SECTION 600

STREET CONSTRUCTION, SITE WORK AND RESTORATION

TABLE OF CONTENTS

SECTION 600

STREET CONSTRUCTION, SITE WORK AND RESTORATION

600 GENERAL

A. The work under this section includes all erosion control, clearing, grubbing, roadway excavation, grading, base course, asphaltic paving, concrete construction and other miscellaneous items of work required for street construction, site work and restoration as shown on the drawings and included in the specifications.

B. Unless otherwise indicated, WisDOT Specifications in this section shall be in reference to the State of Wisconsin Department of Transportation, Division of Highways, "Standard Specifications for Highway and Structure Construction", Latest Edition, including Supplemental Specifications. Unless otherwise specified, all street construction work shall conform with the WisDOT Specifications as amended herein.

601 EROSION CONTROL

A. Prior to initiating any land disturbance associated with the work specified in the Contract Documents, CONTRACTOR shall implement erosion control procedures as shown on the drawings, as specified herein, as required by local ordinance, or as recommended in Wisconsin's Best Management Practices.

B. Cost for erosion control shall be paid according to the various unit prices included in the Bid. If individual items are not included in the Bid, the cost of this work shall be considered incidental to adjacent utility and roadway construction work.

602 CLEARING AND GRUBBING

A. In general, allowable tree removals shall be those trees which are necessary to be removed for utility and roadway construction within the right-of-way and easement areas. Actual allowable tree removals will be determined in the field by ENGINEER. All trees and brush outside the right-of-way and/or easement areas, and all vegetation not specifically marked for removal shall be protected by CONTRACTOR unless otherwise allowed by ENGINEER.

B. CONTRACTOR shall remove stumps and roots from within twelve inches of finished grade. Grinding will be an acceptable method of removal to minimize disturbance and necessary restoration. In the event of removal by grinding, CONTRACTOR shall remove the majority of resulting chipped wood. CONTRACTOR shall establish finish grade in the area of tree removal. Depressions from stump and root removal shall be filled with topsoil. Finish grade will typically be a straight line between the near edge of sidewalk and adjacent back of curb.

C. CONTRACTOR shall remove from site and dispose of trees and brush, including stumps, roots, windfalls, logs, and other vegetation within the work zone.

D. Cost for clearing and grubbing as described shall be paid for according to the items Bid. If tree clearing is to be paid per inch-diameter, only trees having a diameter of 4 inches or more will be measured for payment. If individual Bid items are not provided in the Bid, the cost of this work shall be considered incidental to adjacent utility and roadway construction work.

603 UNCLASSIFIED EXCAVATION

A. All roadway excavation shall be performed as unclassified excavation as specified in Section 205 and Section 207 of the WisDOT Specifications and as herein modified. The following items of work shall be included in the price bid for unclassified excavation:

1. Removal (and stockpiling, if the use of salvaged topsoil is required) of topsoil from all cut areas and fill areas within a 1:1 slope of finished street, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.

2. The excavation to subgrade elevations as detailed in the drawings, including road bed areas, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.

3. The preparation, grading, compaction, and proofrolling of subgrade areas for roadbed, sidewalks, bike paths, driveways, and other miscellaneous surface improvements to the elevations detailed on the drawings. Compaction shall conform to WisDOT Section 207.3.6.3 for special compaction. Following preparation, all street subgrade areas, including utility trench restoration areas in roadways, shall be proofrolled with a heavily loaded tri-axle dump truck or other similar equipment requested by ENGINEER prior to the placement of any base course. ENGINEER must be present during proofrolling to review the work necessary for the stabilization of any unstable areas identified.

4. Excavation and grading required to realign and/or create ditch lines and drainage ways to route drainage to or from storm facilities as shown on the drawings, or as necessary to maintain positive drainage.

5. The removal and disposal of all undesirable and surplus materials.

6. Removal of temporary backfill placed in new utility trenches above subgrade.

B. Unclassified excavation may be completed as part of utility construction prior to initiating general roadway excavation activities. The price bid for utility installations within areas where unclassified excavation is to be performed shall not include the cost for unclassified excavation required in this Contract for street construction.

C. Saw cuts in existing pavement and sidewalks shall be to neat straight lines. Edges of saw cut edges damaged during construction shall be recut prior to acceptance for paving.

D. Removal of existing concrete pavement, sidewalks, driveways, and curb and gutter, shall be completed in accordance with WisDOT Section 204 and shall not be included in the price Bid for unclassified excavation.

E. The cost for unclassified excavation will be paid for on the basis of the price Bid. The price bid shall include excavation of materials and placement and compaction of excavated materials, except topsoil, to subgrade elevations. ENGINEER's estimated quantity for unclassified excavation will be noted in the Bid for CONTRACTOR’s information. CONTRACTOR shall be responsible to make his own computations for unclassified excavation in compiling the price bid. No changes in payment for unclassified excavation will be allowed unless changes in the work to be completed have been approved by ENGINEER. Payment for any such changes shall be determined by calculating the unclassified excavation quantity related to the change in work and applying a unit price cost based on the price Bid and ENGINEER's original estimated unclassified excavation quantity.

604 BORROW EXCAVATION

A. Where requested by ENGINEER, CONTRACTOR shall attempt to salvage suitable materials from utility and roadway construction activities to provide fill for roadway construction. Where sufficient quantities of materials suitable for roadway construction are not available from areas of the site, as determined by ENGINEER, CONTRACTOR shall perform Borrow Excavation to make up the deficit in accordance with Section 208 of the WisDOT Specifications.

B. Cost for Borrow Excavation shall be paid for according to the items included in the Bid. If individual Bid items are not provided in the Bid, the cost of this work shall be considered incidental to adjacent utility and roadway construction work.

605 UNDERCUT

A. ENGINEER may request the excavation of unsuitable materials in areas of unstable subgrade. The excavation of such materials, except in areas where CONTRACTOR has completed utility construction or placed roadway fill, shall be measured by ENGINEER and paid for at the unit price bid for undercut.

B. The excavation and replacement of unstable trench backfill and/or roadway fill or base course material placed by CONTRACTOR shall be at CONTRACTOR's expense.

C. Undercut shall be measured in place less any fill or base course material placed by CONTRACTOR.

D. Payment for undercut will only be made if undercut is approved by ENGINEER and only within the limits as requested. The price bid per cubic yard shall include all costs to excavate, remove, dispose of undesirable material, and backfill with Gradation No. 1 base course material.

E. Where requested by ENGINEER in the field, undercut areas shall be lined with geotextile material prior to backfill. Cost for geotextile shall be paid for in accordance with the unit price bid.

606 GEOTEXTILES

A. Geotextile shall be placed as requested by ENGINEER to stabilize roadway subgrade areas. Construction fabric shall be Mirafi 500X, Supac 5 WS, or equal. Any alternate fabric must have ENGINEER's approval prior to use. Geotextile fabric shall be installed in accordance with the manufacturer's recommendations. Vibratory compaction shall not be used in the compaction of base course in areas where geotextile fabrics are used.

B. Payment will be made according to the unit price bid for Geotextile Fabric for the actual subgrade surface area covered.

607 DENSE GRADED BASE

A. Dense graded base shall consist of crushed stone and be furnished in accordance with Section 305 of the WisDOT Specifications. Dense graded base shall be placed directly on subgrade areas or on top of salvaged asphalt millings. CONTRACTOR shall supply ENGINEER with a current sieve analysis of the material prior to use. The material furnished shall be uniformly graded and shall conform to the gradation requirements of WisDOT Section 305.2.2:

BASE COURSE GRADATION

Sieve Size	Percentage by Weight Passing Gradation No. 1 (3-inch Maximum)	Gradation No. 2 (1-1/4 inch Maximum)	Gradation No. 3 (3/4-inch Maximum)
3-inch	90 – 100	--	--
1-1/2 inch	60 - 85	--	--
1-1/4 inch	--	95 – 100	--
1-inch	--	--	100
3/4-inch	40 – 65	70 – 93	95 – 100
3/8-inch	--	42 – 80	50 – 90
No. 4	15 – 40	25 – 63	35 – 70
No. 10	10 – 30	16 – 48	15 – 55
No. 40	5 – 20	8 - 28	10 – 35
No. 200	2 – 12	2 – 12	5 – 15

B. Dense graded base shall be placed to the thickness shown on the typical section drawings. Where typical section drawings are not provided, a minimum of 9 inches of dense graded base shall be provided. Dense graded base thickness for utility trench patches in roadway areas shall match existing aggregate base thickness with 12-inch minimum. The top 4 inches of dense graded base shall be Gradation No. 2. Dense graded base below the upper 4 inches shall be Gradation No. 1 or 2. Dense graded base shall be wetted and rolled with a self-propelled hydrostatic drive vibratory roller.

C. The finished new dense graded base shall be fine-graded, rolled, and compacted in preparation for placement of new pavement. CONTRACTOR shall provide temporary aggregate ramps at all pavement or concrete edges that are vertically separated by more than 1-inch. Ramps shall extend at a 12:1 slope to match adjacent surfaces. CONTRACTOR shall maintain the finished surface and ramps until immediately prior to paving.

D. Payment for dense graded base shall be made at the unit price bid and shall include all labor, materials, and work necessary for complete installation. When bid price is based on tonnage, payment will be made based on weight tickets provided to ENGINEER within one week of delivery for each truck load of base course. Fine grading will be measured for payment based on the area or length paved. Payment for fine grading shall include shaping, watering, rolling, providing temporary ramps, maintenance of finished surface and removal of temporary ramps. If a bid item for fine grading is not provided in the bid, the cost for this work shall be considerable incidental to dense graded base.

608 SALVAGED ASPHALT PAVEMENT

A. Where required on the drawings or in the Special Provisions, CONTRACTOR shall salvage existing asphaltic pavement for use in roadway construction and/or restoration. Work shall be completed in accordance with Section 306 of the WisDOT Specifications as amended herein.

B. Pulverized asphalt millings shall consist of asphalt pavement that has been pulverized in place to the full depth of existing pavement. Pulverized millings shall be graded and

compacted to the grades established by ENGINEER prior to placement of new asphaltic pavement or additional dense graded base material. Ninety-five percent (95%) of pulverized millings shall pass a 1-1/2 inch screen with all material less than 4 inches in its longest dimension. Price Bid for pulverized millings shall be paid for on a square yard basis for existing pavement pulverized and shall include pulverizing existing pavement to full depth, grading and compaction.

C. Salvaged asphalt millings shall consist of asphalt pavement that has been milled and transported for use as dense graded base for roadway construction and/or restoration. Ninety-five percent (95%) of salvaged millings shall pass a 1-1/2 inch screen with all material less than 4 inches in its longest dimension. Salvaged millings shall be paid for on a square yard basis for existing pavement milled. Cost for milling, stockpiling and placing, grading and compacting shall be included in the price bid for milling.

609 POURED IN PLACE CONCRETE

A. General: The work under this section includes the construction of all poured in place concrete improvements required for utility or street construction as shown on the drawings and as specified.

B. Concrete Mix Requirements:

1. CONTRACTOR shall provide mix design to ENGINEER for approval prior to placing concrete. All concrete shall conform to the requirements as called for in Section 501 of the WisDOT Specifications, unless otherwise specified.

a. Concrete shall be normal set air entrained concrete with water reducing agent, Grade A-WR.

b. Standard mix shall use Type IA cement to produce a minimum compressive strength of 3,000 psi in ten days.

c. High early strength mix shall use Type III cement to produce a compressive strength of 3,000 psi in 3 days.

d. Mix shall provide entrained air of 6% ±1% by volume.

e. When the ambient air temperature exceeds 80°F during concrete placement, the requirements of ACI 305 shall apply.

f. If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.

C. Batching and Delivery:

1. Ready-mixed concrete shall be batched, mixed and delivered in accordance with ASTM C94 and ACI 304 from an approved batching plant.

a. Concrete shall be mixed 50 revolutions at plant, 20 upon arrival at site, and 20 each time water is added; maximum of 110 revolutions at mixing speed.

b. Concrete shall be delivered and discharged within 1-1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates, or the cement to the aggregates.

c. Truck mixers shall be equipped with drum revolution counters.

d. In no event shall concrete which has taken its initial set be allowed to be used. Retempering of concrete is not permitted.

2. A representative of ENGINEER may be at the batching plant periodically to observe the batching and mixing.

3. With each load of concrete CONTRACTOR shall obtain delivery tickets and shall make these tickets available for review by ENGINEER. Delivery tickets shall provide the following information:

   a. Date.

   b. Name of ready-mix concrete plant, job location, and CONTRACTOR.

   c. Type of cement and admixtures, if any.

   d. Specified cement content in sacks per cubic yard of concrete and approved concrete mix number or designation.

   e. Amount of concrete in load, in cubic yards.

   f. Water added at job, if any.

   g. Truck number and time dispatched.

   h. Number of mixing drum revolutions.

4. The mixer shall not be loaded beyond the capacity given by the manufacturer, and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device which will positively prevent discharging the mixture until the specified mixing time has elapsed.

5. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched in a timely manner to avoid delay in concrete placement, and the work shall be organized to use the concrete promptly after arrival at the job site.

6. The temperature of the delivered concrete shall not exceed 85°F.

D. Placing, Finishing, Curing and Protection:

1. The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the base course.

2. When slip form machines are used, the concrete mix shall be controlled to prevent sloughing.

3. Where forms are used, they shall be of sufficient strength to resist distortion or displacement.

   a. Forms shall be full depth of the work.

   b. Forms shall be securely staked and held firmly to line and grade until the concrete has set.

c. Forms shall be cleaned thoroughly and oiled before use.

4. Concrete shall be thoroughly consolidated during placement to remove all voids. Honeycombed areas shall be pointed and rubbed with mortar to provide a void-free surface.

5. The exposed surface shall be thoroughly troweled and provided with a medium broom finish at right angles to vehicular or pedestrian traffic.

6. Handicap ramps shall be provided as shown on the standard detail drawings.

7. Unless otherwise noted, all edges shall be rounded with a 1/4-inch radius edger.

8. Before final finishing, a 10-foot straight edge shall be used to check the surface. Any areas showing a variation of more than 1/4 inch from the straight edge shall be corrected.

9. Final finishing shall be delayed a sufficient time so that excess water and grout will not be brought to the surface.

10. As soon after finishing operations as the free water has disappeared, all exposed concrete surfaces shall be sealed by spraying on them a uniform coating of curing material in such a manner as to provide a continuous water impermeable film on the entire exposed concrete surface.

    a. Curing material shall be maintained for at least 7 days. Liquid curing compounds shall conform to WisDOT Section 415.3.12.2 and the requirements of the Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete, AASHTO Designation M148, Type 2, White Pigmented.

    b. The liquid curing compound material shall be applied to form a uniform coverage at the rate of not less than 1/2 gallon per 100 square feet of surface area, or at the manufacturer's recommended rate, whichever is greater.

    c. Within 30 minutes after the forms have been removed, the newly exposed concrete surfaces shall be coated with the curing compound, applied at the same rate as on the finished surface.

11. CONTRACTOR shall erect and maintain suitable barricades to protect the new concrete.

    a. Where it is necessary to provide for pedestrian traffic, the CONTRACTOR shall, at his own cost, construct adequate crossings such that no load is transmitted to the new concrete.

    b. Any part of the work damaged or vandalized prior to final acceptance shall be repaired or replaced at the expense of CONTRACTOR.

    c. Pedestrian traffic shall not be permitted on new concrete within 72 hours after application of curing material.

    d. No construction equipment or other vehicular traffic shall be permitted over newly placed concrete until a minimum compressive strength of 3,000 psi has been achieved.

e. New concrete shall not be backfilled until it has reached the required minimum compressive strength.

E. Testing:

1. Slump as measured per ASTM C-143 shall not exceed 2 inches for motorized slip form construction and 3-1/2 inches for all other construction.

2. CONTRACTOR shall assist OWNER's Consultant in preparing sets of test cylinders from representative trucks to determine compressive strength at 7 days for standard mix and 3 days for high early strength mix. Testing shall be by OWNER's Consultant.

F. Reinforcement:

1. Reinforcing bars shall comply with ASTM A 615, Grade 60 for cast-in-place structures and Section 505 of WisDOT Specifications for all other reinforcement. Steel wire shall comply with ASTM A 82. Welded wire fabric shall comply with ASTM A 185.

2. Reinforcing shall be bent cold in shop and all bends shall conform to ACI standards. Heating of reinforcement will not be permitted, and reinforcement shall not be bent or straightened in any manner that will injure the steel. Fabrication tolerances shall comply with CRSI Manual. Unless otherwise shown on the drawings, all end hook dimensions shall conform with "ACI Standard Hooks."

3. Comply with the specified standards for details and methods of placing reinforcement and supports.

4. CONTRACTOR shall clean reinforcement to remove loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete.

5. Splices in reinforcement shall be avoided wherever possible. Splices shall be Class B, Category 1 in accordance with ACI 318. Welded wire fabric shall be lapped at least one full mesh.

6. After reinforcement is placed, and before placing concrete over it, ENGINEER shall be allowed sufficient time to observe the reinforcing. All reinforcing must be securely positioned prior to placing concrete.

7. Minimum Structure Reinforcing: Where reinforcing is not shown, provide a minimum of No. 4 at 8-inch centers each way in members 10 inches or less in thickness and No. 5 at 12-inch centers each way in each face in members greater than 10 inches thick.

8. Reinforcement placed for concrete pavement, curb and gutter, sidewalks, or driveways shall be epoxy coated.

G. Curb and Gutter:

1. Concrete curb and gutter shall be placed in accordance with WisDOT Section 601 to the dimensions and shapes shown in the standard detail drawings. Where curb and gutter details are not provided, curb and gutter shape and dimensions shall match existing adjacent curb and gutter.

2. A minimum 4 inch thick layer of compacted dense graded base shall be provided beneath the full width and a minimum 6 inches behind all curb and gutter. At sections of the curb and gutter to be replaced, the existing base course may be reused provided it conforms to the above requirement and is placed over a stable subgrade.

Prior to placement of concrete, the base shall be thoroughly compacted and moistened.

3. All curved curb and gutter shall form smooth curves and shall not be a series of chords. Radius forms shall be used for all curved curb and gutter where the radius of curvature is 100 feet or less.

4. Driveway openings in the curb line will be staked by ENGINEER in the field. The details for concrete gutter sections through a driveway are shown in the standard detail drawings.

5. A 3/4-inch thick expansion joint filler shall be provided in accordance with Section 415 of the WisDOT Specifications, through the curb and gutter at:

   a. The ends of radii on curved sections including intersection radii.

   b. At storm sewer inlets (5 feet away from each side);

   c. At a maximum interval of 100 feet.

6. Expansion joint filler shall extend through the entire thickness of concrete, be perpendicular to the surface and at right angles to the line of the curb and gutter, and be left 1/4-inch below the gutter line.

7. At equally spaced, nominal intervals of not less than 6 feet nor more than 15 feet, with 10 feet typical, a contraction joint shall be tooled to a depth of 1/5 of the total concrete thickness with a 1/4-inch radius jointer. The contraction joint shall be tooled at right angles to the line of the curb and gutter from the top back of curb to the gutter flag.

8. CONTRACTOR shall provide curb and gutter with the following steel reinforcement:

   a. Provide two 20-foot No. 4 rebars centered on each utility crossing with 3-inch bottom clearance. One bar shall be positioned 3-inches from the gutter flag and one bar shall be poisoned 3-inches from the back of curb.

   b. Provide two 5-foot No. 4 rebars centered on each storm sewer inlet casting having a minimum 4 inches of concrete between the casting and the finished pavement. Rebars shall be positioned 2 inches from the gutter flag. One rebar shall be positioned 2 inches from the top gutter surface. The other rebar shall be positioned 4 inches from the top gutter surface.

9. Curb and gutter shall be marked at all sanitary sewer lateral crossings, as required in 502 D. CONTRACTOR shall:

   a. Make note prior to construction or repair of any such markings on existing curb and gutter to be replaced, and make appropriate measurements so as to be able to remark the curb after construction.

   b. Mark any additional crossings not previously marked, when location information is provided by ENGINEER.

10. Curb and gutter shall be measured for payment along the gutter flow line, including the length through storm sewer inlets, but excluding median nose areas. The unit prices bid for concrete curb and gutter shall apply to both straight and curved curb and gutter (excluding median nose areas), to standard and reject curb and gutter, and to depressed sections at driveways and curb ramps (excluding median nose areas). The

cost of all equipment, labor and materials for base preparation (excluding undercut), forming, reinforcement, concrete placement, finishing, jointing, form removals, marking of lateral crossing locations, curing and protection shall be included in the unit price bid for curb and gutter.

11. The cost of curb and gutter placed in median nose areas shall be included in the unit price bid for median nose.

H. Concrete Sidewalk and Driveways:

1. Concrete sidewalk and driveway shall be placed in accordance with WisDOT Section 602 to the dimensions and thicknesses shown in the standard detail drawings.

2. A minimum 4 inch thick layer of compacted dense graded base shall be provided beneath all new sidewalks and driveways. Where sidewalks and driveways are to be replaced, existing base material may be reused provided it conforms to the above requirement and is placed over a stable subgrade.

3. Sidewalk cross slope shall be 1/4 inch per foot pitched to drain toward curb, unless otherwise noted in the drawings or requested by ENGINEER.

4. Concrete sidewalk shall be segmented into 5-foot long rectangular blocks with tooled joints made at right angles to the centerline of the sidewalk. Sidewalk intended as a multi-use path shall be segmented with saw cut joints instead of tooled joints. Concrete driveways shall be segmented into uniform rectangular blocks with tooled joints at a maximum spacing of 10 feet in each direction. Joints must extend at least 1/5 of the total thickness of concrete. Tooled edges and joints shall be rounded with an edging tool of 1/4-inch radius.

5. A 3/4-inch thick expansion joint filler shall be provided in accordance with Section 415 of the WisDOT Specifications, through the sidewalk. Filler shall be placed at:

   a. The ends of radii on curved sections including intersection radii.

   b. interfaces of sidewalks and driveways.

   c. interfaces of driveways and curbs.

   d. interfaces of sidewalks and curbs.

   e. interfaces of sidewalks at corners.

   f. at box-outs for castings;

   g. at 100-foot intervals in sidewalks.

6. Where an existing curb stop box will lie within a proposed sidewalk or driveway apron, CONTRACTOR shall notify ENGINEER to coordinate replacement by the Middleton Water Utility with a frost-proof collar prior to CONTRACTOR pouring concrete.

7. Cost for new concrete sidewalk and driveway shall be paid for according to the unit price bid. Price shall include all labor, equipment and materials for base preparation (excluding undercut), forming, concrete placement, finishing, jointing, form removal, curing and protection.

I. Curb Ramps:

1. Curb ramps shall have a maximum slope of 12H:1V.

2. Each curb ramp shall be provided with a detectable warning field installed in fresh concrete of all sidewalk and multi-use trails at legal crosswalks, and as shown in the detail drawing. A detectable warning field shall not be installed in asphalt pavements. The typical size of detectable warning field shall be 2 feet by 4 feet. On multi-use paths that are wider than 6 feet, the width of the detectable warning field shall be 2 feet less than the path width. The curb ramp detectable warning field shall be a cast in place truncated dome system, installed per manufacturer's recommendations. Approved material include: Neenah Foundries 24" x 24" cast iron 4984-24Q in Federal Yellow (33538); TufTile 24"x24" Cast Iron TTCI2424-WS-YEL in Federal Yellow (33538); or equivalent. Warning fields of dimension 24" x 30" may also be used as needed to achieve widths of five, seven or nine feet.

J. Measurement and Payment: Curb ramp detectable warning field shall be measured and paid for by the square foot of surface area acceptably completed. Payment shall be full compensation for all materials, equipment and labor to provide a detectable warning field in curb ramps. Payment for all excavation, base course, and concrete sidewalk directly below the detectable warning field shall be included in measured quantity for payment as concrete sidewalk, which costs shall not be included in the bid price for curb ramp detectable warning field.

610 CASTING ADJUSTMENT & CONE REPLACEMENT

A. Adjusting Castings:

1. When the upper layer of asphalt pavement will be placed in a different construction season than placement of the lower layer, castings shall initially be set to match the surface of the lower layer. When both upper and lower layers of asphalt pavement are to be placed in the same construction season, castings shall be adjusted to match the surface of the upper layer.

2. The lowest adjusting ring shall be set with the entire circumference bearing directly on a sound, flat concrete surface without use of stones or shims.

3. Adjustments shall not be made sooner than three days prior to the scheduled time of paving. CONTRACTOR shall provide a Type 1 barricade with flasher on each adjusted casting until paving has been completed.

4. Internal chimney seals, where required, shall be installed after completion of upper layer pavement.

5. Valve boxes shall be adjusted by turning the box whenever suitable adjustment is available. Paving rings may only be used where approved by ENGINEER. The top of box shall be adjusted to match the pavement surface, and the box shall be plumb to allow valve operation. CONTRACTOR shall contact OWNER to check operation of valve after box adjustment and prior to paving.

6. Payment for adjusting castings on existing structures shall include costs to remove all existing precast, block, brick, mortar, HDPE rings and mastic adjustment materials and to provide new HDPE adjusting rings. Payment to be made as follows:

a. The costs for adjusting the casting of a new utility structure shall be considered incidental to the new utility structure.

b. The costs for adjusting a new casting planned to replace an existing casting shall be included in the price bid for the replacement casting.

c. The costs for adjusting an existing casting to match proposed grade shall be included in the price bid for adjusting a casting.

d. Adjustment of valve boxes shall be considered an incidental item of work, and no separate payment will be made.

B. Cone Replacement:

1. Where shown on plan drawings, CONTRACTOR shall install a new manhole cone as a replacement of deficient precast, blocks and bricks.

2. The costs to remove existing deficient manhole structure materials and set a new cone, including providing a waterproof mastic joint at connection to the existing manhole barrel, shall be included in the price bid for cone replacement.

3. Costs of casting adjustment and/or replacement of casting are not to be included in the price bid for cone replacement, and will instead be paid at the price bid for adjustment or replacement casting.

C. Steel Plates:

1. When clearance does not allow installation of a concrete cone, a steel plate may be specified. The steel plate shall be 1” thick Grade 60 steel with a 24” diameter hole centered in the plate.

611 ASPHALTIC PAVING

A. General:

1. The work under this section includes asphaltic concrete pavement and other miscellaneous items of work required for utility or street construction as shown on the drawings.

2. ENGINEER may request samples of asphaltic concrete for testing. CONTRACTOR shall cut samples from the finished pavement where requested by ENGINEER and patch the sample area. Samples for sieve analysis and asphalt content will be taken by ENGINEER prior to placement.

B. Adjusting Castings:

1. Where paving of the upper layer will be completed in the construction season following placement of the lower layer, castings shall initially be set to the finished surface of the lower layer. Where upper layer paving and lower layer paving are completed in the same construction season, castings shall be adjusted to finished grade as they are set.

2. Adjustments shall not be made sooner than 48 hours prior to the anticipated time of paving. CONTRACTOR shall furnish Type 1 barricades with flashers on all adjusted castings until paving has been completed.

3. Internal chimney seals, where required, shall be installed after completion of upper layer pavement.

4. Valve boxes shall be adjusted by turning the box whenever suitable adjustment is available. Paving rings may only be used where approved by ENGINEER. The box shall be adjusted to conform to the finished pavement and shall be plumb to allow valve operation. OWNER shall be contacted by CONTRACTOR to check operation of valve after box adjustment and prior to paving.

5. Payment for adjusting castings on existing structures shall include costs to remove all existing precast, block, brick, and mortar adjustment and provide new HDPE adjusting rings. Payment to be made as follows:

   a. The cost for adjusting castings for new utility construction prior to lower layer paving shall be considered incidental to the new utility structure.

   b. The cost for adjusting new castings set to replace existing castings prior to lower layer paving shall be included in the price bid for the replacement casting.

   c. The cost for adjusting new manhole castings from the finished lower layer surface to finished grade and for adjusting existing castings to lower layer and/or upper layer grades shall be paid in accordance with the unit prices bid. Adjustment of valve boxes shall be considered an incidental item of work.

C. Pavement Materials and Placement:

1. This work shall include the construction of asphaltic concrete pavement for areas to be paved including utility trench restoration and roadway construction.

2. Materials and construction shall conform to the requirements of the latest edition of the Wisconsin Department of Transportation (WisDOT) specifications, sections 450, 455 and 460. Additionally, materials and construction shall also conform to the requirements the current WDOT ASP 6, 460.2.1, which includes the regression of air voids from 4.0% to 3.0% with asphalt cement.

3. Omitted from the requirements will be Ride quality requirements and testing (section 440), QMP mixture sampling and testing (section 460.2.8), PG binder and tack coat sampling and testing (section 455.2.2 and 455.2.3), cold weather paving (section 450.3.2.1) and safety edge (section 450.3.2.11).

4. Asphaltic concrete pavement shall be:

   3 LT 58-28 S hot mix asphalt for lower layers (19 mm aggregate);
   4 LT 58-28 S hot mix asphalt for upper layer (12.5 mm aggregate); and
   5 LT 58-28 S hot mix asphalt for wedging or leveling (9.5 mm aggregate),

   per the latest edition of the Wisconsin Department of Transportation (WisDOT) specifications, section 460.3.1, unless otherwise specified in the Special Provisions.

5. Prior to the commencement of paving, mix designs and aggregate sieve analysis shall be submitted to ENGINEER.

6. Apply tack coat as specified in WisDOT Section 455 to each layer of pavement that will be overlaid with HMA mixture as part of the contract.

7. The pavement structure shall be in accordance with the typical section drawings. When typical section drawings are not provided, CONTRACTOR shall provide pavement thickness to match adjacent pavement, or pavement thickness shown on appropriate standard detail drawings, whichever is greater. The thickness for each layer shall conform to the table for minimum and maximum thickness as found in WisDOT Section 460.3.2.

D. Measurement and Payment: The cost for asphaltic concrete lower and upper layers shall be paid for by the ton at the unit price bid. Payment for tack coat shall be considered incidental to the price bid for asphalt. The maximum quantity of asphaltic pavement allowed for payment shall be 105% of the bid quantity. Unit prices bid shall include all materials, labor, and equipment necessary for complete, in place, asphaltic concrete pavement. Final payment shall be reduced for density deficiencies in accordance with Section 460.5.2.2 of WisDOT Specifications. The lot density shall be calculated as the average of any five adjacent density test results, and the lot area shall be considered as the full pavement width multiplied by the length encompassing the five test results.

612 CHIP SEALING

A. Materials

1. Asphalt Material. Asphalt materials shall conform to State of Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction, Section 455, except as modified herein. The asphalt material for Black Boiler Slag Seal Coat shall be CRS-2P, polymer modified, and be applied at a rate of 0.28 gallons per square yard. The asphalt material for Pea Gravel Seal Coat shall be CRS-2P, polymer modified, and applied at a rate of 0.38 gallons per square yard. The asphalt material for Dry Bottom Boiler Slag shall be CRS-2P, polymer modified, and be applied at a rate of 0.36 gallons per square yard. The asphalt material shall be rapid set emulsion that has elastic properties and shall comply with AASHTO M316.

   The temperature of the asphalt material at the time of application shall be not less than 150ºF nor more than 180ºF.

2. Aggregates

   a. General. Aggregate materials shall conform to State of Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction, Section 460, except as modified herein. Contractor shall submit sample of aggregate material to the Engineer at least two weeks before the start of Work. The application rate for aggregate shall be within the range specified in the following table. The exact rate will be determined by the Engineer.

Screenings	(lb./sq.yd.)
Black Boiler Slag	18 - 22
Pea Gravel	22 - 24
Dry Bottom Boiler Slag	22

   The Contractor shall take care to preclude contamination of stockpiles with oversized rock, clay, silt, or excessive amounts of moisture. The stockpile shall be located in areas that drain readily. Segregation of the aggregate will not be permitted.

   b. Black Boiler Slag. The aggregates for the chip seal shall consist of hard, durable particles of Black Boiler Slag (by-product of coal burning). Gradation requirements for the aggregate material shall conform to the following:

Sieve Size	% Passing by Weight
⅜ inch	100
No. 4	90 - 100
No. 8	45 - 75
No. 40	0 - 8
No. 200	0 - 3

c. Pea Gravel. The aggregates for the chip seal retained on the No.4 sieve shall have 10 percent, by weight, or less flat & elongated pieces based on a 5:1 ratio. The percent wear, measured according to AASHTO T96, shall not exceed 40 after 500 revolutions. At least 60 percent, by count, of the aggregate retained on the No. 4 sieve shall have one or more fractured face. The aggregate shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
½ inch	100
No. 4	0 - 60
No. 16	0 - 5

d. Dry bottom boiler slag. The cover aggregate shall be dry lightweight slag. The aggregate shall be applied at a rate of 22 pounds per square yard. The aggregate shall conform to the following gradation:

Sieve Size	Percent Passing by Weight
½ inch	100
⅜ inch	95 - 100
No. 4	0 - 60
No. 8	10 - 30
No. 200	0 - 10

3. Laboratory Testing. The Contractor shall provide certification that all materials used comply with specifications. The City reserves the right to test all materials to verify their compliance with specifications.

B. EQUIPMENT

All equipment, tools, and machines used in the performance of the Work will be subject to the approval of the Engineer and shall be maintained in satisfactory working order at all times. Descriptive information on the chip seal and applying equipment to be used shall be submitted for approval not less than five (5) days prior to the start of chip sealing.

1. Chip Sealing Equipment. The equipment used by the Contractor shall be such that there is continuous application of the asphalt material and aggregate without delay of application.

   The Contractor shall furnish a minimum of two (2) pneumatic-tired rollers. All rollers and brooms shall be equipped with flashing amber lights visible from the front and rear and conforming to the requirements of the vehicle code.

2. Pavement Cleaning Equipment. The Contractor shall furnish power brooms, power blowers, air compressors, water flushing equipment and hard brooms as necessary for preparation of the pavement before application of the chip seal.

3. Auxiliary Equipment. Hand squeegees, shovels, and other equipment shall be provided as necessary to perform the Work.

C. Construction Methods

1. Weather Limitations. The chip seal shall not be applied when either the pavement or air temperature is 55ºF or below and falling, but may be applied when both the air and pavement temperature are 45ºF or above and rising.

2. Application of the Chip Seal. The existing pavement shall be swept clean with a power broom to the approval of the Engineer.

   a. Joints. No excessive build-up nor unsightly appearance will be permitted on longitudinal or transverse joints.

   b. Hand Work. Approved hand rakes shall be used to spread chip seal emulsion along edges in areas not accessible to the emulsion spreading equipment. Care shall be exercised in leaving no unsightly appearance from hand Work.

   c. Manhole Covers. All manhole castings shall be covered such that no material will enter the pick holes or space between lid and casting.

3. Rolling. Initial rolling shall consist of one (1) complete coverage performed with a pneumatic-tired roller and shall begin immediately behind the spreader. Asphalt and aggregate shall not be spread more than 500 feet ahead of completion of initial rolling operations. Secondary rolling shall begin immediately after completion of initial rolling. The amount of secondary rolling shall be sufficient to adequately seat the aggregate and in no case shall be less than two (2) complete coverages.

D. Clean Up. All roads shall be swept within 48 hours after the application of the chip seal. Any excess aggregate swept by the Contractor will be the responsibility of the Contractor for disposal. Disposal of excess material swept shall be included in the square yard price. Contractor accompanied by an Engineering Technician shall uncover all lids upon completion of chip sealing to verify lids have not been sealed shut by chip seal. Contractor will be billed if City personnel must clean pick holes or unseal any lids. The Contractor shall maintain all traffic control signs until final clean up is done.

E. Protection of Work. Contractor shall take appropriate steps to minimize risk of damage to the work. Any damage to the materials shall be repaired by the Contractor at his own expense.

F. Notification. Twenty-four (24) hour advance notification of affected residents will be the responsibility of the Contractor. The Contractor shall leave a door hanger at each residence stating the time and date of when the street will be closed and reopened. The Contractor shall coordinate his Work with the City's Recycling and Waste Contractor to avoid conflicts. The Contractor shall open areas to traffic as soon as practical.

G. Method of Measurement. Chip seal will be measured in square yards for the areas satisfactorily completed.

H. Basis of Payment. Chip seal will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing all materials, equipment, tools, labor, notifications to residents, traffic control and incidentals necessary to complete the Work.

613 SPOT SEALING

A. Scope. The Work involved with Spot Sealing shall be similar to the Work involved in chip sealing. The intent of Spot Sealing shall be leveling low spots around man holes and miscellaneous areas within the road to provide a consistent level course before the chip seal is applied.

B. Method of Measurement. Spot Seal will be measured in square yards for the areas satisfactorily completed. Contractor shall notify engineer of completion so these areas can be measured before applying chip seal.

C. Basis of Payment. Spot Seal will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing all materials, equipment, tools, labor, notifications to residents, traffic control and incidentals necessary to complete the Work.

614 CRACK FILLING

A. Scope. The general requirements described in Sections 611 D, E and F shall apply.

B. Materials.

1. Hot-Applied, Single Component Joint Sealant.

   The Joint Sealant shall conform to the requirements of ASTM-D3405 or ASTM-D6690, and meet the following test parameters. Sealant material shall be dropped off at the City garage site at 3300 Laura Lane in advance of the Work taking place. The materials will be inspected and the quantity confirmed by the Public Works Department prior to any Work taking place.

Test	Typical Results
Penetration, mm/10	80
Resilience, %	63
Flow, cm	0.1
Bond test, 50% extension @ -20˚ F (-29˚ C)	Pass
Viscosity @ 380˚ F (183˚C), CPS	2000
Wt. per gallon, lbs.	10
Wt. per liter, kg	1.20
Recommended Pouring Temp.	370˚F (188˚C)
Recommended Safe Heating Temp.	390˚F (199˚C)

C. Equipment.

1. A portable router shall be used to rout the cracks to the width and depth specified. If the bit is such that routed crack measurements are not consistent, the Contractor shall replace the bit with a new one to achieve consistent width and depth.

2. An air compressor shall be used to blow the cracks clean and dry after the routing has taken place.

3. A boiler type of machine capable of a recommended pour temperature and safe heating temperature (usually 390ºF to 410ºF for the type of sealant specified). The boiler type machine shall have a wand applicator to apply an even flow of sealant to the cracks to prevent any excess flowage and running of the sealant.

D. Construction Methods.

1. Surface Preparation.

The joints and cracks to be sealed must be clean and dry. Dust, dirt, etc. shall be removed prior to application. Proper routing should be slightly larger than the existing crack/joint to ensure proper adhesion to sidewalls. The cracks shall be routed a minimum of 3/4" wide by 3/4" deep and not to exceed 1" wide by 1" deep. The cracks shall be heated and blown out before the Joint Sealant is applied.

The Contractor shall furnish power brooms, power blowers, air compressors and hand brooms as necessary for preparation of the pavement before application of the Joint Sealant.

2. Application.

Joint Sealant shall be melted in an oil-jacketed melter-applicator equipped with an agitator and separate thermometers for oil bath and melting vat. Sealant shall not be applied when air temperatures are lower than 40˚F (4˚C).

The Joint Sealant shall be applied into the crack/joint, by slightly overfilling. Immediately after applying the sealant, the Contractor shall finish the surface by pushing a soft rubber, U-shaped squeegee along the crack. The finished surface of the sealant shall be approximately 3-4 inches wide and flush with the pavement surface.

3. Clean Up. Any material from the routing of the cracks/joints shall be swept into the curb line. The City will provide the final sweeping of the curb line with its street sweeper.

E. Method of Measurement. Crack Filling will be measured based upon the amount of rubberized sealant dropped off and inspected at the City garage prior to placement.

F. Basis of Payment. Crack Filling will be paid for at the contract unit price per pound, which price shall be full compensation for furnishing all materials, equipment, tools, labor, notifications to residents, traffic control and incidentals necessary to complete the Work.

615 PAVEMENT MARKING

A. Where required, CONTRACTOR shall provide pavement markings.

B. The colors, dimensions, and placement of pavement markings shall conform to the Manual on Uniform Traffic Control Devices (MUTCD). Unless otherwise provided, the following definitions of the MUTCD shall be further defined to provide:

1. MUTCD Section 3A.05

a. A normal line is 4 inches wide.

b. A double line consists of two normal lines separated by a space of 4 inches.

c. A broken line consists of 10 foot long normal line segments, separated by 30 foot-long gaps.

d. A dotted line shall consist of 2 foot long normal line segments, separated by 4 foot-long gaps.

2. MUTCD Section 3B.16

    a. Stop lines shall be 24 inches wide.

3. MUTCD Section 3B.18

    a. Crosswalk lines shall be 8 inches wide.

    b. If used, diagonal or longitudinal lines shall be 24 inches wide and spaced 24-48 inches apart.

C. All pavement markings shall consist of paint and glass beads applied in accordance with Section 646 of the WisDOT Specifications. Measurement shall be per lineal foot of line or per unit of word or symbol provided. Measurement of double line shall be per lineal foot of each of the two normal lines.

D. Two-way traffic shall be maintained at all times. CONTRACTOR shall take precautions as necessary including traffic control measures and/or scheduling off-hour work times to protect markings from vehicular and pedestrian tracking.

E. Payment for this work shall be at the unit price bid. The prices bid shall include all labor, materials, and equipment necessary to prepare the surface, provide the markings and glass beads, protect the markings until dry, replace markings that fail within the proving period and provide traffic control.

616 RESTORATION AND SITE WORK

A. General: The work under this section includes fine grading, topsoil placement, plantings, restoration, and other miscellaneous items of work required for utility and street construction as shown on the drawings and included in the specifications for areas outside of paved surfaces where a vegetative surface is required.

B. Grass Restoration:

1. Grass restoration shall be completed in all areas disturbed by construction other than areas with finished gravel, brick, asphalt, concrete, or decorative landscape treatments.

2. Topsoil shall be of humus-bearing soil, adapted to the sustenance of plant life and commonly known as black dirt, and shall be free of stones, debris, vegetable material construction materials, lumps of dirt, and excesses of peat, sand, or clay. Topsoil shall consist of salvaged topsoil or hauled-in topsoil. Placing of topsoil shall be in accordance with Section 625.3.3 of the WisDOT Specifications. Topsoil shall be finish graded and raked prior to placement of seed or sod. Finish grading shall consist of placing topsoil to the edge of hard-surfaced areas or to limits established by ENGINEER. Cost for import (if necessary), placement, and grading of topsoil shall be included in the price bid for restoration.

3. Grass restoration shall be accomplished by planting grass seed or sod in accordance with the following requirements:

    a. Seed Restoration:

        (1) Unless otherwise shown on the drawings, all grass areas disturbed by construction activities not adjacent to existing residential properties and in all

areas where longitudinal grass restoration will be less than 12 inches in width, shall be restored with grass seed restoration.

(2) Seed restoration shall consist of providing, placing and grading topsoil to a minimum depth of 6 inches, seeding, fertilizing, and mulching.

(3) Seed materials shall conform to Section 630 of the WisDOT Specifications for No. 40 seed or Madison Parks Mix unless otherwise requested by ENGINEER. Fertilizer shall be non-phosphorus and intended for starting turf grass from seed. Mulching shall conform to Section 627 WisDOT Specifications for straw or hay mulch applied using Methods A or B.

(4) CONTRACTOR shall maintain newly seeded areas until a uniform stand of grass is established. Maintenance shall include watering, re-seeding, re-fertilizing, re-mulching, re-grading of washouts and rivulets, weed removal, and mowing. Cost for maintenance shall be included in the price bid for grass restoration.

b. Sod Restoration:

(1) Unless otherwise shown on the drawings, all grass areas disturbed by construction activities adjacent to existing residential properties and 12 inches in width or wider, shall be restored with sod.

(2) The topsoil in the area to be sodded shall be a minimum 6 inches thick and shall be loosened and brought to a reasonably fine granular texture, to a depth of not less than about 1 inch.

(3) A non-phosphorus, slow-release nitrogen fertilizer shall be spread uniformly over the areas to be sodded at the rate of 17 pounds per 1,000 square feet. Fertilizer shall be worked into the soil prior to placing sod.

(4) Sod shall consist of a dense, well-rooted growth of permanent and desirable grasses, indigenous to the general locality where it is to be used, and shall be practically free from weeds or undesirable grasses. The variety of grasses shall be generally consistent with the varieties specified for seeding. At the time the sod is cut, the grass shall have a length of approximately 2 inches and the sod shall have been raked free from debris.

(5) The thickness of the sod shall be as uniform as possible, approximately 1-1/2 inches or more, depending on the nature of the sod, so that almost all of the dense root system of the grasses will be retained, but exposed, in the sod strip and so that the sod can be handled without undue tearing or breaking.

(6) Sod shall be cut in uniform strips with minimum nominal dimensions of 18-inch by 36-inch, but no larger than is convenient for handling and transporting.

(7) Sod shall be laid so that the joints caused by abutting ends of sod strips are not continuous. Each sod strip shall be so laid as to abut snugly against the strip previously laid.

(8) As the sod is being laid, it shall be rolled or firmly but lightly tamped with suitable wooden or metal tampers to "set" or press the sod into the underlying soil.

(9) At points where water will flow over the sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent upstream strip end to provide a "shingle" effect. A layer of earth shall be placed over this juncture, which earth shall be thoroughly compacted to conduct the surface water over the upper edge of the sod. Additional stakes or staples shall be provided to hold sod where necessary.

(10) At the limits of sodded areas, wherever practical or feasible, the end strips shall be placed to effect a broken line, and ends of the strips shall be turned in and treated as above described.

(11) All sodded areas shall be kept thoroughly moist for a period of 14 days following placement by watering or sprinkling when rainfall is deficient. Sod which is dead, stressed, or not rooted into the soil at the end of the watering period shall be replaced by CONTRACTOR at no additional cost. Replacement sod shall be maintained by CONTRACTOR as required for new sod.

C. Basis of Payment: Seed and sod restoration shall be paid for according to the unit prices bid. Where unit prices are not provided for in the bid, the cost for this work shall be included in the unit prices bid for adjacent utility, street and concrete construction. The price for grass restoration shall be full compensation for preparing the earth bed including providing, grading, fertilizing and rolling the topsoil; furnishing, placing, mulching, staking, top dressing, and watering seed or sod and for all labor, equipment, tools and incidentals necessary to complete the work.

617 RETAINING WALLS

A. In areas as generally shown on the drawings and as specifically noted in the field by ENGINEER, CONTRACTOR shall construct retaining walls. The layout of the wall shall be approved by ENGINEER prior to construction of the wall. Retaining wall height shall not exceed 4 feet without terracing.

B. Boulder Walls:

1. Boulders shall be round field stone with varying sizes and weights. The minimum weight shall be 250 pounds.

2. A foundation consisting of Gradation No. 2 dense graded base shall be provided beneath the wall. The foundation shall be 18 inches thick and extend 18 inches from each face of the wall. The top of the foundation shall be 12 inches below finished grade. The wall may be constructed in conjunction with the new embankment.

3. Boulders shall be placed with larger boulders beneath smaller ones. Adjacent boulders shall be selected and oriented to produce a wall with the smallest gaps achievable. Some chinking with smaller stones may be required to secure stability of the boulders. The minimum batter shall be 3 inches in one vertical foot unless otherwise allowed by ENGINEER.

4. Geotextile fabric Supac 140N, or equal, shall be installed behind the wall to prevent the backfill from eroding through the joints and courses. Backfill shall be 1-inch clear bedding stone Gradation No. 1 per Section 200. The wall may be constructed in conjunction with the new embankment.

5. Boulder wall shall be measured for payment per square foot of face area, measured along the batter of the face between the foundation and top of wall. Boulder wall shall

be paid for at the contract unit price bid. Price shall include cost for excavation, for selecting, furnishing and installing the boulders, providing the foundation, providing geotextile fabric, backfilling, disposing of excess materials, and for all labor, equipment, and materials necessary to complete the work.

C. Modular Block Wall:

1. This work includes construction of interlocking modular concrete block units and accessories at locations shown on the drawings and as requested by ENGINEER in the field. Units shall be installed to conform to elevations shown on the drawings or as staked in the field to match existing grade.

2. Modular block units shall be constructed in accordance with the following standards:

   a. ASTM C90 - Load Bearing Concrete Masonry Units.

   b. ASTM C140 - Sampling and Testing Concrete Masonry Units.

   c. ASTM D4475 - Apparent Horizontal Shear Strength of Pultruded Reinforced Plastic Rods by the Short-Beam Method.

   d. ASTM D2339 - Strength Properties of Adhesives in Two-Ply Wood Construction in Shear by Tension Loading.

3. Modular block units shall be one of the following pre-approved proprietary systems:

   a. Keystone Retaining Wall Systems, Inc.

      (1) 8 inch Compact Unit

      (2) Gray color

      (3) Classic straight face (split face)

      (4) Setback angle 7.1° (1:8)

   b. Rockwood Retaining Walls, Inc.

      (1) 8-inch Classic unit

      (2) Gray color

      (3) Straight splitface

      (4) Setback angle 7.1° (1:8)

   c. A single block type and style shall be used throughout the project. The front face of the blocks shall conform to the above requirements for color, texture and pattern unless otherwise specified in the Special Provisions.

4. Modular Block Units shall be precast concrete having a minimum 28-day compressive strength of 3,000 psi. The concrete shall have a maximum moisture absorption of 8%.

5. Modular block units shall incorporate a mechanism or device which will develop a mechanical connection between courses.

6. The top course of wall shall be made with solid pre-cast concrete cap units designed to be compatible with the remainder of the wall.

7. Masonry units, when delivered to the site, shall be thoroughly cured and shall be dry. When stored on the site, they shall not be in contact with the ground and shall be kept clean.

8. Subgrade shall be approved by ENGINEER to confirm that the actual foundation soil conditions meet or exceed assumed design strength. Soils not meeting required strength shall be removed and replaced with acceptable material and paid for as Undercut, as described in Section 605.

9. CONTRACTOR shall provide a wall leveling pad consisting of Graduation No. 2 dense graded base. Rounded aggregate shall not be allowed in the leveling pad. The leveling pad shall be a minimum 12 inches thick and 2.5 feet wide, with the top of the pad at 8 inches to 16 inches below finished grade at the exposed wall face. Materials shall be compacted to provide a level surface on which to place the first course of units.

10. CONTRACTOR shall provide 4-inch drain tile on the fill side of all retaining walls. Drain tile shall be 4-inch perforated corrugated ADS with integral filter fabric.

11. The first course of concrete wall units shall be placed on the base leveling pad. Units shall be placed side by side for full length of wall alignment. The units shall be checked for level and alignment. Alignment may be done by a string line or offset from base line.

12. While placing material behind first course of units, the passive soil wedge at the front of these units shall be placed according to manufacturer's recommendations.

13. Unit fill material shall consist of Gradation No. 1 Bedding material as defined in Section 201. All backfill placed within a zone from the top of the leveling pad to the bottom of the wall cap units and back to the undisturbed earth embankment cut (minimum of one foot behind the back surface of the modular block units), including all material used to fill voids in the modular block units, shall be unit fill material. Backfill lifts shall be no more than eight inches in depth. Backfilling shall closely follow erection of each course of modular block units. Compaction of the unit fill material shall be accomplished by at least three passes of lightweight manually operated compaction equipment acceptable to the ENGINEER. Any damage or misalignment of the wall face during backfilling operations shall be corrected at the CONTRACTOR's expense.

14. All excess unit fill material from top of units shall be cleaned prior to installing the next course. Each course is to be completely filled, backfilled, and compacted prior to proceeding to next course.

15. Geogrid shall be provided for modular block retaining walls where recommended by the block manufacturer and shall be a uniaxial geogrid product made of polyester, polyethylene or polypropylene material. Geogrid material shall be at least 6 feet wide, placed with 6 inch overlap at edges, and 12 inch overlap at ends. Geogrid shall be Tensar UX1400, Mirafi Miragrid 7XT, or equal.

16. Concrete cap units shall be bonded to the underlying modular block units with a durable, high strength flexible adhesive compound designed for use with pre-cast concrete block materials. The adhesive shall be Keystone Kapseal, Sonneborn 200, or equal.

17. Modular block wall shall be measured for payment per square foot of face area, with the wall height measured along the batter of the face from the top of foundation to the top of wall cap units. ENGINEER may elect to measure course lengths and multiply by course height, or count the modular blocks and cap units installed to calculate the face area. Modular block wall will be paid for at the unit price bid, which shall be full compensation for required excavation, providing a wall leveling pad, modular block units, cap units, drain tile, unit fill, geogrid (where required), disposal of excess materials, and for all labor, equipment and materials necessary to complete the work.

618 TREES, SHRUBS AND GROUND COVERS

A. The specifications in this section apply to all Contracts involving proposed installations of trees, shrubs, and ground covers in the City of Middleton.

B. Miscellaneous Materials

1. Topsoil for planting beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range of between pH 6.0 and 6.8.

2. Special soil mix: When required shall be a mixture of topsoil, compost and peat moss in a ratio of 4:1:1. Install to the depth indicated on the plans.

3. Compost: Standard commercial grade compost of sheep or cow manure.

4. Peat moss: Brown to black in color, weed and seed free granulated raw peat or baled peat, containing not more than 9% mineral on a dry basis.

5. Slow release fertilizer: Granular fertilizer consisting of 50% water-insoluble nitrogen, phosphorous, and potassium in a 5-10-5 or 20-10-10 proportion as directed by ENGINEER, or in proportions as recommended in a soil report from a qualified soil testing agency.

6. Anti-desiccant: Water-insoluble protective film emulsion providing a protective film over plant surfaces; permeable to permit transpiration. Mixed and applied in accordance with manufacturer's instruction.

7. Staking/Guying: Use 2-inch or wider bands of polypropylene, or elasticized or webbed strapping acceptable to ENGINEER. Stakes shall be 6 feet to 8 feet long sections of unflanged metal or 2-inch by 2-inch hardwood.

8. Selective pre-emergence herbicide (if required): The selective pre-emergence herbicide shall be a type which controls plants emerging from seed, but has no harmful effect on established plants when applied at recommended rates. The material shall resist leaching and thereby remain relatively effective throughout one growing season. The selective pre-emergence herbicide shall be in the liquid or wettable powder form and shall be "Surflan" as produced by Elanco Product Company, a division of Eli Lilly Company, Indianapolis, IN 42606; "Weedicide" produced by Weyerhauser Company, Tacoma, WA 98401; or an equivalent that is acceptable to ENGINEER.

C. Plant Materials:

1. Trees to be planted on City property shall be on the list of species recommended by the City Forester and approved by the Park, Recreation and Forestry Commission.

2. Trees and shrubs shall not be planted in the City of Middleton that are listed as unsuitable species in the Middleton City Ordinances (Off-Street Parking Areas Specifications and Standards, Section F).

3. Provide trees, shrubs, and other plants typical of their species or variety; with normal, densely-developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if they show signs of growth during storage.

4. Provide trees with a single main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable.

5. Deciduous trees are to be free of branches to a point about 50% of their height. Height of branching should bear a relationship to the size and kind of tree so that the crown of the tree will be in good balance with the trunk as the tree grows. Evergreen trees shall be branched to the ground.

6. No pruning wounds shall be present with a diameter of more than 1 inch and such wounds must show vigorous bark on all edges.

7. Trees and shrubs planted in rows shall be matched in form.

8. Trees and shrubs larger than those specified in the plant list may be used when acceptable to ENGINEER. If the use of larger trees or shrubs is acceptable, increase the spread of roots or root ball in proportion to the size of the plant.

9. Shrubs and small plants shall meet the requirements for spread and height indicated in the plant list, and in the Middleton City Ordinances (Off-Street Parking Areas Specifications and Standards, Section F).

    a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.

    b. Single stemmed or thin plants will not be accepted.

    c. Side branches shall be generous, well twigged, and the plant as a whole well-bushed to the ground.

    d. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branch injuries.

10. Balled and burlapped trees and shrubs: Dig with firm, natural balls of earth of diameter not less than that recommended in "American Standard for Nursery Stock", and of sufficient depth to encompass the fibrous and feeding root system necessary for full recovery of the plant.

11. Bare-root plants: Dig with adequate fibrous roots, covered with a uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist straw or peat moss.

12. Container-grown stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole. No plants shall be loose in the container. Container stock shall not be pot bound, nor have kinked, circling, or bent roots.

13. Annual and perennial flowers: Top premium quality, free of all insects and diseases. Flowers are to be in a healthy, vigorous condition, with well developed root systems. Furnish flowers of the sizes indicated in the plant list.

D. Quality Assurance:

1. All trees and shrubs shall be nursery grown under climatic conditions smaller to those in the locality of the project for a minimum of 2 years.

2. Trees and shrubs furnished shall be at least the minimum size indicated. Larger plants are acceptable, at no additional cost, and providing that the larger trees and shrubs will not be cut back to size indicated. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated.

3. A certificate of inspection, or a copy thereof, for injurious insects, plant diseases, and other plant pests shall accompany each shipment or delivery of plant material.

4. Trees and shrubs may be inspected and approved at the place of growth, for compliance with specification requirements for quality, size, and variety. Such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the work.

E. Submittals: Upon plant materials acceptance, CONTRACTOR shall submit written maintenance instructions recommending procedures for maintenance of plant materials.

F. Delivery, Storage and Handling:

1. All plant materials shall be labeled by plant name and size. Labels shall be attached securely to all trees, shrubs, and containers of other plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

2. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.

3. Take all precautions customary in good trade practice in preparing plants for moving. Dig, pack, transport, and handle plants with care to ensure protection against injury. Spray deciduous trees and shrubs in foliage with an approved “Anti-Desiccant” immediately after digging to prevent dehydration. Protect all plants from drying out. Cover plants transported on open vehicles with a protective covering to prevent wind burn.

4. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to OWNER. Water heeled-in plantings daily.

5. No trees or shrubs shall be bound with rope or wire in a manner that could damage or break the branches.

6. Plants shall be lifted and handled from the bottom of the ball only. Plants moved with a ball will not be accepted if the ball is cracked, loose or broken before or during the planting operations.

G. Project Conditions:

1. Work notification: Notify ENGINEER at least two working days prior to installation of plant material, and again upon project completion.

2. CONTRACTOR shall coordinate planting work with installation of sod and the construction of other site features.

3. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings or in the Special Provisions.

H. Preparation:

1. Time of planting:

   a. Evergreen material: Plant evergreen trees and shrubs between April 15 and May 30 before new growth begins. If project requirements require planting at other times, plants shall be sprayed with anti-desiccant prior to planting operations.

   b. Deciduous materials: Plant deciduous trees and shrubs in a dormant condition between October 1 and December 1, or between April 15 and May 30. Oaks, Elms, and Hackberry are to be planted in the spring, not in the fall. If deciduous trees or shrubs are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operations.

   c. Planting times other than those indicated will only be allowed upon acceptance of ENGINEER.

2. Planting shall be performed only by experienced workers familiar with planting procedures under the supervision of a qualified supervisor.

3. Locate plants as indicated or as approved in the field after staking by ENGINEER. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected by ENGINEER.

4. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide planting pits with a diameter at least 24 inches greater than the diameter of the root system for shrubs and at least three times the root ball diameter for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a minimum depth of 6 inches, except soil under root ball. Reuse excavated soil for backfill unless otherwise directed by ENGINEER.

5. Fill excavations with water and allow to percolate out before positioning trees or shrubs and placing lower layer of backfill.

6. CONTRACTOR shall notify engineer in writing of soil conditions CONTRACTOR considers to be detrimental to tree growth. Proper water drainage must be assured.

7. Provide dry, loose topsoil for planting bed mixes. Frozen or muddy topsoil is not acceptable.

8. Areas within parking lot islands or tree planters proposed for tree plantings shall be excavated to a depth of 3 feet below finished grade and filled with topsoil to support tree growth. This excavation shall commence only after placement of the curb and gutter and shall provide a 1:1 slope from the bottom of curb to avoid disturbing the curb and gutter.

9. For tree installations associated with either a new street construction or major reconstruction project, provide a 12 inch minimum depth of topsoil within a 10 foot radius of each tree planting.

I. Installation:

1. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Face tree paint marks south, if provided. Carefully remove excess soil from top of ball to expose root collar. Set root collar 1 inch to 2 inches above the finished grade. No filling will be permitted around trunks or stems. Install fertilizer around shrubs per the manufacturer's directions and in the quantity recommended for the plant size.

2. Remove transit guard, twine, rope, wrapping materials and plant labels secured around the trunk or branches. After balled and burlapped plants are set, remove all burlap, ropes, and wire baskets from tops of balls. Backfill with one-half the soil, working it around roots to eliminate air pockets, then water. Backfill to finished grade and water. Form a slight saucer-like basin to catch and hold additional water.

3. Bare root plants shall have their roots spread into a natural position, free of bunching, kinking, or circling. All broken or damaged roots shall be cut back to the point where they are clean and free of rot. No other root pruning shall be done.

4. For plants in plastic or metal containers, the container shall be removed before planting. For plants in biodegradable pots, the pot shall be slit vertically in at least three places prior to backfilling. If roots are crowded or coiled at the bottom, sides, or surface of the root ball, they shall be gently separated from the edges or surface.

5. Plants shall be thoroughly watered immediately after planting.

6. Space ground cover and floral plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 12 inches of the trunks of trees and shrubs within planting bed and to within 6 inches of edge of bed.

7. Mulching:

   a. Mulch tree and shrub planting pits and shrub beds with 3 inches to 4 inches of wood mulch immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface. All shrub beds with bark mulch shall receive pre-emergence herbicide treatment in accordance with manufacturer's instructions for surface application just after installation of mulch.

   b. Mulch floral beds with bark mulch 1 inch to 1-1/2 inches deep immediately after planting.

   c. Avoid placing mulch in contact with tree trunk. Pull back mulching material 4 inches to 6 inches from the trunk.

8. Wrapping, Staking, Guying:

   a. Do not wrap trees unless directed to do so by ENGINEER. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.

b. If required, wrap trunks of trees spirally from bottom to top with specified tree wrap and secure in place.

(1) Overlap 1/2 width of the tree wrap strip and cover the trunk from the ground to the height of the first branches.

(2) Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least three places in addition to the top and bottom.

(3) CONTRACTOR shall remove all wrapping materials after one year.

c. Only trees so designated shall be staked and guyed. Ties made of approved material shall be attached directly to the stakes or may be attached to the stakes by wire. In no case shall the wire extend around the tree trunk. Ties shall be attached loosely enough to allow a small amount of play in the trunk. Stakes shall be driven outside the root ball. The Contractor will be responsible for removing all stakes and guy materials one year after planting.

9. Pruning:

a. Do not prune healthy branches. Remove or cut back only broken, damaged, and asymmetrical growth of new wood. Do not paint pruning cuts.

b. Multiple leader plants: Preserve the leader which will best promote the symmetry of the plant. Cut branches flush with the trunk or main branch, at a point beyond a lateral shoot or bud a distance of not less than one-half the diameter of the supporting branch. Make cut on an angle.

10. Tree relocation (if shown on the drawings):

a. Transplant trees designated for relocations shown on the drawings. Prune, dig, ball and burlap, move and plant in accordance with specified tree planting requirements.

b. Maintain trees and shrubs in storage areas by bracing plants in vertical position and setting balls in an enclosed berm of topsoil or bark. Water as required to maintain adequate root moisture.

c. Re-burlap root balls if required before final transplanting operations.

J. Cleanup:

1. Excess soils, branches, binding and wrapping materials, rejected plants and other debris resulting from any planting shall be promptly cleaned up and removed from the site.

2. The work area shall be kept safe and neat at all times until the work is completed. Under no condition shall the accumulation of soil, branches or other debris be allowed upon a public property in such a manner as to result in a public hazard.

K. Maintenance:

1. Maintain plantings for a period of at least 60 days after completion of planting operations until all plants are sufficiently recovered from transplanting and in a healthy

growing condition acceptable to ENGINEER. Maintain plantings installed in the fall after October 1 until May 30 of the following year.

2. Maintenance shall include cultivating, weeding, watering and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.

3. Water trees, plants, ground cover and perennial grouping beds within the first 24 hours of initial planting and not less than twice per week until final acceptance.

4. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

5. Reset settled plants to proper grade and position. Restore planting saucer and adjustment material and remove dead material.

6. Tighten and repair stakes and guys as required.

7. Floral beds: Twice during the maintenance period and at two-week intervals, spray plants with “Ra-Pid-Gro” per manufacturer’s directions. Replace all poor-growing plants immediately.

L. Acceptance:

1. Inspection to determine acceptance of planting areas will be made by ENGINEER, upon CONTRACTOR’s request. Provide notification at least two working days before requested inspection date. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy vigorous condition.

2. Upon acceptance, OWNER will assume plant maintenance.

M. Basis of Payment:

1. The number of plants, furnished and planted, measured as provided above, will be paid for at the Contract unit price. Price shall be payment in full for furnishing, transporting, handling, potting, storing, pruning, placing and replacing plant materials; for all excavation of plant holes, salvaging of topsoil, mixing and backfilling; for furnishing and applying all required fertilizer, mulch, water, wrapping, stakes and guys, weed control barrier, and rodent barriers; for disposal of excess and waste materials; for maintenance care; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work.

2. Undercut of the parking lot islands or tree planters will be paid for at the Contract unit price per cubic yard of material removed. That price shall be payment in full for all excavation work specified above and also for all items of work designated on the drawings for which no separate unit prices are included in the Contract.

3. Payment for the topsoil backfill of the undercut in the parking lot island areas or tree planters will be made at the Contract unit price for Topsoil or Salvaged Topsoil, classified in accordance with the terms of the Contract.

N. Warranty:

1. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of two years after completion and acceptance of entire project.

2. Replace, in accordance with the drawings and specifications, all plants that are more than 25% dead or, as determined by ENGINEER, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes due to CONTRACTOR's negligence. The cost of such replacement(s) is at CONTRACTOR's expense. Warrant all replacement plants for two years after their installation.

3. Warranty shall not include damage or loss of trees, shrubs, or ground covers caused by animal damage, acts of vandalism, or storm damage.

4. Remove and immediately replace all plants, as determined by ENGINEER, to be unsatisfactory during the initial planting installation.

END OF SECTION