. The transition shall be done in approximately five (5') feet. There shall be a one-half (1/2") expansion joint at the beginning of the transition piece.

507.7.1 Method of Measurement
The method of measurement shall be per lineal foot.

507.7.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Concrete Curb and Gutter. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to do the work.

507.8 Driveway Curb Cuts
Driveway curb cuts shall conform to the requirements of Section 507.6 as to method of construction.

As in Section 507.6, the Contractor may, with the consent of the Engineer, remove the curb and gutter as a unit and replace the gutter section. This shall remain the Contractor's option at no change in cost to the Owner. It shall, however, require the Contractor to repair any pavement or roadway damaged by the work at no additional cost to the Owner and to the satisfaction of the Engineer.

507.8.1 Method of Measurement
The method of measurement shall be per lineal foot.
507.8.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Driveway Curb Cut. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to do the work.
508 - CURB & GUTTER CONSTRUCTION - NEW OR REMOVE AND REPLACE

508.1 Scope of Work
The work under this section shall consist of constructing new concrete curb and gutter or the removal and replacement of existing concrete curb and gutter of the dimensions and design as shown on the plans or as specified in the Contract Documents. The work shall be placed in one course on the prepared foundation or base, at the specified locations, and to the required lines and grades.

The Contractor shall furnish all labor, equipment, materials, supervision, supplies, tools, and incidentals for the work.

508.1.1 Method of Measurement
The method of measurement shall be per lineal foot. When concrete pavement is constructed with integral curb and gutter, the measurement of the pavement shall be to the back of curb and shall include all work required to construct the curb section.

508.1.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Construct New or Remove and Replace Concrete Curb and Gutter. Said payment shall be full and complete compensation for the furnishing of all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove the existing curb and gutter; properly dispose of the excess materials; excavate for subgrade; furnish and install base material; grade, level, and compact the base material; construct the new curb and gutter or remove and replace the existing curb and gutter; and restore the area within the construction work area.

When concrete pavement is constructed with integral curb and gutter, the payment for concrete pavement with integral curb shall include the cost of the curb and gutter.

508.2 Grading Limits
The grading limits for curb and gutter shall be two (2') feet behind the back of curb for integral curb and 6" for separate curb and gutter.

508.3 Line and Grade
The Contractor shall construct the new curb and gutter to line and grade as shown in the Contract Documents or as staked by the Engineer.

The Contractor shall construct the replacement curb and gutter to match the line and grade of the abutting curb and gutter, as shown in the Contract Documents, or as staked by the Engineer.

508.4 Restoration
The area between the curb and sidewalk shall be restored by the Contractor in accordance with the specifications for topsoil, seed or sod, mulch, fertilizing and watering as shown in Section 700 on Landscaping, unless otherwise directed by the Engineer.
In the case there is no sidewalk, the restoration shall be from the back of curb to the slope intercept, unless directed by the Engineer.

508.4.1 Method of Measurement
The method of measurement shall be per the appropriate bid item under Section 700 of these Standard Specifications.

508.4.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price bid for Topsoil, Seed, Mulch, Fertilize, and Water. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to do the work in accordance with the requirements of Section 700 on landscaping in these Standard Specifications.

Areas damaged by the Contractor outside the construction limits shall not be measured for payment, unless the work was directed by the Engineer.

508.5 Topsoil for Remove and Replace Curb & Gutter
For remove and replace curb and gutter, the Contractor shall use screened topsoil conforming to the specifications in Section 700 of these Standard Specifications.
509.1 Scope of Work
All driveways and sidewalks shall be constructed in accordance with the Sidewalk and Driveway Construction Detail #504, unless stated otherwise in the Contract Documents.

509.2 Grade
The standard grade of the walk is one-third (1/3) of an inch per foot above the top of the curb to the street side of the walk, with the distance being measured from the face of curb. In addition, the standard transverse pitch of the standard four (4') foot walk is 0.08 foot, or one (1") inch down toward the street.

The maximum pitch, across the width of the standard four (4') foot walk, shall not exceed sixteen-hundredths (0.16) foot or two (2") inches down toward the street.

Where wider walk is required by ordinance or by the Contract Documents, one-fourth (1/4") inch per foot minimum and one-half (1/2") inch per foot maximum shall be the cross slope.

The maximum longitudinal grade of the walk shall not exceed 1:12 or, 8.33%, without the consent of the Engineer.

509.3 Staking
The project staking shall conform to Section 203 of these Standard Specifications.

509.4 Jointing
Sidewalk shall be constructed in five (5') foot sections with construction joints separating the sections. The construction joints shall be prepared by trowelling or sawing or by installing expansion joints.

Joints shall be located as directed by the Engineer. Where sidewalk width is seven (7') feet or less, transverse joints will be installed at five (5') foot intervals. Sidewalks wider than (7') feet will have transverse joints at a maximum of (10') feet and a longitudinal joint installed. The longitudinal joint shall be installed as either a sawed or a construction type joint. The location of the joint shall be determined by the Engineer.

509.5 Expansion Joints
Placement of expansion joints shall conform to Section 503 of these Standard Specifications.

509.5.1 Basis of Payment
The cost of this item shall be included in the Contract Price for the work causing its need and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish and install the expansion joint material.
509.6 **Excavation and Fill Areas**

All unclassified excavation required for the installation of the sidewalk shall be included in the cost of sidewalk construction (new and/or remove and replace).

All fill areas under sidewalks and driveways shall be filled with crushed aggregate and compacted per Section 300 of these Standard Specifications.

This item shall be a pay item only if authorized by the Engineer prior to excavation and if measured by the Engineer prior to placement of fill material. Over-excavation by the Contractor shall not qualify for this pay item.

If the sub-base is deemed unstable by the Engineer, excavation below sub-grade shall conform to Section 300 of these Standard Specifications for Public Works Construction.

509.6.1 **Method of Measurement**

The method of measurement will be per cubic yard of excavation to be filled measured in place.

509.6.2 **Basis of Payment**

The basis of payment shall be as measured above and paid for per the Contract Unit Price for Fill Material. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate, dispose of excess material, furnish new granular fill, place fill, grade, and compact the material.

509.7 **Base Material**

The Contractor shall remove existing base and place a minimum of two (2") inches of granular base under all sidewalk (new and remove & replace), unless it is determined by the Engineer that the existing granular base meets this requirement. Said granular material shall consist of stone, crushed aggregate, traffic bond, or other approved base material. Sand and existing subgrade material will not be permitted for use as the base material without prior written permission by the City Engineer.

Base material shall be placed, thoroughly compacted, and finished to a firm true surface.

509.7.1 **Basis of Payment**

The cost of this item shall be included in the Contract Unit Price for New, or Remove and Replace Sidewalk, unless specifically stated otherwise in the Contract Documents, and shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, place, level, and compact the base material required for the project.

509.8 **Curb Ramps**

Curb Ramps shall conform to Sections 503.9 and 507.6 of these Standard Specifications.

509.9 **Sidewalk Vaults**

Whenever sidewalks are to be constructed over a vaulted area or basement area extending into the public right-of-way, an authorization by the City of
Manitowoc’s Board of Public Works shall be obtained. During application for authorization, plans and design data of the proposed structure be a registered engineer or architect shall be submitted to the City Engineer’s office for approval.
510 - SIDEWALK CONSTRUCTION - NEW OR REMOVE AND REPLACE

510.1 Scope of Work
The work under this section shall consist of constructing new concrete sidewalk or the removal and replacement of existing concrete sidewalk of the dimensions and design as shown on the plans or as specified in the Contract Documents. The work shall be placed in one course on the prepared foundation or base, at the specified locations, and to the required lines and grades.

The Contractor shall furnish all labor, equipment, materials, supervision, supplies, tools, and incidentals for the work.

510.1.1 Method of Measurement
The method of measurement shall be per square foot.

510.1.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Construct New or Remove and Replace 4” or 6” Concrete Sidewalk. Said payment shall be full and complete compensation for the furnishing of all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate for subgrade, including removal of existing sidewalk; furnish and install base material; grade, level, and compact the base material; construct the sidewalk; and restore the area within the construction work area.

510.2 Construction Work Area
The construction work area for new and remove and replace sidewalk shall be 1’ (foot) on either side of the sidewalk. This area shall be expanded as required to accommodate the construction of a 3:1 slope.

The Contractor shall be liable for any damage caused beyond the construction work area noted above, unless specified otherwise in the Contract Documents of the project being constructed. Restoration of the area within the construction work area shall be included in the bid price for the work being done.

510.3 Removal Limits
Removal limits shall be marked by the Engineer prior to the Contractor beginning removal. Only those slabs marked by the Engineer shall be considered for payment. If the Contractor finds that additional slab removal will be necessary to make his work satisfactory, he shall contact the Engineer to review the proposed removal and shall mark any additional slabs, or portion thereof, that the Engineer agrees are required by the work.

510.4 Line and Grade
The Contractor shall construct the new sidewalk to the line and grade as shown in the Contract Documents or as staked by the Engineer.

The standard line for new sidewalk shall be eight (8") inches inside the right-of-way of the street, unless otherwise shown on the plans or staked by the Engineer.
The standard grade for new sidewalk shall be one-third (1/3") inch per foot above the top of the curb for each foot measured from the face of the curb to the street side of the sidewalk. The standard transverse pitch shall be two (2%) percent down toward the street side of the walk.

510.5 Removal
When required by the Engineer, removal shall be done by the Contractor to allow for adjoining slabs to be adjusted for line and grade. The purpose of said removal shall be to eliminate any trip hazards from offset joints, broken or cracked slabs, spalled slabs, or water pockets. The final grade shall eliminate these problems allowing for smooth joints and positive drainage either across the planting strip to the curb or down the walk.

510.6 Saw Cutting
Saw cutting shall be done by the Contractor to assist in removal of slabs when full depth construction joints do not exist.

Saw cutting may be done when approved by the Engineer to reduce the area of removal of oversized slabs. If required by the Engineer, it is generally agreed that the remaining slab shall not be shorter than four (4') feet.

510.6.1 Method of Measurement
The method of measurement will be per lineal foot.

510.6.2 Basis of Payment
The basis of payment for joint sawcutting required for removal shall be include in the unit price for sidewalk removal and replacement. The basis of payment for all other sawcutting shall be as measured above and paid for per the Contract Unit Price for Saw Cutting. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to saw cut the slab to the dimensions required by the Engineer.

510.7 Remove Existing 4", or 6", Sidewalk
When required by the Engineer, the Contractor shall remove existing four (4") or six (6") inch sidewalk and shall restore the area with topsoil, seed, mulch, fertilizer, and water, unless otherwise specified in the Contract Documents.

510.7.1 Method of Measurement
The method of measurement will be per square foot for sidewalk removal, and per square yard for topsoil, seed, mulch, fertilize, and water.

510.7.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Sidewalk Removal and Restoration. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove the existing four (4") or six (6") inch sidewalk and restore the area with topsoil, seed, mulch, and fertilizer, and to water the area per these Standard Specifications.
510.8 Removal of Temporary Asphalt Patch
In the event that the City or other parties have placed a temporary asphalt patch in place of a slab of sidewalk, curb and gutter, driveway section, or other concrete work, the Contractor shall remove the temporary asphalt material and construct the sidewalk, curb and gutter, driveway section, or other concrete work in conformance with the specifications for removal and replacement of the appropriate bid item.

The method of measurement and basis of payment shall be in accordance with the appropriate bid item for removal and replacement of the work.

510.8.1 Method of Measurement
The method of measurement will be per bid item for Removal and Replacement of 4" or 6" Concrete Sidewalk.

510.8.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Removal and Replacement of 4" or 6" Concrete Sidewalk. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove and properly dispose of the asphalt material, excavate to subgrade, and construct the replacement concrete sidewalk per these Standard Specifications.

510.9 Roof Drain Replacement
The Contractor shall take care to preserve all existing roof drains that extend under the sidewalk. When the work requires that a roof drain be lowered or relocated, the Contractor shall attempt to save the pipe and shall perform the work by excavating and adjusting, or if required, replace the existing drain pipe with a new four (4) inch non-perforated drain pipe. The Contractor shall seal the joint connections and fill the excavation with granular fill.

This pay item shall only be allowed when required by the Engineer, based on the need to relocate the existing drain pipe. Negligence on the part of the Contractor in preserving the existing drain will not be a basis for application of this bid item.

510.9.1 Method of Measurement
The method of measurement will be per unit of roof drain installed with each roof drain replacement constituting one (1) unit.

510.9.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Roof Drain Replacement. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate, salvage and install or furnish and install drain pipe, backfill trench, and restore lawn damaged by the work.

510.10 Swale in Curb Lawn
When required by the Engineer, the Contractor shall construct a swale in the curb lawn between the walk and the curb to improve the drainage from the walk to the curb and gutter. The swale shall be constructed with an approximately
two (2') foot wide drainage bed and with sides sloping at a maximum steepness of 6:1 (17%).

510.10.1 Method of Measurement
The method of measurement will be per square yard of excavated material required for the construction of the curb lawn swales.

510.10.2 Basis of Payment
Basis of Payment shall be as measured above and paid for per the Contract Unit Price for Construct Curb Lawn Swale. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate, grade, and restore the area of the curb lawn swale, including topsoiling, seeding, mulching, fertilizing, and watering in conformance with these Standard Specifications.

510.11 Restoration

510.11.1 Topsoil, Seeding and Watering
The Contractor shall furnish and install screened topsoil and seed conforming to the specifications in Section 700 of these Standard Specifications. Watering requirements shall also be found in Section 700.

At crosswalks where sidewalk and curb ramp areas are replaced to achieve the A.D.A. standard curb ramp slope, there may be additional lawn excavation/grading required to meet the sidewalk edge. The Engineer shall determine the exact limits of the grading. All costs for this grading work shall be incidental to the sidewalk construction.

The backfilling shall progress with the work, and shall be done as soon as possible after 7 calendar days of curing, but no later than 14 calendar days after the sidewalk was placed, all to the satisfaction of the Engineer.

The area between the curb and sidewalk outside the construction work area (described in Section 503.1) shall be restored by the Contractor in accordance with the specifications for topsoil, seed, mulch, fertilize, and water as shown in Section 700 on landscaping. The use of sod may be specified by the Engineer in lieu of seed and mulch.

510.11.2 Method of Measurement
The method of measurement shall be per square yard for the appropriate bid item under landscaping, if applicable.

510.11.3 Basis of Payment
The basis of payment shall be included in the item creating its need unless specified as a separate pay item in the contract documents in which case it will be measured as above and paid for per the Contract Unit Price for Topsoil, Seed, Mulch, Fertilize, and Water. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to do the work per Section 700 on landscaping in these Standard Specifications.
510.12  Root Barrier

510.12.1  General
The Contractor shall install a 12-inch deep root barrier at the locations
designated by the Engineer, where root damage has necessitated the
replacement of the existing sidewalk. The actual length of the root barrier may
vary depending on the tree size, area available for pruning, and obstructions
which could prevent trenching. The Contractor shall install the root barrier in
conjunction with the sidewalk replacement.

510.12.2  Materials
The City of Manitowoc shall furnish all of the tree root barrier materials
including the jointer strips. The tree root barrier will be Deep Root #LB-12-2
as manufactured by Deep Root Partners, L.P., 345 Lorton Ave. #103,
Burlingame, CA. (800-458-7668).

The root barriers are injection molded polypropylene plastic panels with
ultraviolet inhibitors. The panels are 24 inches long by 12 inches deep with
four (4) (integrally molded) vertical root-deflecting ribs, a double top edge, and
three (3) anti-lift ground lock tabs. The panels shall be connected together with
the self-locking jointer strips.

510.12.3  Construction and Installation
The root barrier shall be installed in accordance with Root Barrier Installation
Detail #510.

The vertical root deflecting ribs of the root barrier shall be facing inwards
towards the tree and the double top edge shall be approximately three (3”) inches below the existing grade. The panels shall be connected with the
flexible jointer strips. The trench for the root barrier shall be backfilled with
crushed aggregate base course material.

The root barrier shall be installed in conjunction with the sidewalk replacement
with the root barrier being installed along the inside of the concrete forms and
the sidewalk poured directly against the root barrier and with three (3”) inches
of concrete over the top of the root barrier. The Contractor shall use care when
stripping the concrete forms to avoid damage to the root barrier.

510.12.4  Method of Measurement
This item shall be measured by the lineal foot of root barrier installed and
accepted.

510.12.5  Basis of Payment
This item, measured as noted above, shall be paid for at the unit price bid for
“Install 12-Inch Root Barrier”. The said payment shall be full compensation for
all labor, equipment, and supplies required to excavate, install, backfill the
trench and for restoring all disturbed lawn areas.

510.13 Reinforcement
Rebar or wire mesh shall not be used in the construction of any sidewalk or
driveway unless authorized by the City Engineer.

Fiber mesh shall be permitted.
511 - CONCRETE PAVEMENT STANDARDS & CONSTRUCTION -
GENERAL

511.1 Scope of Work
The work under this section shall consist of construction of new concrete pavement or of the repair or removal and replacement of existing concrete pavement as shown on the plans or as specified in the Contract Documents. The work shall be placed in one course on the prepared foundation or base, at the specified locations, and to the required lines and grades.

The Contractor shall furnish all labor, equipment, materials, supervision, supplies, tools, and incidentals for the work.

511.2 Reinforcement
All deformed bars shall be epoxy coated in conformance with Section 505.2.4 of the D.O.T. Specifications.

Dowels, expansion caps, and wire mesh shall conform to Section 415 of the D.O.T. Specifications.

Dowels at joints shall be held firmly in place by rigid baskets and "00" gauge steel wire while the concrete is placed, so that they retain their proper place and spacing.

511.3 Expansion Joint Filler
Expansion joint filler shall conform to the requirements of Section 415.2.3 of the D.O.T. Specifications.

511.4 Joint Sealer
All joints shall be sealed with a hot poured elastic type joint sealer or other sealer approved by the Engineer.

511.5 Forms For Slip Form Paving
Whenever forms, box-out lumber, etc. are used, they shall be of a height equal to the thickness of the concrete immediately adjacent to the boxout. Wood forms shall be two (2") inch surfaced plank. Lumber of less thickness will be permitted only on irregular shapes and short curves.

Whenever the paving machine deviates from proposed alignment to pave around hydrants, poles, etc., forms shall be set to proper grade at these locations to contain the concrete.

During the finishing of the curb opening for a driveway, forms of proper height shall be set to maintain the section of the pavement.

511.6 Driveway Openings
The Contractor shall refer to the project plans and/or consult with the Engineer to determine where curb openings are desired for driveways. At these locations the curb shall be omitted and the gutter shall be shaped per the details in these Standard Specifications.
511.7 Joints
All joints shall be saw cut to a minimum depth of one-quarter (1/4) of the thickness of the pavement, but not less than one and one-half (1 1/2”) inch.

Joint finishing and edging shall conform to Section 415.3.11.7 of D.O.T. Specifications.

Any other type of joint or section must be approved by the Engineer before it will be permitted.

511.7.1 Basis of Payment
The cost of sawing, cleaning, and sealing of the joints shall be included in the Contract Unit Price for New, Repair, or Remove and Replace Concrete Pavement, unless specifically stated otherwise in the Contract Documents. Said price shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to do the work.

511.8 Longitudinal And Transverse Joints
Longitudinal joints shall be constructed as and where shown on the plans and details.

All transverse joints shall be constructed where shown on the plans and details and as herein specified.

Joints shall be constructed as shown on plans or as described in the Contract Documents.

All transverse joints shall be normal (perpendicular to the centerline), unless noted otherwise.

When skewed transverse joints are specified in the Contract Documents or on the Plans, the Contractor shall construct the skewed joints right hand forward as shown on Detail# 514.

When doweled transverse joints are specified in the Contract Documents or on the Plans, the Contractor shall construct the doweled joints as shown on Detail# 513.

Longitudinal joints shall be spaced as shown in Detail# 511 and #512 and in no case shall they exceed 12.5 feet.

All intersection, transverse, and longitudinal joints shall be constructed as shown in the detail on Detail# 514 and/or #515 included in these Specifications.

The Contractor shall construct a Type “A” transverse joint at the locations shown on the plans. The Type “A” Joints shall be constructed as shown in the detail on Detail# 515.
A pavement joint shall be provided within five feet of the curb face on all cul-de-sac streets. Joint details for Cul-De-Sacs are shown on Details# 517 thru #520.

The transverse contraction pavement joint shall be located at a uniform spacing of 15 feet (plus or minus one (1’) foot). The transverse contraction joints shall be located a minimum of six (6’) feet and a maximum of 10 feet from the nearest construction joint.

To avoid premature cracking of contraction joints, every 5th joint shall be made with a suitable separator plate or knife joint (formed joint), all to the satisfaction of the Engineer.

The Contractor shall install ¾ inch epoxy coated deformed tie bars on 3 foot centers at all locations where the new concrete pavement will be directly abutting existing concrete pavement.

Where the curb and gutter is remaining, transverse joints shall be adjusted to match the curb joints on each side of the street, but no curb section shall be less than three (3) feet in length. The transverse joints may be skewed from zero to three feet maximum.

511.9 Expansion Joints
A one (1”) inch felt expansion joint shall be placed in the curb section at all radius point joints and, at intersections. At all breaks in horizontal, or vertical alignment, or where dowel basket expansion joints are to be placed, one and one-half (1 1/2”) inch felt shall be utilized.

511.10 Excavation And Fill Areas
All unclassified excavation required for the installation of the concrete pavement shall be included in the cost of repair, and/or remove and replace concrete pavement construction unless otherwise specified in the contract documents. All new concrete pavement on pre-graded streets shall also include unclassified excavation within such pay items. New streets, no pre-graded, shall have a separate bid item for unclassified.

All fill areas shall be filled and compacted with crushed aggregate in conformance with Section 300 of these Standard Specifications.

Fill material shall be a pay item only if authorized by the Engineer prior to excavation and if measured by the Engineer prior to placement of fill material. Over-excavation by the Contractor shall not qualify for this pay item.

511.10.1 Method of Measurement
When fill material is a pay item the method of measurement will be per cubic yard of excavation to be filled and shall be measured in place.

511.10.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract.
Unit Price for Fill Material. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to excavate, dispose of excess material, furnish new granular fill, place fill, grade, and compact the fill material.

511.11 Base Material
As shown on the details in these Standard Specifications, the Contractor shall undercut and place a minimum of eight (8”) inches of granular base on top of eight (8”) inches of six (6”) diameter maximum breaker run all under the concrete pavement (new and remove and replace) unless it is determined by the Engineer that the existing base is adequate or allows for the elimination of breaker run. Said granular material shall consist of compacted crushed aggregate and breaker run per Section 300 of these Standard Specifications.

Base material shall be placed, thoroughly compacted, and finished to a firm true surface.

511.11.1 Basis of Payment
The cost of this item shall be as specified in the Contract Unit Price for furnish and install eight (8”) inch CABC and furnish and install eight (8”) inch breaker run stone material and shall be measured per square yard for each item.

511.12 Integral Curb
All new concrete pavement shall be constructed with integral curb unless noted otherwise in the contract documents. All work shall be in accordance with Section 601 of the DOT Specifications.

511.12.1 Method of Measurement
Integral curb shall be included in the unit price bid per square yard of concrete pavement. The measurement for integral curb shall extend to the back of the curb.
512 - CONCRETE PAVEMENT CONSTRUCTION - REPAIR OR REMOVE AND REPLACE

512.1 Scope of Work
The work under this item shall consist of the repair (or removal and replacement) of concrete pavement of the thickness and at the locations indicated in the contract.

512.1.1 Method of Measurement
The method of measurement will be per square yard. When concrete pavement is constructed with integral curb and gutter, the measurement of the pavement will be to the back of curb and shall include all work required to construct the curb section.

512.1.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Unit Price for Concrete Pavement Repair, or Removal and Replacement. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to remove existing pavement (and curb and gutter, if specified); excavate for subgrade; furnish and install base material; grade, level, and compact the base material; furnish and install dowel bars; construct the new concrete pavement; and restore the area within the construction work area.

When concrete pavement is constructed with integral curb and gutter, the payment for concrete pavement with integral curb shall include the cost of the curb and gutter but not the cost of any manhole, and catch basin/inlet adjustment and associated backplastering.

512.2 Full Depth Pavement Patching

512.2.1 Dimensions
The minimum dimension of a patch bounding a joint or pavement edge shall be six (6’) feet.

Interior patching, not bounded by a joint or pavement edge, shall not be allowed.

Full depth patches shall be the same thickness as the existing pavement.

The edges of full depth patches shall be dowelled to the adjoining existing pavement. The dowel bars shall be three-quarter (3/4”) inch diameter, epoxy-coated, one (1’) foot long, and shall be placed at three (3’) feet on center and in accordance with the requirements of Section 416.2.4 of the D.O.T. Specifications.

515.2.2 Removal
Pavement removal shall be rectangular in shape, and the area of pavement removal shall be marked by the Engineer prior to removal.
The Contractor shall not disturb the subgrade any more than is necessary during the removal of the pavement. Any damage to surface or underground facilities shall be the sole responsibility of the Contractor.

512.3 Base Course
All base course shall be mechanically compacted, smoothed and leveled to proposed pavement depth. Additional base material may be required to obtain an acceptable base and/or proper depth.

512.3.1 Basis of Payment
The cost of this item shall be included in the Contract Unit Price for the work causing its need, unless specifically stated otherwise in the Contract Documents. Said price shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, install, level, compact, and maintain the base course material as required for the project.

512.4 Placing Concrete
All placing, finishing, and curing of concrete shall conform to requirements of the appropriate sections of these Standard Specifications.

All straight edging of patches shall be done in a transverse direction, so the crown of the existing pavement is retained.

Longitudinal and transverse joints shall conform to the pattern of the existing pavement (or as required by the Engineer) and shall be sealed in accordance with these specifications prior to opening of the street to traffic.

Expansion joints shall conform to the pattern of the existing pavement or shall be as required by the Engineer.

512.4.1 Basis of Payment
The cost of sealing and saw cutting shall be included in the Contract Price bid for the work causing its need, unless specifically stated otherwise in the Contract Documents. Said price shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, install, and maintain the work as required for the project.

The cost of expansion joints shall be included in the Contract Unit Price for the work causing its need, unless specifically stated otherwise in the Contract Documents. Said price shall include all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, transport, install, and maintain the expansion joints as required for the project.
513 - MUDJACKING

513.1 Scope of Work
The work under this section shall consist of the adjustment of concrete slabs by the process of mudjacking the slabs to bring them into alignment with the adjoining slabs. The work shall be at the locations shown on the plans or specified in the Contract Documents.

513.2 Materials
The materials for mudjacking shall consist of the proper proportions of ground limestone, sand, Portland Cement, and water. A mix of stiff consistency shall be used for raising pavement slabs and a more fluid mix shall be used for filling voids.

Ground Limestone - 100% passing #50 sieve and less than 40% passing #200 sieve.

A minimum compressive strength for the grout mix of 300 psi at seven days shall be required.

The Contractor shall submit his mix design to the Engineer for review and approval prior to the start of the work.

513.3 Mudjacking Construction Methods

513.3.1 Size and Location of Holes
The holes in the slab through which the "mud" is to be pumped shall be approximately two and one-half (2 1/2") inches in diameter. The hole shall be core drilled the full depth of the concrete curb and gutter, sidewalk, or pavement section. The core removed shall be cylindrical in shape.

The hole locations shall be not less than twelve (12") inches or more than eighteen (18") inches from a transverse joint.

The holes shall be spaced not more than six (6') feet on center, so that not more than thirty (30) square feet of slab is raised by pumping into any one hole.

Cracked slabs shall not be raised.

For a pumping joint where faulting has not yet occurred, a minimum of two holes can be used.

For a pumping joint with one corner of the slab faulted, the hole at the low corner shall be set back to avoid raising the adjacent slab.

Additional holes may be required to ensure filling all the voids under the slab.

Holes shall be spaced so that they will all be the same distance apart and/or lay in circular patterns about each other.
If a slab is settled on one side or end and requires only a few holes in that section to raise it, the holes shall be spaced in the same relationship with the slab as if it were necessary to drill the entire section.

If offset adjacent slabs refuse to separate or slide, relative to each other, a saw cut shall be made along the entire joint and run the full depth of the slab.

513.3.2 Order of Pumping
For correcting a dip or sag in the pavement, jacking should begin at the low point in the sag and progress in such an order to prevent cracking of the slab. The mudjacking shall continue until the slab has been raised to the desired elevation. All holes shall then be pumped so that no voids remain under the slab.

Slabs shall not be raised more than one-quarter (1/4") inch while pumping in any one hole at any time. No part of a slab shall lead any other part of the slab or any adjacent slab more than one-quarter (1/4") inch at any time. When using two jacks, two adjacent holes shall not be worked simultaneously.

After jacking operations are completed, all holes shall be filled with a stiff grout. The grout shall consist of one part sand and three parts cement and shall be tamped into place and fluted to a smooth finish.

513.3.3 Line and Grade
Pavement sections shall be raised to the original roadway cross section in areas where entire sections of roadway have settled. In areas where only localized settlement has occurred, individual slabs shall be raised to the level of the adjacent slab. The completed operation shall produce a slab that is within one-eighth (1/8") inch tolerance of the desired finished grade.

Any pavement slab damaged in raising operations shall be removed and replaced by the Contractor at his own expense.

513.4 Method of Measurement
The method of measurement for mudjacking will be per square foot for concrete pavement and sidewalk raised and per lineal foot for curb and gutter raised.

513.5 Basis of Payment
The basis of payment for mudjacking shall be as measured above and paid for per the Contract Unit Price for Mudjacking. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to furnish, mix, and pump the mixture (as required to bring the work within the required alignment with the adjacent existing work) and to sawcut joints as specified above.

513.6 Restoration
After the work has been completed, the Contractor shall restore any damaged areas, clean up the site, and remove all waste materials from the surface and surrounding area.

If the sidewalk slab or curb and gutter is raised to a point where the slab is
above the adjoining landscape, the Contractor shall topsoil, seed, mulch, fertilize, and water the area in conformance with Section 700 of these Standard Specifications.

513.6.1 Method of Measurement
The method of measurement will be per Section 700 of these Standard Specifications for topsoil, seed, mulch, fertilize, and water.

513.6.2 Basis of Payment
The basis of payment shall be as measured above and paid for per the Contract Price for Topsoil, Seed, Mulch, Fertilize, and Water. Said payment shall be full and complete compensation for all labor, equipment, materials, supervision, supplies, tools, and incidentals required to complete the work in conformance with Section 700 of these Standard Specifications.
## SECTION 500

**PORTLAND CEMENT CONCRETE CONSTRUCTION**

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NOTES:
SEE SECTION 500 OF STANDARD SPECS FOR JOINTING OF CONCRETE.
SEE FORM #504 FOR STANDARD DRIVEWAY NOTES.
1. WHEN LAWN AREA EXISTS, A JOINT SHALL BE CONSTRUCTED AT FACE OF WALK (SAW OR TOOL).
2. MAY REQUIRE DRIVEWAY RECONSTRUCTION (PER ENGINEER).
STANDARD CURB RAMPS
TYPE 1, 2 AND 3

General Notes:
Details of construction, materials and workmanship not shown on this drawing shall conform to the pertinent requirements of the standard specifications and the applicable special provisions.

Ramps shall be built at 1:12 or flatter. When necessary, the sidewalk elevation may be lowered to meet the high point on the ramp.

Types 1, 2 and 3 ramps shall have a normal sidewalk, apron and curb on both sides of ramp.

Detectable warning field shall be measured and paid by the square foot as curb ramp detectable warning field. The concrete pedestrian curb, if needed, shall be measured and paid by the linear foot as "Concrete Curb Pedestrian Ramp". Concrete sidewalk in the curb ramp area shall be measured and paid by the square foot as concrete sidewalk, including the area under the detectable warning field.

Surface texture of the ramp shall be obtained by broom or transverse to the slope of the ramp.

Use the Type 3 ramp only when a Type 1 or Type 2 cannot be achieved because of field conditions.
CONCRETE SIDEWALK
SPECIAL FINISH DETAIL

WINDOW PANE

2'6"  5'  2'6"  5'  2'6"  5'  2'6"  5'  2'6"  PATTERN REPEATS

1/2" EXPANSION JOINT (TYPICAL)
FACE OF CURB

3" (TYP.)

VARES 14.5' TO 15'
BLDG. TO BACK OF CURB

2'6"  2'6"  2'6"

R/W (TYPICAL)

3" TROWELED EDGE

MEDIUM BROOM FINISH (TYPICAL)

FACE OF BUILDING VARIES
CONTRACTOR TO FIELD VERIFY
BUILDING MORTAR MASONRY

1" EXPANSION JOINT (TYPICAL)

TROWELED CONTRACTION JOINT
AS SPECIFIED (TYPICAL)

EXISTING ENTRANCE MATERIAL TO BUILDINGS REMAIN

City of Manitowoc
ENGINEERING DEPARTMENT

Rev. 4/05
FORM NO. 507
NO SCALE
SIDEWALK ANCHORS ARE FOR USE ON SLOPES EXCEEDING 10%
NEW SIDEWALK FINAL MEASUREMENT FOR CORNER LOTS

SHOWING (2) DIFFERENT EXAMPLES OF R.W. LOCATIONS

ANYTHING UNDER 8" THE OWNER PAYS FOR
(EXAMPLE, STANDARD SWK SETBACK IS 8" OFF THE PROPERTY LINE).

ANYTHING OVER THE STANDARD SETBACK OF 8" THE CITY PAYS FOR

NOTE A
THE OWNER WOULD NOT PAY ANY MORE THAN 100.67' AS SHOWN IN THIS EXAMPLE.

NOTE B
THE OWNER WOULD NOT PAY FOR 110.0' OF SWK ONLY THE LOT SIZE OF 100' THE CITY WOULD PAY FOR THE 10' OF SWK AS SHOWN.
ROOT BARRIER INSTALLATION

DETAIL "A"

NEW CONCRETE SIDEWALK

EXCAVATION &
BACKFILL MATERIAL

INSTALL ROOT BARRIER
(DEEP ROOT LB12-2)

TOP OF ROOT BARRIER
3" BELOW FINISHED
SIDEWALK GRADE

COMPACTED CRUSHED
AGGREGATE BASE COURSE

DEEP ROOT LB12-2
(SUPPLIED BY CITY)

NO SCALE
GENERAL NOTES

Details of construction not shown on this drawing shall conform to the standard specifications and special provisions.

CONTRACTION JOINTS

Contraction joints shall be normal to the centerline, the location of contraction joints through intersections shall be shown on the plans or as directed by the engineer.

Contraction joints shall not be sealed or filled.

Dowel bars shall be installed parallel to the pavement centerline and surface.

CONSTRUCTION JOINTS

Construction joints shall be a minimum of 4 feet from the nearest contraction joint and aligned either parallel to contraction joints or at 90° to the centerline.

* Tie bars may be inserted through the header board after the concrete has been placed.
  ① Alternative designs of the dowel assembly may be used when approved by the engineer. Mechanical dowel bar implanters may be used instead of dowel assemblies.
  ② Dowel bars shall be anchored into drill holes with an approved epoxy grout.
  ③ The free end of dowel bars shall receive a thin uniform coating of bond breaking sealer.
  ④ Dowel bars installed by drilling shall be spaced 1-3" on center. The grouping of dowel bars shall be centered inside the slab based on all the following situations:
    
    Between the edges of pavements without longitudinal joints or between the edge of pavement and nearest longitudinal joint or between two adjacent longitudinal joints.
    
    The clear distance from the edge of pavement or longitudinal joint to the near edge of dowel bar nearest that edge or joint shall be a minimum of 6 inches and a maximum of 14 inches.

Pavement Depth, Dowel Bar Size and Joint Spacing Table

<table>
<thead>
<tr>
<th>Depth (D)</th>
<th>6 1/2&quot;</th>
<th>7 1/2&quot;</th>
<th>8 1/2&quot;</th>
<th>9 1/2&quot;</th>
<th>10 &amp; Above</th>
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<tbody>
<tr>
<td>1/4&quot;</td>
<td>12&quot;</td>
<td>14&quot;</td>
<td>15&quot;</td>
<td>15&quot;</td>
<td>18&quot;</td>
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DOWEL LED CONTRACTION JOINT

1 1/16" O.D. x 18" DOWEL BARS
ANCHORED INTO EXISTING PAVEMENT.
(SEE NOTE 2)

TRANSVERSE CONTRACTION JOINTS ABUTTING EXISTING PAVEMENT

DOWEL BAR DETAIL

CONTRACTION JOINT LOCATIONS

Dowels @ 12" O.C.

1 1/16" O.D. MAX.
X 9" DRILL HOLE.

1/4" WALL

1/4" WALL
ALL CENTERLINE MHs SHALL BE CONSTRUCTED HAVING A DIAMOND SHAPE. THE MIN. DIMENSION OF CONCRETE SHALL BE 1'-0" FROM THE MH CASTING TO THE CONSTRUCTION JOINTS. 4'x4' SQUARE ½" DIA. 24" AT 2'-6" CENTERS. 2 BARS PER FACE OF SQUARE.

NOTE: ALL JOINTS SHALL HAVE CONCRETE JOINT SEALER, HOT POURED ELASTIC TYPE ASTM DESIGNATION D-3405
**Approach Slab at Bridge Abuts.**

**Concrete Pavement**

**General Notes**
Details of construction not shown on this drawing shall conform to the standard specifications and special provisions.

Dowel bars are not required when the approach slab abuts an asphalt pavement over base course.

Spacing of No. 8 bars in the approach slab is permitted for skewed structures only, spaced shall be staggered, with a minimum of one space per bar. The length of lap shall be 20 inches.

1. No. 4 bars spaced at 2'-0" C-C in both the longitudinal and transverse directions may be used for top reinforcement as an alternative to the welded wire fabric.
2. Tie bars between reinforced slabs may be omitted where slab reinforcement extends across the centerline or reference line.

**Skewed Pavement More than 2 Lanes**

**Skews > 30°**
(Pavement width ≤ 30°)

**Skews ≤ 30°**
(Pavement width ≥ 30°)

**Approach Slab and Adjacent Pavement**

**Section C-C**
Transition Detail
Approach Slab to Adjacent Pavement

**Section D-D**
Contraction Joint

**Section B-B**
Bend Detail
Bottom Reinforcement

**Section A-A**
Reinforcement Positioning Detail

**X (R5S) - Reinforced Concrete Slab**
**X (RPS) - Paved Concrete Shoulder/Concrete Pavement, or Concrete Surface Drain (See Details Elsewhere in the Plan)**
**X (N5S) - Non-Reinforced Concrete Slab**

1. Standard contraction joint normal or skewed to E or W.
2. 1/8" expansion joint with dowel bars normal or skewed to E or W.

**D - Clear Depth**
2'-0" - 4'-0"/3'-0"

No. 4 bars spaced 2'-0" C-C (May be placed at skew angle of structure or normal to C-C)

Welded wire fabric
8" x 12" W5.5 x W4

Spaced at 2'-0" C-C

1/4" dia. dowel bars

No. 4 transverse bars
No. 6 longitudinal bars

**Section**

Bridge Abutment

1/2" expansion joint filler

1/2" dia. dowel bars

Spaced at 12" C-C
STANDARD CUL-DE-SAC

JOINT DETAIL

(36' FACE TO FACE)

NOTE: TIE BARS SHALL BE INSTALLED IN ALL LONGITUDINAL JOINTS

NO SCALE
STANDARD CUL-DE-SAC JOINT DETAIL
(32' FACE TO FACE)

NOTE: TIE BARS SHALL BE INSTALLED IN ALL LONGITUDINAL JOINTS
OFFSET CUL-DE-SAC
JOINT DETAIL
(36' FACE TO FACE)
OFFSET CUL-DE-SAC
JOINT DETAIL
(32' FACE TO FACE)

NOTE: TIE BARS SHALL BE INSTALLED IN ALL LONGITUDINAL JOINTS

City of Manitowoc
ENGINEERING DEPARTMENT

Rev. 12/09 skk
FORM NO. 520
CONCRETE MEDIAN SLOPED NOSE DETAIL

CONCRETE MEDIAN BLUNT NOSE DETAIL

GENERAL NOTES

1. See Plan for Median Nose Width and Radius (for Round Nose Alternate).
2. Width of gutter to match existing gutter or as specified elsewhere in the Plan.
3. Depth equal to adjacent pavement. Adjacent pavement structure details are shown on the Plan. Typical Options:
   - C1: New or Existing Concrete Pavement.
   - C2: Asphaltic Concrete Pavement over New or Existing Concrete Base Course.
   - C3: Asphaltic Concrete Pavement over Crushed Aggregate Base Course.
4. Tie bars or pavement ties required in new concrete pavement or concrete base course. Tie bars shall be No. 4 x 4-3/8" spaced at 2'-0" C-C. Pavement ties are required in existing concrete base course. Tie shall be No. 4 x 4-3/8" spaced at 2'-0" C-C in a horizontal skew of 6:1. The direction of skew shall alternate after every one or two bars.
5. Surface type and details are shown elsewhere in the Plan.
UNIFORM WIDTH CONCRETE CORRUGATED MEDIUM

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

WHEN CONCRETE CORRUGATED MEDIUM IS CONSTRUCTED TO SEPARATE TRAFFIC FLOWING IN THE SAME DIRECTION AND PAVEMENT MARKING IS APPLIED TO THE CONCRETE CORRUGATED MEDIUM AREA.

WHEN CONCRETE CORRUGATED MEDIUM IS CONSTRUCTED TO SEPARATE TRAFFIC FLOWING IN THE OPPOSING DIRECTION, YELLOapproval dey PAVEMENT MARKING SHALL BE APPLIED TO THE FLAT PORTION OF THE CONCRETE CORRUGATED MEDIUM. THE VIEW OF PAVEMENT MARKING CONCRETE CORRUGATED MEDIUM SHALL BE MEASURED IN PLACE AND ACCEPTED IN ACCORDANCE WITH THE CONTRACT AND PAID FOR AT THE CONTRACT UNIT PRICE PER SQUARE FOOT.

SECTION A-A

LONGITUDINAL SECTION

SECTION B-B

LONGITUDINAL SECTION

CONCRETE CORRUGATED MEDIAN AND ADJACENT PAVEMENT

HALF CROSS SECTION

EDGE OF PAVEMENT SURFACE ADJACENT TO MEDIUM

2'-0"

EDGE OF PAVEMENT SURFACE ADJACENT TO MEDIUM

2'-0"

TOP OF CORRUGATION

FLAT SURFACE

BOTTOM OF CORRUGATION

3/4" DEPTH

1/4" DEPTH

CONCRETE CORRUGATED MEDIUM AND ADJACENT PAVEMENT

BASE AGGREGATE NO. 1 OR NO. 2 DEPTH SHOWN ELSEWHERE IN THE PLANS

3" DEPTH SHOWN ELSEWHERE IN THE PLANS

TIE BAR OR PAVEMENT TIE

EDGES OF PAVEMENT SURFACE ADJACENT TO MEDIUM

2'-0"

CONCRETE CORRUGATED MEDIUM VARIOUS TYPICAL WIDTHS

PLATE: 1/2" THICK

SHEET: 1/16" THICK
ALTERATION TO EXIST. CONCRETE SPILLWAY

NEW 8" PVC STORM

PROVIDE OPENING IN CURB FOR 8" STORM PIPE

FUNNEL CURB TO 8" PIPE

NEW 18" STANDUP CURB, TIE INTO REMAINING CONCRETE SPILLWAY

14+00 AT EXISTING SPILLWAY

6"

12"

18"

NO. 4 X 12" EPOXY BARS DRILLED & SPACED 2'-0" C-C (TYPICAL)

56.88

56.93

56.47

NEW 18" TYPE "A" STANDUP CURB TAPERED TO MATCH EXIST CURB

EXIST CURB

EXIST CONC SPILLWAY

BACK OF NEW CURB

NO. 4 X 12" EPOXY BARS DRILLED & SPACED 2'-0" C-C (TYPICAL)

EXIST SPILLWAY

BACK OF CURB

SAW AT CURB FACE & REMOVE
BLOCKING UP EXISTING OPENINGS
IN UNDERGROUND VAULTS

SEAL THE STREET SIDE OF THE
NEW & EXIST WALL
IN VAULT AREA

EXIST WALL

EXIST WALL

3/8" DOWELS - 12" LONG
DRILLED 6" INTO EXIST WALL

16"

12" CONCRETE BLOCK

EXIST CONCRETE FLOOR
MOORING PILE DETAIL
TYPE 1

14" - 73# "H" PILE
40' LENGTH

3" DIAMETER WELDED TO "H" PILE

USE MIN. 3000 PSI CONCRETE

NO SCALE
SECTION A-A

1 1/2" EXPANSION JOINT FILLER

D=1" X 2 1/2" DIAMETER SLEEVE CEMENT POST IN PLACE (TWO)

1 1/2" CLEAR

NOTE: "D" = RISE OF EACH STEP AND SHALL BE EQUAL TO THE TOTAL REQUIRED RISE DIVIDED BY THE NUMBER OF STAIRS AS SHOWN ON THE PLANS OR DETERMINED BY THE ENGINEER (MAX "D" = 7)

USE "NO. 4" REINFORCEMENT BAR @ 12" O.C.

CONCRETE SIDEWALK, 4-INCH

UNITED STATES

CONCRETE STEP DETAIL

City of Manitowoc
ENGINEERING DEPARTMENT

FORM NO.
530

Rev. 01/10